MONASH University

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Health Facilities Costing Study

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List of acronyms

AHC	Area Health Centre
ARI	Acute Respiratory Infection
BOR	Bed Occupancy Rate
CIF	Cost, Insurance and Freight
CRS	Constant Returns to Scale
DEA	Data Envelopment Analysis
DFAT	Department of Foreign Affairs and Trade (Australia)
DWE	Direct Wage Employee (paid for from the provincial health services grant)
EFT	Equivalent Full Time
ENT	Ear, Nose and Throat (clinic at the National Referral Hospital)
EPI	Expanded Program on Immunisation
GSH	Good Samaritan Hospital (Guadalcanal Province)
HCC	Honiara City Council
HFS	Health Facility Survey
HIES	Household Income and Expenditure Survey
HIS	Health Information System (MHMS)
HGH	Helena Goldie Hospital (Western Province)
HSSP	Health Sector Support Program
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
ICPC	International Classification of Primary Care
IP	Inpatient
IQR	Interquartile Range
LOS	Length of Stay
MHMS	Ministry of Health and Medical Services
MoFT	Ministry of Finance and Treasury
MPS	Ministry of Public Service
NAP	Nurse Aid Post
NCD	Non Communicable Disease
NHSP	National Health Strategic Plan 2011 – 2015 (MHMS)
NGO	Non-Government Organization
NMS	National Medical Stores
NRH	National Referral Hospital
NSE	National Service Employee
NVBDCP	National Vector-Borne Disease Control Program

OP	Outpatient
PES	Patient Exit Survey
PHD	Provincial Health Director
PHO	Provincial Health Office
PNG	Papua New Guinea
RHC	Rural Health Clinic
SBD	Solomon Islands Dollar
SE	Scale Efficiency
SIEA	Solomon Islands Electricity Authority
SIG	Solomon Islands Government
SIWA	Solomon Islands Water Authority
SLMS	Second Level Medical Store
SPC	Secretariat of the Pacific Community
TE	Technical Efficiency
UHC/RDP	Universal Health Coverage / Role Delineation Policy (draft)
VRS	Variable Returns to Scale
WHO	World Health Organization

Technical notes

All dollar units in this report are presented in Solomon Islands Dollars (SBD) and the price year is 2013. The currency conversion as at 30 June 2013 was SBD 1 = USD 0.1371.

All costs and other data presented are annual for 2013 unless stated. The Solomon Islands government's fiscal year is the same as the calendar year, January to December.

All health service inputs, outputs and costs in this report are nationally representative estimates of health service delivery in Solomon Islands in 2013, unless otherwise stated. For lower level facilities (including Area Health Centres, Rural Health Clinics and Nurse Aid Posts), this involved weighting the costs of the sample of the health facilities that were surveyed, by the characteristics of those facilities surveyed (as per our stratified sampling approach) relative to those not surveyed. Sampling weights were applied to Area Health Centres, Rural Health Clinics and Nurse Aid Posts only, as the National Referral Hospital and all provincial and church hospitals were sampled and therefore these estimates are already representative.

The methods for data collection and analysis are described in the Technical Annex.

Definitions

Child Welfare Visits refers to a specific field in the Health Information System (HIS) operated by the Ministry of Health and Medical Services (MHMS). The HIS guidelines define child welfare visits as: "a regular scheduled clinic for babies and children less than 5 years of age, either in the clinic or on tour or at a satellite clinic. Activities include Expanded Programme on Immunisation, growth monitoring, health assessment etc."[1]

Data Envelopment Analysis (DEA) takes into account the inputs (e.g.: costs) and the outputs (e.g.: services delivered) of a facility to calculate a relative measure of efficiency. It produces technical efficiency scores for facilities from 0 to 1, where a value of 1 indicates the facility is relatively efficient, and a value less than 1 indicates the facility is relatively inefficient.

Efficiency frontier is a term used in the DEA. The DEA produces technical efficiency scores for facilities from 0 to 1, where a value of 1 indicates the facility is relatively efficient, and a value less than 1 indicates the facility is relatively inefficient. Those facilities with values of 1 are considered to be on the "efficiency frontier."

Interquartile range (IQR) is provided in the tables annexed to this report. IQR includes Q1 and Q3. Q1 is the middle value in the first half of the data set and Q3 is the middle value in the second half of the data set. The IQR is available for each data point in the Technical Annex.

Outreach services may be defined by **trips** for outreach, **tours** to communities and patient **contacts** conducted on tour. **Outreach trips** include the number of trips for outreach reported by health workers (to cost transport). **Outreach tours** include the number of satellite clinics, school health clinics and healthy village activities or meetings reported in the Health Information System (HIS). **Outreach contacts** include the total patient number of contacts for antenatal, postnatal and child welfare conducted on tour reported in the HIS.

Recurrent costs are defined by the Solomon Islands government as expenditure that "is recurring spending or, in other words, spending on items that are consumed and only last a limited period of time. They are items that are used up in the process of providing a good or service..."[2] The recurrent costs included in this study are: staff salaries and allowances, supplies, transport costs, utilities and maintenance. This report is focused on recurrent costs.

Scale Efficiency is a term used to describe a model used in the DEA. The DEA takes into account the inputs (e.g.: costs) used to run a facility, and the outputs (e.g.: services delivered) it produces. A facility is scale efficient if any change in its scale (for example, the number of inpatient admissions or outpatient visits) will make it less efficient.

[1] MHMS (2007), 'Solomon Islands Primary Health Care Health Information System: Guidelines for Monthly Reporting from Hospitals and Clinics', p.15. Copy on file with author.
[2] SIG (2012). 'SIG Charter of Accounts Manual', p. 6. Copy on file with author.

Technical Efficiency (TE) is a term used in the DEA. The DEA produces TE scores for facilities from 0 to 1, where a value of 1 indicates the facility is relatively efficient, and a value less than 1 indicates the facility is relatively inefficient.

Variable Returns to Scale (VRS) is a term to describe a model used in the DEA. The DEA compares facilities against each other to obtain relative measures of efficiency. For VRS analyses, only facilities operating at similar production scale are compared against each other.

Executive summary

The Solomon Islands' Ministry of Health and Medical Services (MHMS) commissioned this Health Facilities Costing Study ('the study') to better understand how resources are used to deliver health services. The MHMS oversees two main sources of recurrent funds in support of this system: annual appropriations from domestic government resources and budget support from its development partners, including via the Health Sector Support Program (HSSP). The MHMS recorded recurrent expenditures of SBD 403 million in 2013, including SBD 262 million from domestic resources and SBD 141 million from HSSP, which amounted to 17% of total government recurrent expenditure.[3]

The MHMS uses these funds to support facilities at all levels of the health system – the National Referral Hospital (NRH; unless NRH is specifically mentioned it is not included as part of general reference to "hospitals"), provincial and church hospitals (referred to as "hospitals" in this report unless otherwise specified), Area Health Centres (AHC), Rural Health Clinics (RHC) and Nurse Aid Posts (NAP), and national programs. This study focuses on the facilities only. Although the MHMS manages an estimated 96% of total health expenditure,[4] little is known about how resources are used by these facilities. For example, what is the cost of staff, medical supplies, transport, utilities and maintenance at any given facility? How does the distribution of resources vary between provinces and facility levels? Better understanding these costs is important to the success of the MHMS' efforts to improve its use of existing resources to provide quality services, and ultimately to improve health outcomes as part of the implementation of its universal health coverage and role delineation policy (UHC/RDP).

The study was designed to estimate the recurrent costs (staffing, medical supplies, transport, utilities and maintenance) currently incurred by health facilities, taking into account funds from the MHMS, as well as from churches, private organisations and patients. It found that:

- An estimated SBD 231 million in recurrent costs was spent at all health facilities in the country in 2013.[5] (This only includes costs incurred by facilities and excludes other costs, such as the cost of running MHMS headquarters, or national programs.) Of this SBD 231 million, 44% was spent at NRH and 56% spent at health facilities in the provinces and Honiara City Council (HCC).

[3] The MHMS recorded total expenditures of SBD 415 million, or 14% of total government expenditure (recurrent and development expenditure). See: SIG (2014), 2013 Final Budget Outcome, Honiara, p. 13, 16, 19. Available at: www.mof.gov.sb/Libraries/Budgets/2013_Final_Budget_Outcome.sflb.ashx. Some capital expenditure is recorded under the recurrent budget on buildings (residential and non-residential), computer software and hardware, motor vehicles, office specialised and other equipment.

[4] This figure is for 2012. Total health expenditure is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.The World Bank, World Development Indicators. Available at: http://databank.worldbank.org. See also: The World Bank (2010). Health Financing Options, Washington D.C., p.17. Available at: www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/06/11/000426104_20120611153458/Rendered/PDF/698070ESW0P1120ancing0Options0final.pdf

[5] Note that some of the SBD 231 million may not be reflected in the MHMS recurrent budget (SIG and HSSP) of SBD 403 million, as some drugs, vaccines, or equipment are procured directly by donors and therefore not reflected in the MHMS budget. Similarly, donations and contributions from private companies or patients are not recorded in the budget.

- Taking into account the recurrent costs at hospitals, AHC, RHC and NAP, total recurrent costs in each province varied from SBD 128 per capita in Guadalcanal to SBD 350 in Western, and SBD 229 in HCC. However, including the NRH, total recurrent spending per capita varied between SBD 300 in Temotu to SBD 515 in Central, and SBD 927 in HCC (inclusive of the SBD 229 per capita spent in HCC and SBD 698 spent at the NRH on HCC residents).
- On average, staffing was the largest recurrent cost type at all facility levels, ranging between 51% and 69% of recurrent costs. Medical supplies were the second highest cost for hospitals, AHC, RHC and NAP ranging between 16% and 32% of recurrent costs. Electricity was the second highest cost at the NRH (11%).
- Child welfare visits[6] were the first or second most common reason for presentation at outpatients at hospitals, AHC, RHC and NAP, accounting for 10% to 11% of all outpatient visits. The cost of a visit varied from SBD 64 at hospital to SBD 44 at NAP.
- Deliveries were the most common cause of admission at hospitals, AHC, RHC and NAP, ranging from 14% to 42% of admissions. The cost of deliveries varied from SBD 2,949 at hospitals to SBD 1,277 at NAP (compared to SBD 2,250 at the NRH).
- 45% of hospitals and 70% of AHC, RHC and NAP collect contributions for outpatient consultations and an estimated 37% of patients made a contribution to see a health worker at a facility managed or co-managed by the government.

Figure 1 shows the total recurrent costs by facility type and province. As shown in Figure 1, 44% of recurrent costs were spent at the NRH in 2013, 27% at 11 hospitals, 10% at 31 AHC, 12% at 115 RHC and 7% at 190 NAP. Malaita (15%) and Western (12%) incurred the largest share of recurrent costs spent in the provinces, followed by HCC (6%), Makira (5%), Guadalcanal (5%), Isabel (4%), Central (3%), Choiseul (3%) and Temotu (3%).[7]

With respect to recurrent costs per capita (incurred at provincial levels services and thus excluding the costs incurred at NRH), Guadalcanal, which does not have a provincial hospital (as the NRH and Good Samaritan Hospital, a church hospital, are located on the same island), has the lowest recurrent cost per capita of SBD 128. Western (SBD 350) and Isabel (SBD 344) have the highest cost per capita.

Figure 2 shows the total average recurrent cost by facility type. The total recurrent cost of running the NRH was estimated to be SBD 101 million in 2013. This differs from the amount reported in the 2013 MHMS budget (SBD 61.5 million) as it takes into account staff house rental costs (SBD 12.4 million) and electricity and water costs (SBD 14 million) budgeted by the MHMS administration, and supply costs (SBD 13.3 million) budgeted by the National Medical Stores (NMS).

The average hospital was estimated to cost SBD 5.6 million to run in 2013, the average AHC was estimated to cost SBD 884,536, the average RHC was estimated to cost SBD 232,528, while the average NAP was estimated to cost SBD 90,447 (refer to Appendix A for the interquartile

[6] Refer to definitions at the start of the document.
[7] As explained in the Technical Annex and footnote 20, Rennell and Bellona province is excluded from this study.

range). Staff and medical supplies accounted for over 80% of recurrent costs at these facility levels. The variation in recurrent costs by province is described in detail in Section 2.

Figure 1: Total recurrent costs for all health facilities by province and facility type, 2013

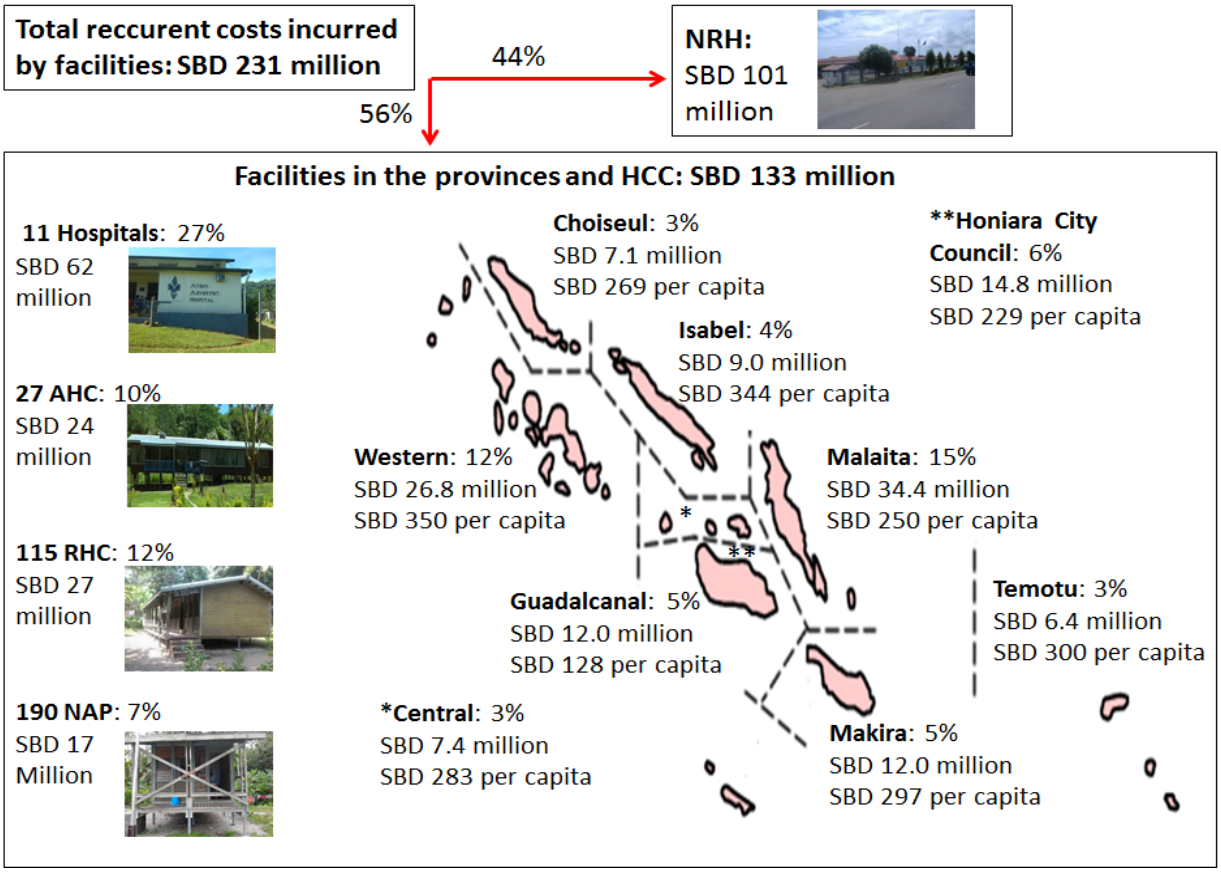


Figure 2: Average total recurrent cost per facility by input and facility type, 2013

		Staff	Medical supplies	Transport	Elec-Tricity	Water	Maint-enance	Other	Total (SBD)
	NRH	60%	8%	4%	11%	3%	1%	13%	101 m
	Hosp	51%	31%	4%	7%	1%	1%	6%	5.6 m
	AHC	51%	32%	11%	3%	0%	2%	0%	884,536
	RHC	69%	16%	6%	5%	0%	3%	0%	232,528
	NAP	61%	23%	7%	6%	1%	3%	0%	90,447

The recurrent costs for each facility were allocated to inpatient, outpatient and outreach services based on the share of resources used to deliver each service (for example, the number of staff working in inpatient and outpatient departments). At the NRH and hospitals, inpatient services utilised over 71% of the total recurrent costs, while at AHC, RHC and NAP outpatient services consumed over 67%. Less than 3% of expenditure was spent on outreach services at all levels.

The cost per each inpatient admission, outpatient visit and outreach activity was calculated based on the estimated annual cost for each service and the total number of services provided annually. For example, the cost of all outpatient departments at NRH (SBD 28.9 million) was divided by the number of outpatient presentations (62,985) to calculate the cost per outpatient (SBD 459). The average cost of an outpatient consultation ranged from SBD 459 at the NRH to SBD 43 at a NAP. The average cost of an inpatient admission ranged from SBD 5,772 at the NRH to SBD 2,160 at an average RHC. Figure 3 and Figure 4 show the average number and cost of outpatient visits and inpatient admissions respectively.

Figure 3: Average number and cost of outpatient consultations by facility type, 2013

	Percent of total costs for outpatients	Average cost per outpatient department (SBD)	Average number of outpatients	Average cost per outpatient visit (SBD)
 NRH	29%	28,893,163	62,895	459
 Hosp	22%	1,247,316	14,735	91
 AHC	67%	592,063	12,078	60
 RHC	78%	181,643	4,970	46
 NAP	75%	67,847	1,831	43

Outpatient visits and inpatient admissions were classified using the International Statistical Classification of Diseases and Related Health Problems 10th Revision using the sample of patient records from outpatient and inpatient registers and case notes. The recurrent costs for each facility were allocated to inpatient and outpatient conditions based on the information collected on resources used to treat each condition (for example, the dose and cost of drugs). This information was often limited so the resulting estimates may not fully represent the variation in costs between different conditions. Figure 5 and Figure 6 show the proportion and cost of outpatient visits and inpatient admissions for select conditions.

At the NRH emergency department (general outpatient department) and NAP the most common reason for outpatient presentation was signs and symptoms of circulatory and respiratory

diseases (16% and 11% respectively).[8] The first most common reason for outpatient presentation at hospitals, AHC and RHC and the third most common reasons at NAP were for child welfare visits. Together with antenatal, postnatal, and family planning visits, these visits often take place as part of specialised clinics at hospitals, AHC, RHC and NAP, but not at the NRH.

Figure 4: Average number and cost of inpatient admissions by facility type, 2013

	Percent of total costs for inpatients	Average cost per inpatient department (SBD)	Average number of inpatients	Average cost per inpatient admission (SBD)
 NRH	71%	71,612,603	12,407	5,772
 Hosp	76%	4,284,759	1,054	4,045
 AHC	32%	281,028	144	2,489
 RHC	19%	43,685	48	2,160
 NAP	24%	21,906	14	2,753

Figure 5: Proportion of outpatient vistis and cost per outpatient visit for select conditions by facility type, 2013

	Child welfare		Circulatory, respiratory systems - symptoms		ARI		Skin infections		Malaria		Diarrhoea	
	%	SBD	%	SBD	%	SBD	%	SBD	%	SBD	%	SBD
 NRH	N/A	-	16	476	3	457	3	457	3	489	4	455
 Hosp	11	64	5	90	9	88	4	88	1	115	0.4	112
 AHC	11	60	10	55	8	57	3	57	6	74	1	57
 RHC	11	46	10	45	10	45	3	45	5	48	1	46
 NAP	10	44	11	41	8	42	3	42	4	48	1	43

[8] Signs and symptoms of circulatory and respiratory conditions include presentations for abnormal heart beat, abnormal blood pressure (without diagnosis), cough, shortness of breath, chest pain, throat pain, etc.

At the NRH complications of labour and delivery were the most common reason for admission (24%) and (uncomplicated) deliveries were the second highest (21%).[9] Uncomplicated deliveries were the most common reason for inpatient admissions at all other facility levels. The cost of a delivery varied from SBD 2,949 at hospitals to SBD 1,277 at RHC (the cost of delivery at NRH was SBD 2,250). Tuberculosis had the highest average cost per admission, ranging from SBD 40,344 at the NRH to SBD 1,266 at NAP. The high cost is primarily due to the length of stay (LOS), which was 70 days at the NRH. Similarly diabetes also has a high cost per admission, ranging from SBD 26,465 at the NRH to SBD 1,073 at RHC, as well as diseases of the circulatory system including hypertension, ranging from SBD 18,348 at the NRH to SBD 1,399 at RHC.

Figure 6: Proportion of inpatient admissions and cost per inpatient admission for select conditions by facility type, 2013

	Deliveries		Pneumonia		Malaria		Injury, poisoning		Tuberculosis		Diabetes	
	%	SBD	%	SBD	%	SBD	%	SBD	%	SBD	%	SBD
 NRH	21	2,250	0	3,675	1	3,911	5	8,553	1	40,344	0.5	26,465
 Hosp	29	2,949	7	3,265	2	4,447	8	4,466	1	25,132	2	7,269
 AHC	14	1,340	10	2,662	7	4,040	7	2,099	0.2	4,211	0.5	3,271
 RHC	36	1,439	15	2,062	9	3,925	4	2,372	0.3	1,811	1	1,073
 NAP	42	1,277	13	2,989	7	5,673	4	2,643	1	1,266	1	2,171

Out of pocket costs incurred by patients were also estimated. While legislation only allows the collection of contributions at hospitals, in the patient exit survey they were found to be collected at all facility levels except the NRH.[10] Facilities reported collecting contributions for outpatient services (55% of hospitals and 70% AHC, RHC and NAP), inpatient services (36% of hospitals

[9] These two ICD categories: (i) complications of labour and delivery (O60-O75); and (ii) encounter for delivery (O80-O85) are mutually exclusive.

[10] The *Health Services Act* (1979) permits for the collection of fees at hospitals, but does not currently permit their collection at lower level facilities. See: the *Health Services Act* (1979), sections 4, 8 and 17. Available at: www.paclii.org/sb/legis/consol_act/hsa161/hsa161.html. Section 4 states that "the services so provided shall be free of charge except in-so-far as the Minister, acting in accordance with the provisions of this Act, may make Rules authorising or prescribing charges for such services." Section 8(d) gives the Minister power to issue regulations "for the control of, and the payment of fees for, the use of facilities of public hospitals by private medical and dental practitioners." The subsidiary legislation and regulations provide a schedule for the collection of fees at the NRH and hospitals. All fees that are collected are required to be placed into the consolidated fund under section 17(2).

and 32% AHC, RHC and NAP), and deliveries (27% of hospitals and 32% of AHC, RHC and NAP). A smaller number of hospitals collected contributions for immunisation services and diagnostic tests. All hospitals and over 50% of AHC, RHC and NAP collected contributions for medical record books, mother's books, and baby books, and a smaller proportion also charged for family planning books, antenatal cards and sick leave requests. Of the facilities that did collect contributions for services and books, the average amount was higher at hospitals than AHC, RHC and NAP, except for medical record, mother's and baby books.

Across all facility types, 35% of respondents to the patient exit survey reported that they were asked to make a financial contribution and 37% reported that they made a contribution. The average contribution to see a health worker was SBD 3.35. A higher proportion of those in the first, second and third quintiles made a contribution to see the health worker relative to the fourth and fifth quintiles. Respondents in the fifth quintile paid more on average (SBD 7.10) than respondents in other quintiles to see the health worker (although this was not statistically significant).

The average cost of transport to the health facility was SBD 29. Those in the richest quintile also reported paying greater travel costs and also had a quicker travel time to facilities (20 minutes), whereas those in the poorest or first quintile had the longest travel time (82 minutes) and were more likely to have travelled by foot.

The average costs incurred by respondents to the patient exit survey are shown by facility type in Figure 7.

Overall there was an under-representation in the poorest or first quintile (12%) and wealthiest or fifth quintile (13%) and greater representation from individuals classified as being in the second (33%), third (24%) of fourth (19%) wealth quintiles in the respondents to the patient exit survey. The over representation in the second and third quintiles and under representation in the fifth quintiles suggests that health care utilisation in Solomon Islands may be pro-poor. The under representation in the poorest quintile requires further analysis.

The efficiency of facilities was compared using standard measures of inputs to outputs, and data envelopment analysis (DEA). Key performance measures by facility type are shown in Figure 8. On average, AHC had the highest ratio of outpatient visits to clinical full time equivalent (FTE) staff and inpatients admissions to clinical FTE. RHC and NAP had a higher ratio of outpatient visits to clinical FTE than at hospitals and the NRH, whereas the reverse was true for inpatients.

Figure 7: Average costs incurred by patients, and time spent visiting a facility, by facility type, 2013

	Average patient costs (contribution, travel & income) (SBD)	Contribution to the facility made	Amount contributed to the facility (SBD)	Travel time (minutes)	Waiting time (minutes)	Time with health worker (minutes)
 NRH	999	0%	n/a	29	108	8
 Hosp	145	37%	5.99	132	64	12
 AHC	101	42%	3.61	150	27	7
 RHC	25	34%	2.82	170	27	18
 NAP	16	46%	2.70	217	17	11
Average	111	37%	3.35	57	34	12

The efficiency of the NRH was also compared to hospitals in other countries in the region. The average LOS at the NRH (7.3 days) was higher than in Australia, Fiji, and Papua New Guinea (PNG), but lower than New Zealand. The average bed occupancy rate (BOR) was 80% for the NRH,[11] which was higher than for hospitals in Fiji (52%). Across Solomon Islands there were 0.2 doctors per 1000 population[12]; this was slightly longer than for PNG, which had 0.1 practising doctors per 1000 population, but lower than Fiji (0.6), New Zealand (2.8) and Australia (3.3). Solomon Islands health workforce population density (doctors/nurses/midwives per 1,000) is estimated at 2.17 compared with 0.5 for PNG, 2.61 for Fiji and 1.8 for Vanuatu[13].

The efficiency of AHC, RHC and NAP was also analysed using DEA. This analysis produces technical efficiency (TE) scores for facilities from 0 to 1, where a value of 1 indicates the facility is relatively efficient, and a value less than 1 indicates the facility is relatively inefficient compared to similar facilities in Solomon Islands. Those facilities with values of 1 are considered to be on the "efficiency frontier"; that is they are (relatively) efficiently using their

[11] The NRH reported the bed occupancy rate as 91.4% for 2012. The discrepancy is likely due to the bed count.
[12] Solomon Islands has over 100 medical students training in Cuba, as well as other under graduate and post graduate doctors training at other regional institutions such as Fiji National University's College of Medicine, Nursing and Health Sciences, and the University of Papua New Guinea; the first cohort of 21 medical graduates returned from Cuba in September 2014 to commence a six month bridging course prior to a two year internship program – a similar number is expected back each year for the next five years.
[13] This is against the minimum threshold of 2.3 per 1,000 recommended by WHO. Pacific data is from WHO Country Health Information Profiles (Centre for Health Information, Policy and Systems Research at Fiji National University), 2011, and WHO HRH Profiles 2012-2013 where available.

inputs to produce health services. The analysis at the individual facility level found that while some facilities are producing outputs in an efficient manner, a large number of facilities are operating a very long way away from the efficiency frontier.

Figure 8: Efficiency measures by facility type, 2013

	Total clinical staff	Outpatient visit per clinical FTE	Inpatient admission per clinical FTE	Average length of stay (days)	Bed occupancy rate (%)
 NRH	497	125	25	7.33	80%
 Hosp	39.5	444	27	6.46	32%
 AHC	7.2	2,305	31	2.99	10%
 RHC	3.2	1,734	20	1.99	5%
 NAP	1.2	1,297	11	2.07	4%

As reiterated by the Permanent Secretary, Dr. Tenneth Dalipanda, and other participants at a workshop held to discuss the draft of this report in October 2014, the study provides a baseline for further analysis and action. It has produced a wealth of information that the MHMS could use to inform its decisions on how resources could be allocated so that the health system is managed more efficiently and equitably. This includes through:

- The annual operating planning and budget process (and how resources might be reallocated using a mixture of fixed costs and other components to increase the performance orientation within MHMS);
- The setting of priorities as part of the next National Health Strategic Plan 2016-2020 and the accompanying medium term expenditure pressures framework; and
- The further refinement and implementation of the UHC/RDP and related service delivery packages.

In addition the study has highlighted the need for further policy action and analysis as summarised in Figure 9 (on the following page).

The study also highlights areas in which the MHMS, together with its development partners, could continue to strengthen its information systems. Priorities in this area include maintaining: a consolidated list of active facilities used across the MHMS; a database of all staff working at

each facility; and a database of the NMS supply chain. In addition the MHMS could also encourage all facilities, including hospitals, to consistently report to its Health Information System, and improve the information systems at the NRH.

The data that were analysed for the purpose of this report represent a small portion of the data that were collected. Additional data were also gathered on the infrastructure and equipment available at facilities that could be used to cost the standards set out in the UHC/RDP. There is also opportunity to further exploit the data that has been analysed for this report. For example, additional analysis could be undertaken on quality of care issues, such as the appropriateness of diagnosis and prescribing practices for the use of pharmaceuticals.

Figure 9: Summary of key considerations stemming from the report

Theme	What we learnt	What the MHMS can do
Efficiency	Some facilities are operating much more efficiently than others. Some hospital costs vary greatly.	Understand what efficient facilities are doing well. Compare hospital expenditures.
Equity	System serves lower middle class, but poorest quintile were underrepresented in the patient exit survey.	Work out if the poorest were underrepresented due to sample bias or lack of geographical or financial access.
Service delivery	Number of services provided by facilities varies, but it's unclear if this is due to population size. Definitions of services are unclear.	Develop estimates of population catchment and work out if service delivery is driven by population size. Better define services.
Conditions	Presentations are most commonly for maternal health, followed by infectious disease, then NCDs. TB and NCD costs high per patient.	Consider greater investment in family planning; hygiene, water and sanitation systems; and lifestyle changes to prevent NCDs.
Contributions at AHC, RHC and NAP	Patient contributions (fees) are small, but common and are the only source of cash to purchase supplies. Impact on equity uncertain.	Ensure medical records and small supplies are freely and regularly available to facilities. Monitor impact on equity.

Readers are additionally directed to the accompanying Cover Note which provides some tentative interpretation of the findings and potential implications of the study. Policy Notes will also be produced using the data as requested by the Solomon Islands Government (SIG) and the MHMS.

1. Introduction

The Solomon Islands Ministry of Health and Medical Services (MHMS) is responsible for providing primary health care and hospital services to an estimated population of 526,000 [14] of which an estimated 80 percent live in rural areas.[15] The MHMS funds facilities at all levels of the health system: the National Referral Hospital (NRH), provincial and church hospitals, Area Health Centres (AHC), Rural Health Clinics (RHC) and Nurse Aid Posts (NAP).[16] The MHMS operates most facilities and also funds a smaller number of facilities that are co-managed by the MHMS and private companies, churches or non-government organizations (NGOs).[17]

The *Health Services Act* (1979) defines the service levels in the following way:

- Hospital: "…for the reception and treatment of persons suffering from illness, including psychiatric illness or requiring rehabilitation, and dispensaries and outpatients departments";
- AHC: "…for the reception and treatment of persons, in which integrated primary health care services for a defined area are provided and organised, such premises being staffed by several categories of health personnel, and having supervisory and referral duties…";
- RHC: "means premises with some residential accommodation in which integrated primary health care services for a provided… being staffed by one or more Registered Nurses and such other health personnel… and having referral and supervisory duties"; and
- NAP: "…provide limited primary health care services, including obstetric services in emergency, and may have some residential accommodation… being staffed by auxiliary nurses and supervised by the Registered Nurse of the clinic in its area."[18]

There are an estimated 344 facilities in the country,[19] including the NRH, 7 provincial hospitals, 4 church hospitals, 31 AHC, 111 RHC and 190 NAP spread across eight provinces and Honiara City Council (HCC).[20] For the purposes of this report 4 AHC have been treated as RHC so the number of facilities costed in this report is 27 AHC and 115 RHC.[21] Figure 10 shows the number of households, hospitals, AHC, RHC and NAP across the country.

[14] Estimates for 2010. See: Population Division of the Department of Economic and Social Affairs of the UN Secretariat, World Population Prospects: The 2012 Revision. Available at http://esa.un.org/unpd/wpp/index.htm

[15] SIG (2009), Solomon Islands Population and Housing Census, p.xxi. Available at: www.spc.int/prism/solomons/index.php/sinso-documents?view=download&fileId=59.

[16] The MHMS is considering changing the classification of AHC, RHC and NAP; as this study is based on analysing services that are currently delivered, the current classification of AHC, RHC and NAP has been used.

[17] A smaller number of fully independent private outpatient service providers operate in the capital of Honiara, but are outside the scope of this study.

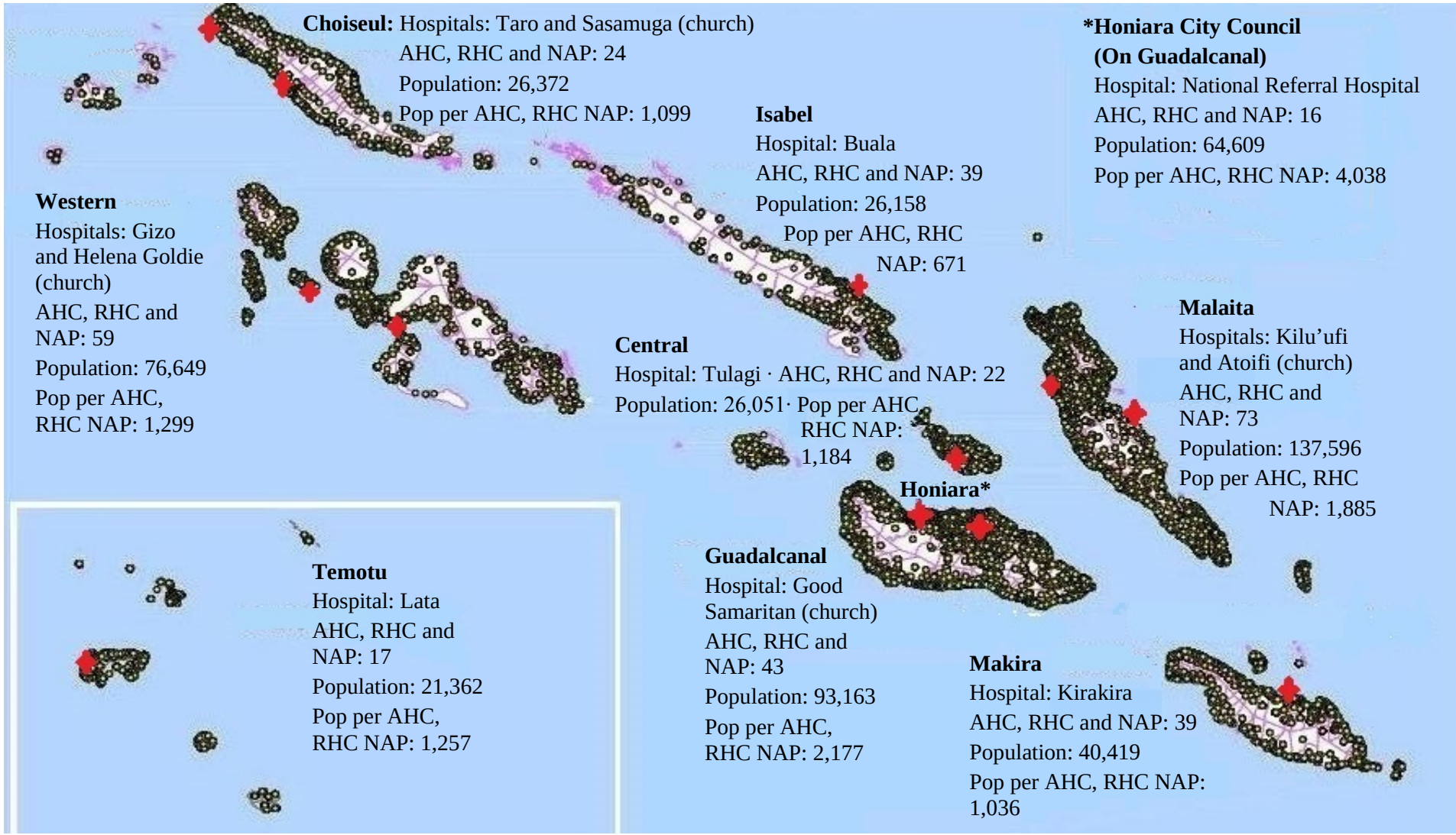
[18] *Health Services Act* (1979), s 2. The act refers to hospitals, health centres, clinics and aid post. The volume of inpatient and outpatient services and the types of conditions that patients present with at each level of the health system are described in detail in Section 3. For a more prescriptive description of the role of each facility type, see: MHMS and WHO (2012), Health Service Delivery Profile: Solomon Islands, p.3. Available at: www.wpro.who.int/health_services/service_delivery_profile_solomon_islands.pdf

[19] As noted in the Technical Annex (page 2), various lists of AHC, RHC and NAP were merged to estimate the total number of facilities.

[20] As explained in the Technical Annex, Rennell and Bellona province is excluded from this study. It has has three lower level facilities but no hospital. Its population is approximately 3,041. See: SIG (2009), op cit 15.

[21] The number of AHC and RHC was 27 and 115 respectively as 3 AHC in Central and 1 in Choiseul were treated as RHC for the purpose of this report.

Figure 10: Solomon Islands households and health system[22]



[22] This map was adapted from the Solomon Islands 2009 Census. See: SIG (2009), op cit 15. The province of Rennell and Bellona has been excluded from this map.

The MHMS oversees two main sources of funds in support of this system: annual appropriations from domestic resources and from its development partners, including through the Health Sector Support Program (HSSP). The MHMS recorded recurrent expenditures of SBD 403 million in 2013, including SBD 262 million from domestic resources and SBD 141 million from HSSP, for the health system and administration, which amounted to 17% of total government recurrent expenditure.[23] These funds are channelled to facilities by:

- Funding clinical and other staff, drugs and other supplies for all levels of the health system;
- Providing health service grants administered by (i) provincial health offices (PHO) for hospitals and primary facilities and (ii) other providers.[24] The funds from both grants are used to contract additional staff, meet recurrent and some capital costs incurred at the facility level, fund the administration of the PHO, and cover the costs of transport of drugs and other supplies, supervision and outreach; and
- Funding and managing national programs, including in the areas of reproductive and child health, malaria and other vector borne diseases, non-communicable diseases and the national nursing administration, which all aim to improve the quality of service delivery primarily through standard setting and training.

Although the MHMS manages the majority of funds to support service delivery and is working towards better systems to account for these funds, there is little consolidated information on the cost of key recurrent inputs (such as staff and drugs) and how these vary between provinces and between different levels of the health system. For example, there is not yet a national database of how many nurses (whether they are contracted by the national or the PHO or directly by facilities) work in each province and in each facility. The National Medical Stores (NMS) supplies second level medical stores and some facilities directly and does not yet comprehensively record supplies ordered by each facility. Other operational costs for transport, utilities and maintenance are funded by the health services grant given to each PHO, and while the MHMS is beginning to systematise the acquittal of these grants across provinces, little is known about how these resources are used across facility types. In addition, little is known about the resources contributed by other providers to the system, or the costs that are incurred by patients.[25]

These problems are common to many health systems. Yet addressing these gaps is important to the success of the MHMS' efforts to improve access to and the quality of services, and

[23] The MHMS recorded total expenditures of SBD 415 million (recurrent and development expenditure), or 14% of total government expenditure. See: SIG (2014), 2013 Final Budget Outcome, Honiara, p. 13, 16, 19 and 20. Available at: www.mof.gov.sb/Libraries/Budgets/2013_Final_Budget_Outcome.sflb.ashx. Some capital expenditure is recorded under the recurrent budget on buildings (residential and non-residential), computer software and hardware, motor vehicles, office specialised and other equipment; as well as the portion of health service grants that are used to fund capital expenditure.

[24] These grants are transfers of funds from the MHMS to the PHO (into a MHMS bank account). For accounting purposes these grants are acquitted as an imprest. The MHMS budget includes health service grants to the PHO for "primary" services (AHC, RHC and NAP) in all provinces and "hospital" services in six provinces (Central, Isabel, Malaita, Makira, Temotu and Western). The MHMS budget also includes grants to churches in four provinces (Choiseul, Guadalcanal, Malaita and Western).

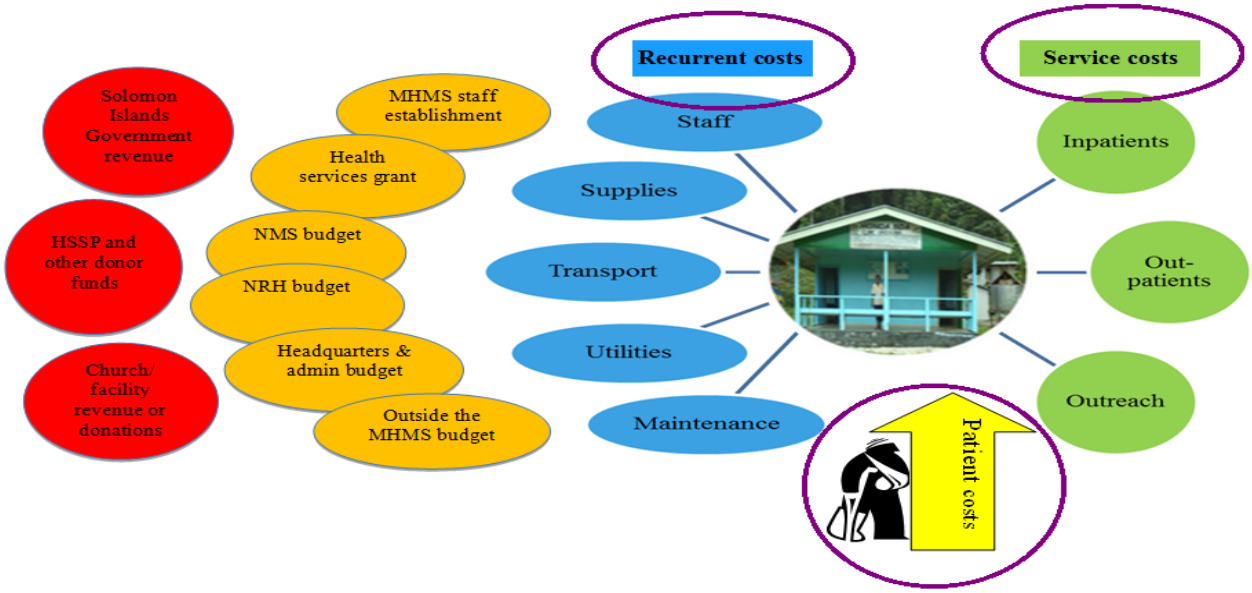
[25] The *Health Services Act* (1979) permits for the collection of fees at hospitals, but not at AHC, RHC or NAP, see: the *Health Services Act* (1979), s 4, 8 and 17. Available at: www.paclii.org/sb/legis/consol_act/hsa161/hsa161.html. The *Health Services (Hospital) Regulations* (1980) provide a schedule of fees for the NRH and hospitals.

ultimately to improve health outcomes for those it serves. The current National Health Strategic Plan 2011-2015 (NHSP) sets out a vision for how the MHMS aims to do so, based on the MHMS key values, which include universal access; equity and accessibility; and effectiveness with efficiency. [26] Building on the NHSP, the MHMS recently initiated the design of a universal health coverage or role delineation policy (UHC/RDP) to increase the availability and quality of service delivery at facilities in rural areas. Yet without greater knowledge about how resources are currently used within its system, and where increased resources are needed, the MHMS will be limited in the extent to which it can successfully allocate resources to pursue its priorities.

The MHMS commissioned this study, with support from the World Bank, to better understand how resources are currently used within its system. The Centre for Health Economics at Monash University, together with a colleague from Fiji National University, was contracted to carry out the study with the MHMS. As shown in Figure 11 the study was designed to estimate:

1. The major recurrent costs of facilities, including staff, supplies, transport, utility and maintenance costs, across provinces and facility types;
2. The costs of services provided by facilities, across provinces and facility types; and
3. The costs incurred by patients, including voluntary patient contributions (fees), travel and other incidental expenses, across provinces and facility types.

Figure 11: Sources and costs assessed in the study



The estimates of recurrent costs are based on current service standards, that is, the current levels of staff and supplies provided to facilities.[27] As depicted in Figure 11, they reflect the estimated recurrent expenditure from all funding sources, including funding from the MHMS budget,

[26] MHMS (2011), National Health Strategic Plan 2011-2015. Available at: www.wpro.who.int/health_services/solomon_islands_nationalhealthplan.pdf

[27] However the cost estimates in this report can be used to inform the costing improvements in service delivery, such as those set out in the UHC/RDP. The study also conducted an audit of infrastructure and equipment at facilities. These data has not been included in this report for space reasons but will be made available to the MHMS.

additional resources from church authorities, and revenue generated directly by facilities.[28] With respect to the MHMS budget, the costs include expenditure funded from Solomon Islands Government and development partners across all budget lines. The MHMS budget is allocated to a total of 34 divisions. Ten of these divisions are the provinces (including HCC), four are administrative units (headquarters and administration; policy and planning; internal audit; nursing administration), 18 are national programs (such as the National Vector Borne Disease Control Program (NVBCDP), and the National Imaging Division), and the NRH and the National Medical Stores are also divisions (see Annex 1 for a full list of all MHMS divisions). There are no specific budget lines for provincial hospitals, AHC, RHC and NAP. Each of the 34 divisions is allocated a share of the MHMS budget, which must be executed based on their annual operational plan. Divisions currently have a high level of autonomy for budget execution. However, divisions like the NMS and NVBCD must work jointly with the provincial divisions for service delivery. The budget source of each recurrent cost item in the MHMS budget is described in Figure 12. It is important to note that the study does not report allocated budget. It reports actual expenditure, without judgment of whether the appropriate price was paid for the purchase of goods or services, or what the ideal cost of goods or services are.

This report is set out in six sections. Readers unfamiliar with the study or Solomon Islands should first review the Technical Annex, which provides a full description of the methodology, including for sampling, data collection and data analysis. The report describes the recurrent costs for all provincial facilities including hospitals, AHC, RHC and NAP (Section 2.1) and the NRH (Section 2.2), followed by the service costs (Section 3), patient experience at all levels of the health system (Section 4), and key performance and efficiency measures (Section 5). The full results summarised in these sections is available in Appendix A. The report concludes with discussion of the results and their limitations, as well as key considerations for future policy analysis and action stemming from the results (Section 6).

[28] Note that church-managed facilities operate within the structure of the MHMS, and like MHMS-managed facilities they receive government funding, as well as support from the church.

Figure 12: Sources of recurrent costs in the 2013 MHMS budget by facility type

Recurrent cost	AHC, RHC and NAP	Hospitals	NRH
Staff salaries and allowances[29]	Provincial Divisions (Health services grant; Church grant) Headquarters and admin.[30]	Provincial Divisions (Health services grant; Church grant) Headquarters and admin.	NRH Headquarters and admin
Medical supplies	NMS	NMS	NMS
Laboratory supplies	NMS; NVBDCP	NMS; Headquarters and admin[31]; NVBDCP	NMS; Headquarters and admin
X-ray supplies	N/A	NMS	NMS
Food supplies	N/A	Provincial Divisions (Health services grant; Church grant)	NRH
Administrative supplies	N/A	Provincial Divisions (Health services grant; Church grant)	NRH
Transport[32]	Provincial Divisions (Health services grant; Church grant)	Provincial Divisions (Health services grant; Church grant)	NRH
Utilities	Provincial Divisions (Health services grant; Church grant)	Provincial Divisions (Health services grant; Church grant)	Headquarters and admin
Maintenance	Provincial Divisions (Health services grant; Church grant)	Provincial Divisions (Health services grant; Church grant)	NRH

[29] For hospitals, AHC, RHC and NAP staff include National Service Employees (NSE) that are funded by the MHMS through the payroll "establishment", administered by the Ministry of Finance and Treasury; and Direct Wage Employees that are funded by the MHMS through the provincial health services grant, administered by the PHO. All staff at the NRH are NSE.

[30] The cost of the public service rental scheme for all NSE is included in the Headquarters and Admin budget.

[31] International laboratory costs are included in the Headquarters and Admin budget.

[32] Transport includes the cost of collecting money, drugs, referral, supervision, outreach and training. These costs are broken down in Section 2.1.4 of this report.

2. Recurrent costs

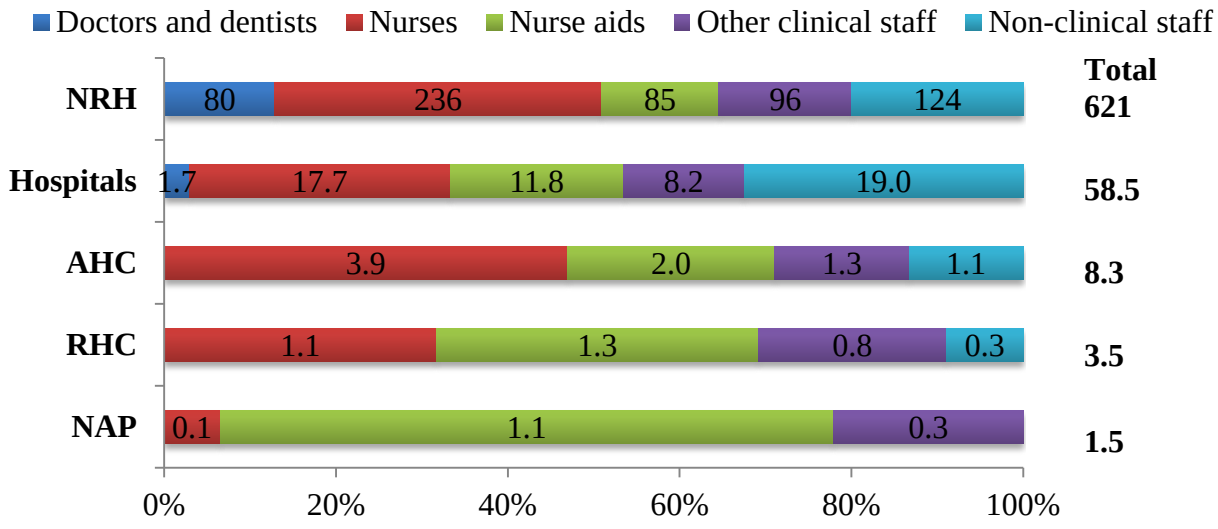
2.1 Hospitals, Area Health Centres (AHC), Rural Health Clinics (RHC) and Nurse Aid Posts (NAP)

2.1.1 Staff

Staffing was the largest cost incurred by all facilities. The estimated numbers and costs of staff per facility are shown Figure 13 to Figure 16 and presented in detail in Appendix A, Table 1 to Table 3. Staffing at the National Referral Hospital (NRH) is described in detail in Section 2.2 of this report, but is mentioned in this section to allow for comparison between facility types.

Figure 13 shows the average total number of staff[33] per facility by facility type and staff cadre: doctors and dentists, nurses, nurse aids, other clinical staff[34] and other non-clinical staff.[35] This count includes: (i) National Service Employees (NSE) that are funded by the Ministry of Health and Medical Services (MHMS) through the payroll "establishment" administered by the Ministry of Public Service and the Ministry of Finance and Treasury; (ii) Direct Wage Employees (DWE) that are funded by the MHMS through the provincial health services grant administered by the provincial health office (PHO); and (iii) others contracted directly by the facility or its supporting organisations.[36]

Figure 13: Average number of staff[37] per facility by facility type and staff cadre, 2013



[33] Staff that were reported as hospital staff, but appeared to have functions related to the PHO were excluded from this analysis: 20 staff members were excluded in total, including Directors of Nursing (5), Assistant Directors of Nursing unrelated to the hospital (3) and public health coordinators (12). Provincial Health Directors who were practicing as a doctor (Buala, Gizo, Kilu'ufi and Lata) or dentist (Tulagi) at hospitals were counted as whole in Figure 13, but the allocation of their salary to the cost of the hospital was 70% as explained in the Technical Annex.
[34] Other clinical staff at hospitals include: Dental assistants, Radiographers, Radiography Assistants, Laboratory Officers and Laboratory Assistants, Microscopists, and other allied health staff. Most other clinical staff at AHC, RHC and NAP were microscopists; for the full list refer to footnote 44.
[35] Non-clinical staff include: cleaners, drivers, gardeners, kitchen staff, security officers, and administrators.
[36] Staff contracted directly by facilities or by other contractors are described at the end of this section.
[37] The clarifications in footnotes 33 to 35 apply to this figure.

Doctors were only based at hospitals and the NRH.[38] The average number of doctors at a hospital was 1.2, and the average number of dentists was 0.5 (compared to 73 doctors in clinical positions at the NRH and 7 dentists). Five hospitals were without a full time doctor (Good Samaritan Hospital (GSH), Kirakira, Sasamuga, Taro and Tulagi). Helena Goldie Hospital (HGH) had 4 doctors, Kilu'ufi and Gizo both had 3 doctors, and Atoifi, Buala and Lata had one doctor.

Nurses and nurse aids were the primary clinician at AHC, RHC and NAP and constituted over 50% of all staff at all levels of the health system, as shown in Figure 13. The number of nursing staff (including nurses and nurse aids) varied from 84 at Kilu'ufi to 9 at Sasamuga for hospitals, from 16 at Honiara City Council (HCC) to 3 at Makira for AHC and from 7 at HCC to 1.5 at Isabel, Temotu and Western for RHC. There was less variation in the number of nursing staff at NAP, with all provinces averaging 1 nurse aid except HCC, which averaged 1 nurse and 1 nurse aid.

On average, there were more nurse aids than nurses at RHC and NAP whereas the reverse was true for hospitals and AHC, although these averages hide variation between provinces. HGH and Sasamuga, and AHC in Makira and Western had more nurse aids than nurses, and RHC in HCC had more nurses than nurse aids.

Figure 14 and Figure 15 show the average staff cost per facility at hospitals and AHC, RHC and NAP respectively for 2013. These costs include gross salary and allowances,[39] rental schemes, annual leave fares, as well as the employee and employer contributions to the National Provident Fund. These costs include all staff based at the facility, as well as visiting doctors who see patients at the facility.[40]

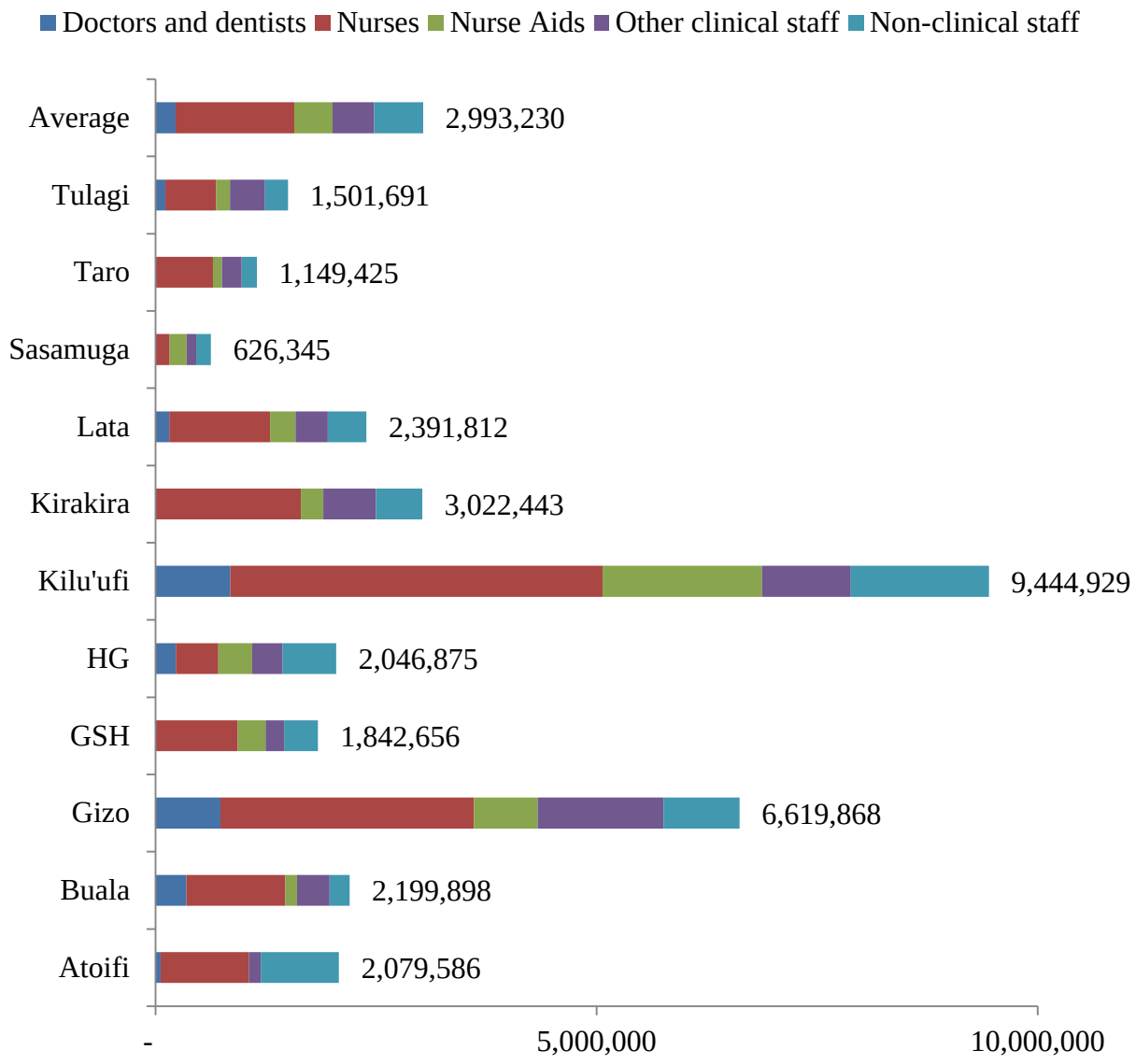
As shown in Figure 14 the average staff costs were SBD 3.0 million per year at hospitals, ranging from SBD 626,345 at Sasamuga, which also had the lowest number of staff, to SBD 9.4 million at Kilu'ufi, which had the highest number of staff. By comparison SBD 60.8 million was spent on staff at the NRH. An average of 78% of staff costs were spent on doctors, dentists, nurses, nurse aids and other clinical staff at hospitals.

[38] 21% of AHC, RHC and NAP reported that a doctor or dentist visited the facility to see patients. An additional 4% of facilities reported that two doctors or dentists visit the facility to see patients. Only 5% of facilities reported that visiting doctors or dentists visit the facility and are paid by a private company or a supporting church organization. The costs of visiting doctors or dentists at these facilities are included in the cost calculations (see Figure 15). The costs of visiting doctors or dentists that are paid for by the national or provincial government have not been included in the staff costs for AHC, RHC or NAP, as these doctors and dentists are included as staff at hospitals.

[39] Allowances include those provided by the National Public Service or provincial governments through the health services grant. They include: Acting Allowance, Charge Allowances, Danger Allowances, Dirt Allowances, Domestic Market Allowance, Festival of Pacific Arts Allowance, Gratuity, Housing Allowances, Leave Conversion, Miscellaneous - Taxable Allowance, Multi Allowance, Provincial Posting Allowance, Regional Assistance Mission to Solomon Islands Allowance, Rent Subsidy, Repay Basic Salary, Repay Overtime, Responsibility Allowance, Risk Allowance, Sitting Allowance, Special Duties Allowances, Tool Allowance, Transport Allowance, Vehicle Allowance, Watchman Allowance, Educational Allowance, Member of Parliament Housing, Permanent Secretary Fuel Allowance, Repay Returned Payments, Special Advance, Special Imprest, Supplementation - Not Taxed, Touring - Subsistence Allowance, Travelling Expenses, Utilities Allowance, Workers Compensation, Lieu of Notice and Recover Lieu of Notice.

[40] Refer footnote 38.

Figure 14: Total cost[41] of staff[42] for hospitals, 2013



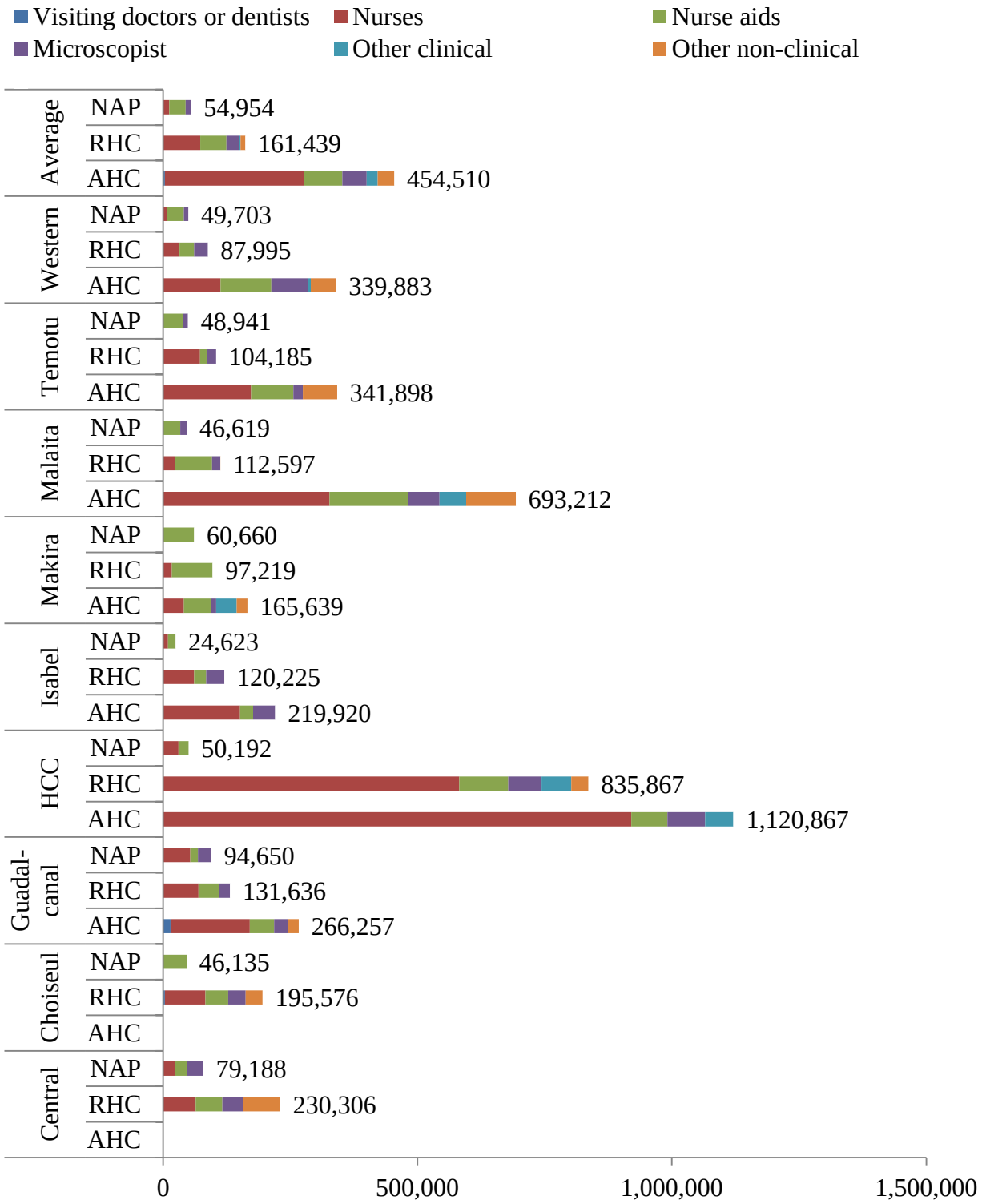
As shown in Figure 15 the average cost of staff was SBD 454,510 at AHC, SBD 161,439 at RHC and SBD 54,954 at NAP per year, yet there was significant variation amongst provinces. HCC, as outlined above had the highest number of nursing staff at AHC and RHC, and a higher proportion of nurses to nurse aids. Consequently the average cost of staffing in HCC was more than double the national average for AHC, and five times the national average for RHC. Guadalcanal had the highest number of staff and staff cost at NAP. Conversely, Makira, Western and Isabel had the fewest number of staff and the lowest average staff costs of AHC, RHC and NAP respectively.

Figure 15: Average total cost[43] of staff[44] per facility for AHC, RHC and NAP by province,

[41] Costs include: Gross salary, allowances (refer to footnote 39 for a full list), rental schemes, annual leave fares and employer contributions to the National Provident Fund.

[42] Other clinical staff includes: Dental assistants, Radiographers, Radiography Assistants, Laboratory Officers and Laboratory Assistants, Microscopists, and other allied health staff. Other non-clinical staff includes: cleaners, gardeners, drivers, security officers, and administrators.

2013



[43] Costs include: Gross salary, allowances (refer to footnote 39 for a full list), rental schemes, annual leave fares and employer contributions to the National Provident Fund.

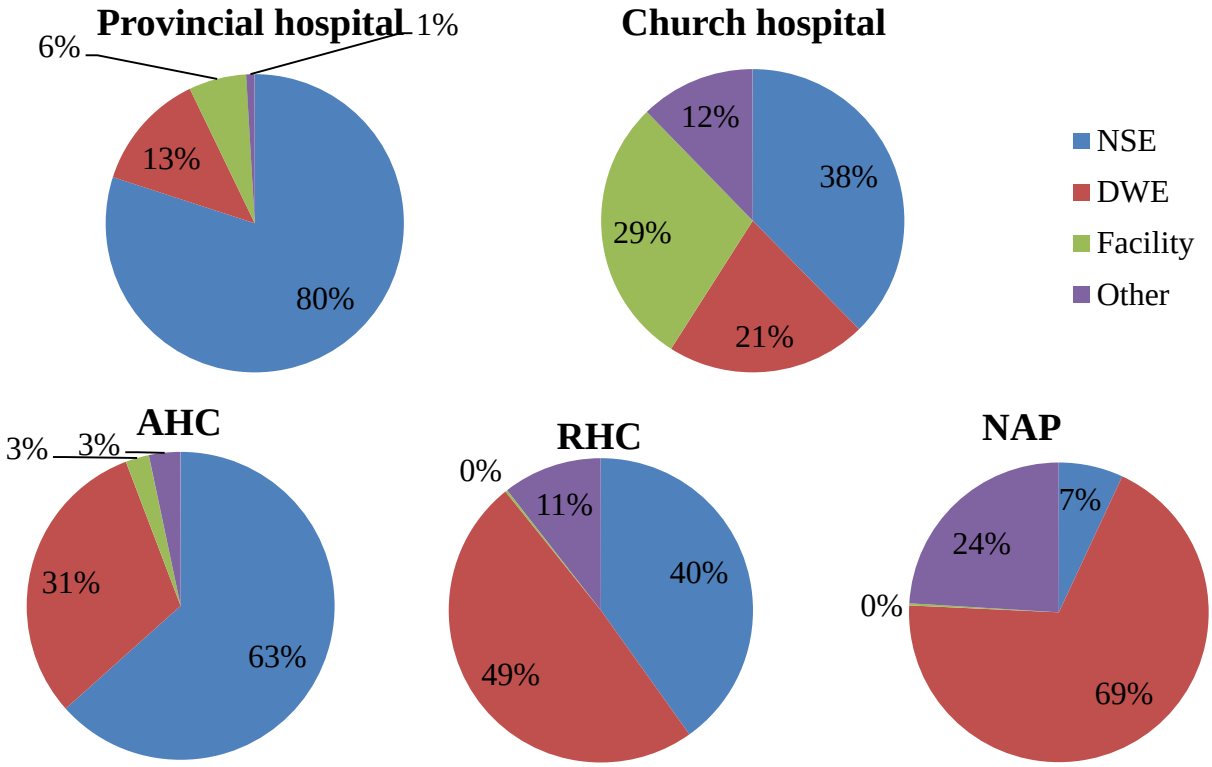
[44] Visiting doctors only include those paid for by the facility or another source. Other clinical includes: community clinical health nurses, midwifes, nurse administrators, training nurse aids, training officers and nurses specializing in Voluntary Confidential Counselling and Testing. Other non-clinical includes cleaners, gardeners, drivers, security officers, and administrators.

Figure 16 shows the average proportion of clinical staff costs by staff type (that is, whether a staff member is a NSE, DWE or is contracted by the facility or other organisation). This analysis, which is important as in practice each PHO allocates NSE and DWE to facilities, shows where NSE and DWE are allocated. NSE staff costs constituted the greatest share of clinical staff costs at provincial hospitals (80%) and AHC (63%), while DWE constituted the highest share of clinical staff costs at RHC (49%) and NAP (69%). Staff costs at church hospitals spread more evenly amongst all payers, including the "facility".

Staff paid for by the facility may be funded through church service grants provided by the MHMS, hospital revenue, or other funding generated by a supporting church or private organisation. Seven hospitals (Buala, GSH, HGH, Kilu'ufi, Kirakira, Lata and Sasamuga) reported as paying for at least one clinical or non-clinical staff directly and as did 13% of AHC, RHC and NAP (11 facilities from the sample). While six hospitals reported paying for clinical staff directly, only 7% of AHC, RHC and NAP did (6 facilities in the sample).

In addition to the staff costs highlighted above, 79% of AHC, RHC and NAP also hold voluntary community clean-ups at the facility. These clean-ups occur on average 9 times a year, with 38 people attending. Only 27% of hospitals, which more commonly employ gardeners and cleaners, reported as holding such clean-ups, once a fortnight or once a month, with two to five people.

Figure 16: Average proportion of clinical staff costs[45] by staff type and facility type, 2013



[45] Other payers were recorded as being: the Australian Government, Church and School partners (including Seventh Day Adventist, Uniting Church and the Church of Melanesia), Council of World Mission, Global Fund to Fight AIDS, Tuberculosis and Malaita, Members of Parliament and the community and unknown.

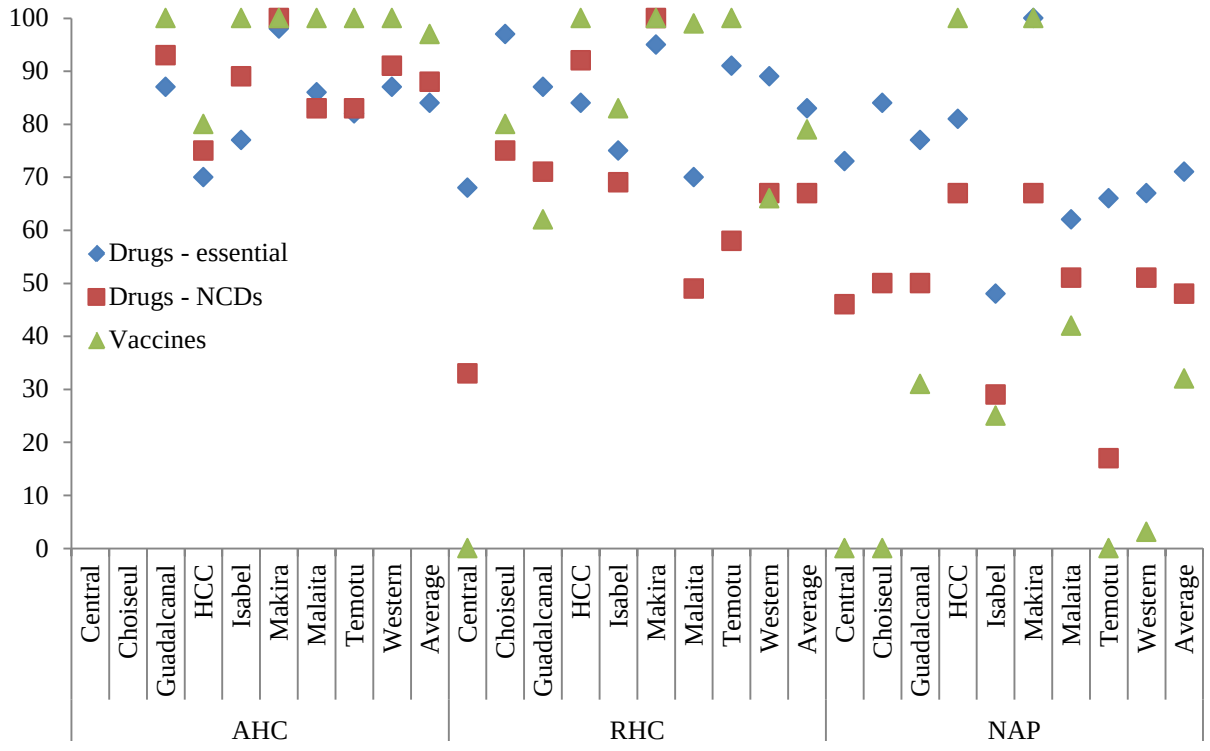
2.1.2 Medical supplies

Medical and other supplies, including pharmaceuticals, were the second largest component of costs incurred by hospitals, AHC, RHC and NAP (but not the NRH). The availability and average costs of pharmaceuticals in 2013 are presented in Figure 17 to Figure 20 and in more detail in Appendix A, Table 4 and Table 5.

The availability of medical supplies was measured in the Health Facility Survey (HFS) by recording if facilities had at least one unexpired unit of items in: (i) the list of priority medicines for mothers and children from the National Medical Stores (NMS); (ii) a selection of key drugs to treat non-communicable diseases (NCD); and (iii) the Expanded Program on Immunisation (EPI) vaccine schedule. These items are listed in the HFS, attached as Appendix B.

Over 70% of priority medicines were available at all facility levels. This is consistent with the findings of the Patient Exit Survey (PES): only 0.25% of respondents reported that the drug they were prescribed was not available at the facility.[46] On average the availability of NCD drugs at hospitals, AHC and RHC was 93%, 88% and 67% respectively and the availability EPI vaccines at these facilities was 100%, 97% and 79% respectively. There was greater variation in the availability of drugs at NAP, as shown in Figure 17. On average 48% of NCD drugs and 32% of EPI vaccines were available at NAP, which may not commonly stock NCD drugs or have cold chain capacity to stock vaccines.

Figure 17: Average availability[47] of pharmaceuticals for AHC, RHC and NAP by province, 2013 (%)

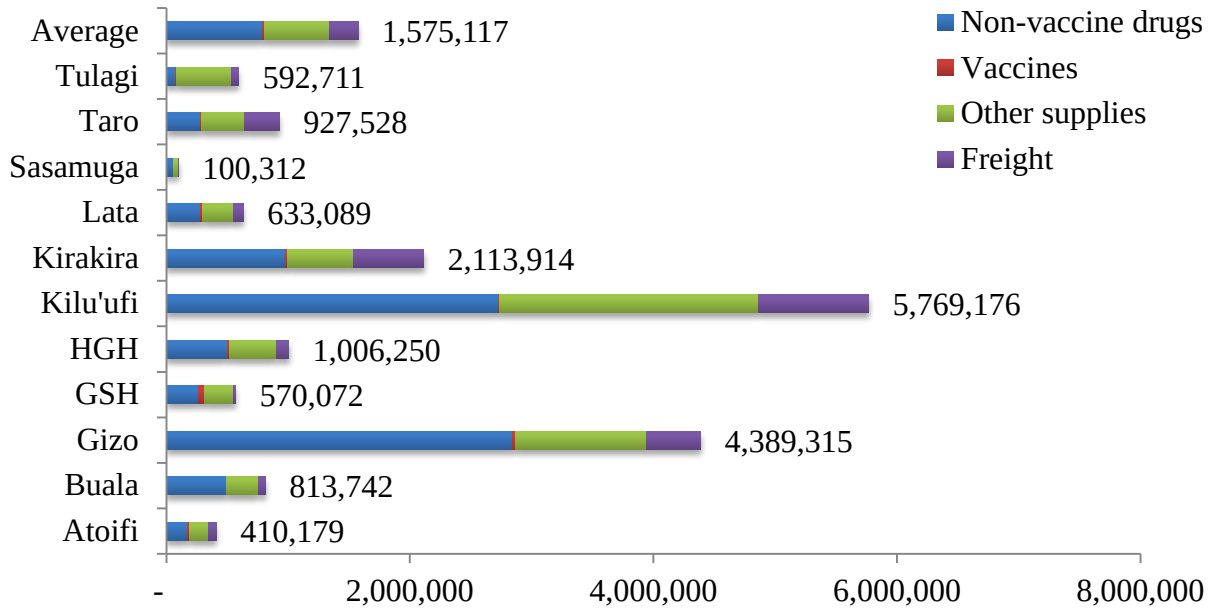


[46] This finding may also be partly attributable to nurse prescribing patterns. That is, if a nurse is aware that a drug is not available, then she/he may prescribe an alternative drug.
[47] Availability means that one unexpired unit was recorded at the facility.

The costs of medical supply orders and freight are shown in Figure 18 for hospitals and Figure 19 for AHC, RHC and NAP. The drug costs include the cost of freight from overseas suppliers to Honiara and the cost of associated insurance. The freight costs also include costs incurred by NMS in delivering the supplies that it receives in Honiara to facilities that it directly supplies. The NMS directly supplies: (i) 15 facilities that act as a Second Level Medical Store (SLMS);[48] and (ii) all facilities in HCC and Guadalcanal and some facilities on outer islands of other provinces. The freight costs presented below only include the freight cost from the NMS to these facilities that it supplies directly, which are costs that are borne by the NMS. Freight costs that are not borne directly by the NMS (including the cost of transporting drugs from SLMS to the facilities that the SLMS supplies and the cost of collecting drugs from the NMS[49]) are presented in Section 2.1.4.

The average cost of medical supplies and freight at hospitals was SBD 1.6 million per year, with a high of SBD 5.8 million at Kilu'ufi (compared to SBD 8.1 million at the NRH). The three hospitals with the lowest cost of medical supplies and freight, Sasamuga (SBD 100,312), Atoifi (SBD 410,179) and GSH (SBD 570,072) are the only hospitals that are not SLMS. On average, hospitals spent 50% of the cost of medical supplies and freight on non-vaccine drugs, 34% on other supplies, 15% on freight and 1% on vaccines. Tulagi was the only hospital that spent more on other supplies (77%) than non-vaccine drugs (13%).

Figure 18: Cost of medical supplies[50] and freight[51] for hospitals, 2013



[48] Data from the NMS, MHMS and the HFS, indicate that there are 15 SLMS: Tulagi Hospital and Panueli AHC in Central; Taro Hospital in Choiseul, Buala Hospital and Susubona RHC in Isabel; Kirakira Hospital and Tawaraha AHC in Makira; Kilu'ufi Hospital, Afio AHC and Malu'u AHC in Malaita; Lata Hospital in Temotu; and Gizo Hospital, Helena Goldie Hospital, Nila AHC and Seghe AHC in Western.

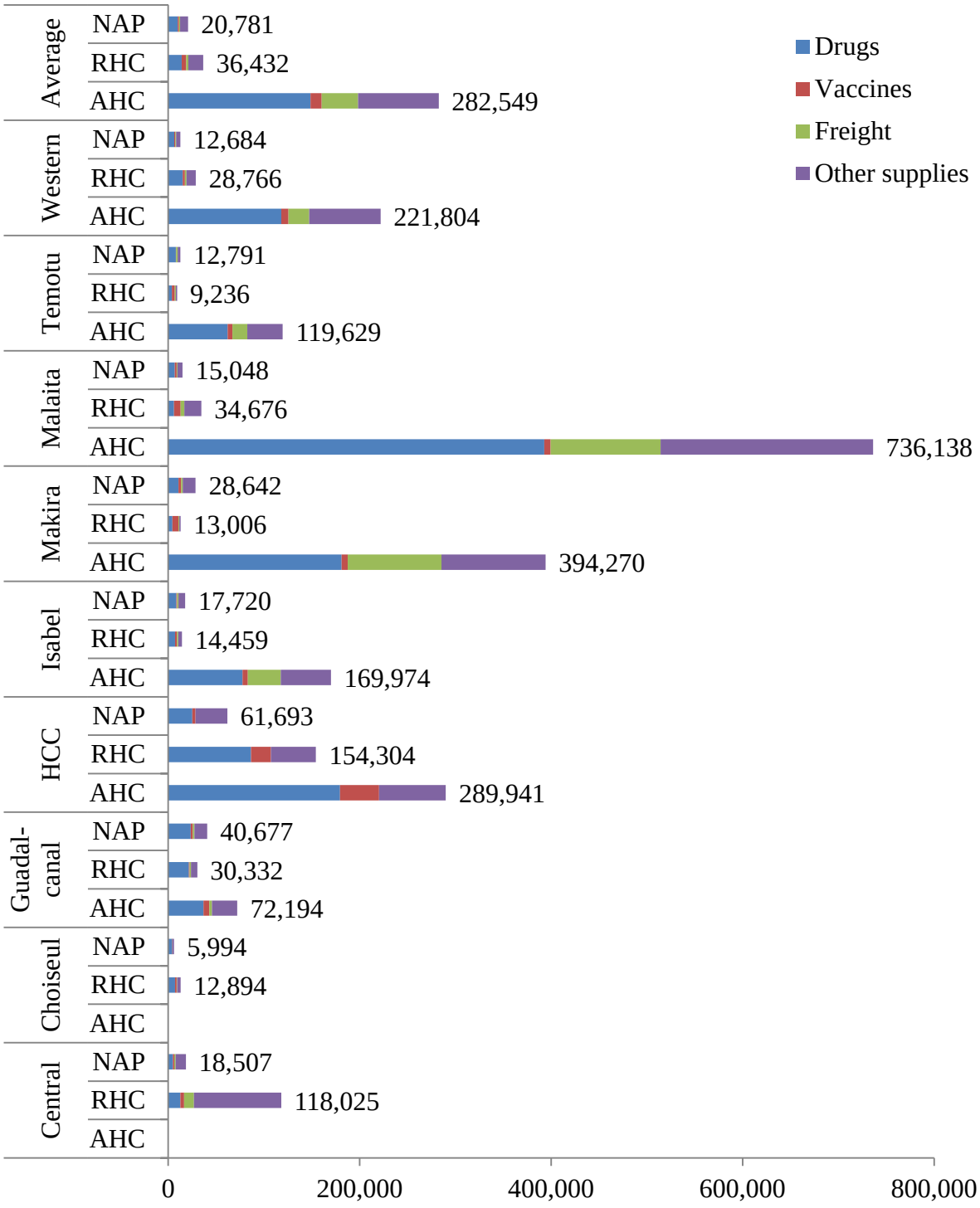
[49] Some facilities in Honiara and Guadalcanal reported that they sometimes collect drugs from the NMS.

[50] The cost of other supplies includes those needed to conduct malaria tests that are provided by the NMS, but excludes other laboratory and imaging supplies, which are described in Section 2.1.3.

[51] The cost of freight only includes the cost of freight from the NMS to SLMS or to facilities supplied directly by the NMS, and excludes cost of freight from SLMS to the facilities that they supply, or the cost of collecting the drugs from the NMS for facilities in HCC and Guadalcanal, which are described in Section 2.1.4.

Figure 19 shows the estimated average cost of medical supply orders and freight for AHC, RHC and NAP per year, being SBD 282,549 for AHC, 36,432 for RHC and SBD 20,781 for NAP.

Figure 19: Average cost of medical supplies and freight[52] per facility for AHC, RHC and NAP by province, 2013

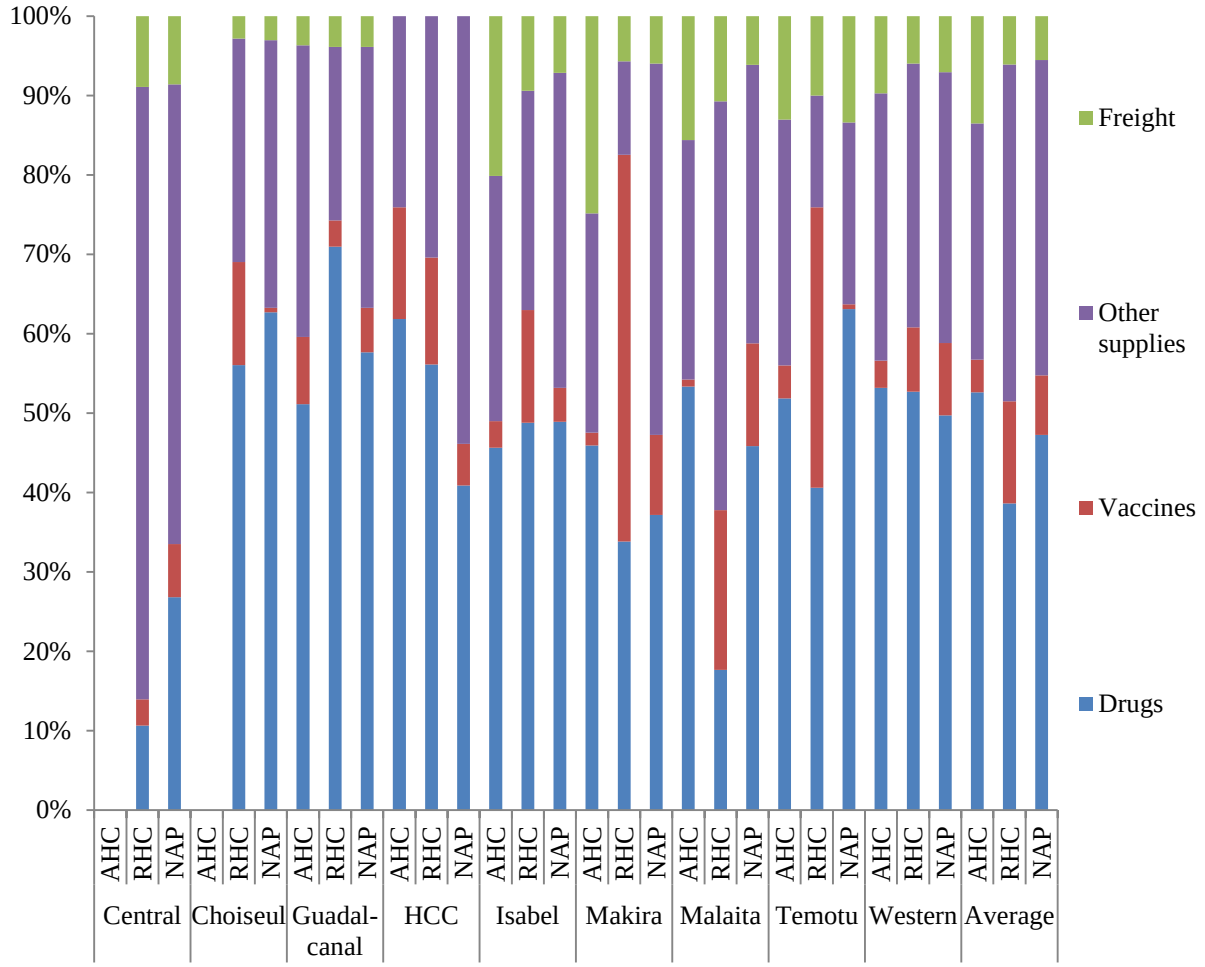


[52] Ibid.

Malaita had the highest average cost of medical supplies and freight for AHC (SBD 736,138), whereas Guadalcanal had the lowest (SBD 72,194). HCC had the highest average costs for RHC (SBD 154,304), which was more than four times the average. RHC in all other provinces except Central had below average costs. HCC also had the highest pharmaceutical cost for NAP (SBD 61,693), again almost triple the average. Conversely, Temotu had a very low average cost for RHC (SBD 9,236), less than one third of the average, and Choiseul had a very low average cost for NAP (SBD 5,994), less than one third of the average.

Figure 20 shows the proportion of the costs spent on non-vaccine drugs, vaccines, other supplies and freight for AHC, RHC and NAP. The highest cost was non-vaccine drugs, which constituted 53% of the costs at AHC, 39% at RHC and 47% at NAP. Like Tulagi, a lower proportion of costs were spent on non-vaccine drugs in RHC and NAP in Central (11% for RHC and 27% for NAP), and a greater proportion was spent on other supplies (77% for RHC and 58% for NAP).

Figure 20: Average percent spent on drugs, vaccines, other supplies and freight[53] for AHC, RHC and NAP by province, 2013

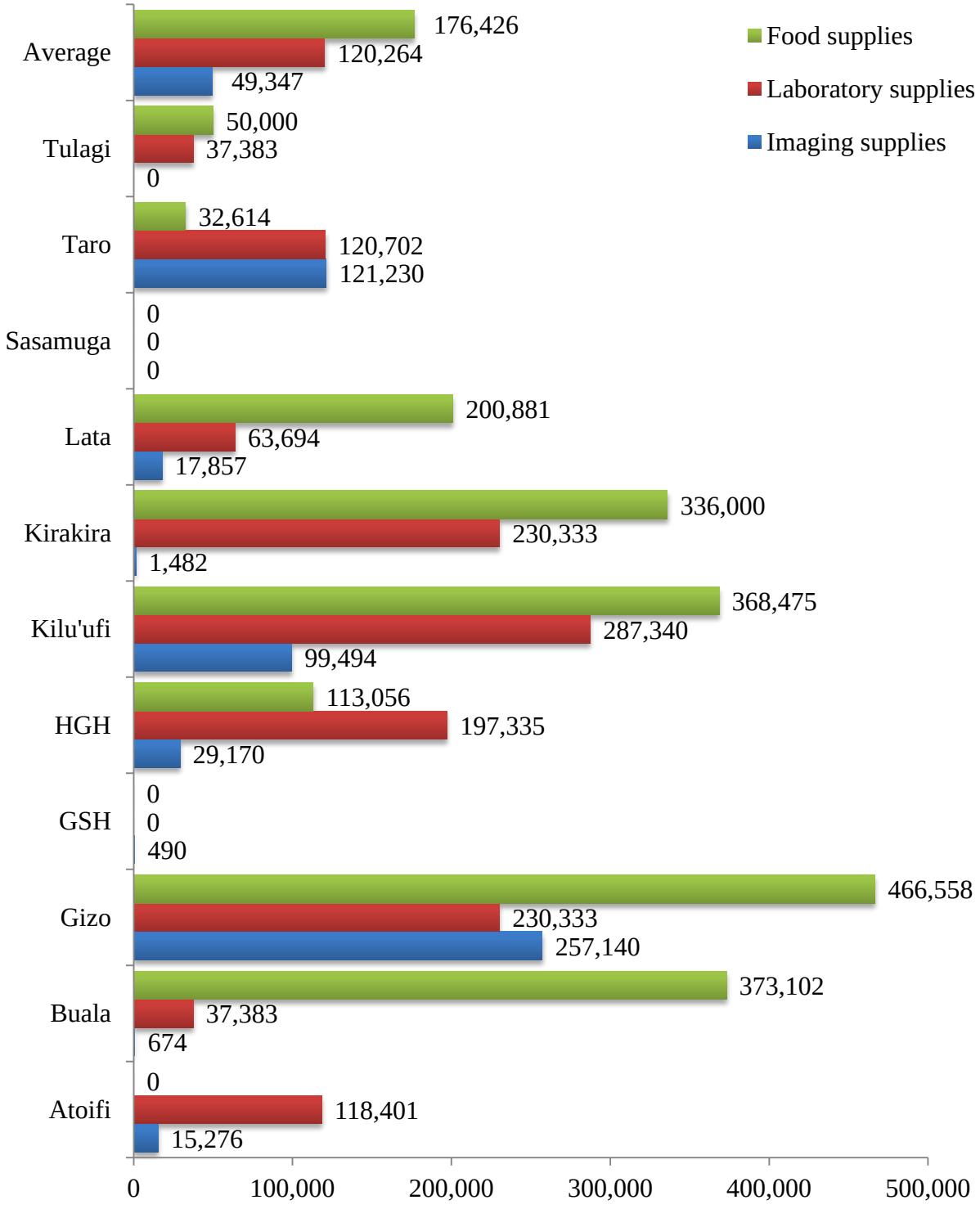


[53] Ibid.

2.1.3 Other supplies

In addition to the medical supplies set out in Section 2.1.2 some hospitals also receive supplies for their laboratory and imaging departments, and kitchens that provide meals for inpatients. These cost estimates are presented in Figure 21 and presented in Appendix A, Table 6.

Figure 21: Costs of laboratory, imaging and food supplies by hospital, 2013



The NRH, Buala, Gizo, HGH, Kilu'ufi, Kirakira, Lata, Taro and Tulagi procure kitchen supplies to provide inpatients with meals.[54] As shown in Figure 21, the average costs of kitchen supplies for hospitals was SBD 176,426 per year, with a maximum of SBD 466,558 at Gizo, compared with SBD 3.7 million at the NRH.

AHC, RHC and NAP and some hospitals only conduct malaria tests[55] and receive supplies from the NMS through the medical supply orders costed in Section 2.1.2 above.[56] A small number of laboratories at hospitals also conduct additional tests. This includes the NRH, Atoifi, Gizo, Helena Goldie, Kilu'ufi, Kirakira, Lata and Taro.[57] The National Laboratory Program also procures items for these additional tests via the NMS and distributes them to laboratory departments in these hospitals. The costs of these supplies are included in Figure 21. In addition all provincial hospitals send laboratory tests, which cannot be done in country, overseas for analysis (via the NRH). These costs are also included in Figure 21 as part of laboratory supplies. As shown in Figure 21, the average costs of laboratory supplies for hospitals was SBD 120,364 per year, with a high of SBD 287,340 at Kilu'ufi, compared with SBD 3.7 million at the NRH.[58]

The NMS also distributes supplies for x-ray and ultrasounds to imaging departments in a small number of hospitals: the NRH, Atoifi, Gizo, Helena Goldie, Kilu'ufi, Kirakira, Lata and Taro.[59] As shown in Figure 21, the average costs of imaging orders for hospitals was SBD 49,347 per year, with a maximum of SBD 257,140 at Gizo, compared with SBD 687,867 at the NRH.

Facilities also receive and procure additional supplies that have not been costed as part of this study. Two national programs, the National Vector Borne Disease Control Program and the National Reproductive, Maternal and Child Health Program provide supplies directly to clinics that were not costed. Facilities also receive or procure different types of medical record books[60] (books kept by patients and used to record his or her medical history), which have also not been costed. Facilities also collected patient contributions for services and medical record books[61] and used these contributions to pay for transport, which has been costed in the Section 2.1.4, and purchase supplies including: stationary, toilet paper, sanitary pads, food, mobile phone credit and food. These supplies have not been costed, but should be included in any facility budget.

[54] Atoifi, GSH and Sasamuga did not provide patients meals in 2013. Aotifi is building a kitchen in 2014, and sometimes provides rice to long-term patients so that they can prepare meals. GSH has a bush kitchen that patients can use to prepare meals.

[55] In 2014 the MHMS, with support from development partners, was piloting rapid HIV tests at some lower level facilities. These tests are not costed in this study.

[56] The National Vector Borne Disease Control Program may also provide facilities with supplies for malaria tests, which are not costed in this report.

[57] Based on provincial laboratory supply orders and discussion with Mr. Alfred Dofai, Head of NRH Laboratory. Buala, GSH, Sasamuga and Tulagi hospitals only conduct malaria tests. Buala and Sasamuga have facilities for conducting additional tests, but have not had a laboratory technician in recent times and did not make an order for laboratory supplies in 2012 or 2013 based on the records received from the NRH laboratory. The laboratory costs for Buala and Tulagi only represents the cost of overseas laboratory tests.

[58] This figure for the NRH includes overseas laboratory costs.

[59] Buala, GSH. Sasamuga and Tulagi hospitals do not have functioning imaging departments. Note that Taro did not have a functioning x-ray machine when the HFS was conducted, but it did received imaging supplies in 2013 and thus they have been costed.

[60] These books include: medical record book (or sickie book), family planning book, antenatal card, mother's book and a baby book.

[61] These contributions are discussed in Section 4.3

2.1.4 Transport

The annual transport costs for AHC, RHC and NAP are shown in Figure 22 to Figure 24 and presented in detail in Appendix A, Table 7. This includes the transport cost[62] attributable to each facility for patient referrals, supervision, training, outreach trips, collecting drugs and collecting money.

The average cost of transport per year is summarized in Figure 22. The average cost of transport was SBD 243,551 for hospitals, SBD 98,659 for AHC, SBD 14,622 for RHC and SBD 6,204 for NAP per year (compared to SBD 4.3 million for the NRH). These costs are shown by hospital in Figure 23 and by province for AHC, RHC and NAP in Figure 24.

Figure 22: Average costs of transport per facility for hospitals, AHC, RHC and NAP by trip type, 2013

Trips	Hospitals		AHC		RHC		NAP	
	SBD	%	SBD	%	SBD	%	SBD	%
Outreach	74,973	32%	5,267	5%	1,157	8%	293	5%
Referrals	60,840	26%	68,042	69%	5,744	39%	2,738	44%
Training	52,364	22%	8,425	9%	4,840	33%	1,772	29%
Supervision	41,227	18%	11,880	12%	704	5%	0	0%
Drugs	4,693	2%	3,915	4%	1,883	13%	1,313	21%
Money	455	0%	1,024	1%	229	2%	75	1%
Total	234,551		98,659		14,622		6,204	

As shown in Figure 22, outreach trips conducted by facilities into villages[63] was on average the highest transport cost for hospitals and the fourth highest transport cost for AHC, RHC and NAP. Based on the HFS, hospitals undertook an average of 15 outreach trips per year, AHC undertook 7, RHC undertook 4 and NAP undertook 2. Three out of four church hospitals (GSH, HGH and Sasamuga) reported conducting minimal outreach trips.[64]

The average cost of a return outreach trip was SBD 7,805 for hospitals, SBD 581 for AHC, SBD 188 for RHC and SBD 102 for NAP. Some facilities reported undertaking outreach trips at no cost. For example, RHC and NAP in Choiseul reported undertaking an average of 10 and 5 outreach trips per year at no cost.

[62] Respondents to the HFS (health workers) were asked to estimate the average return trip costs for different types of trips and were specifically asked to include the cost of fuel, canoe or motor vehicle drivers, accommodation and food. Transport is funded through the provincial health services grant. These grants are acquitted as an imprest by the PHO using Manage Your Own Business accounting software. These acquittals provide some information on transport costs, but it is not consistent between provinces and it is not available for all provinces, for all trip types and by facility type.

[63] For more detail on outreach, see the Definitions at the beginning of this report, Section 3.1 and the Technical Annex. The data presented in this section on *outreach trips* were based on the number of trips recalled by health workers in the HFS, whereas the data presented in Section 3.1 for *outreach tours and contacts* were based on data in the HIS.

[64] These averages are lower than suggested by HIS data presented for *outreach tours and contacts* in Section 3.1.

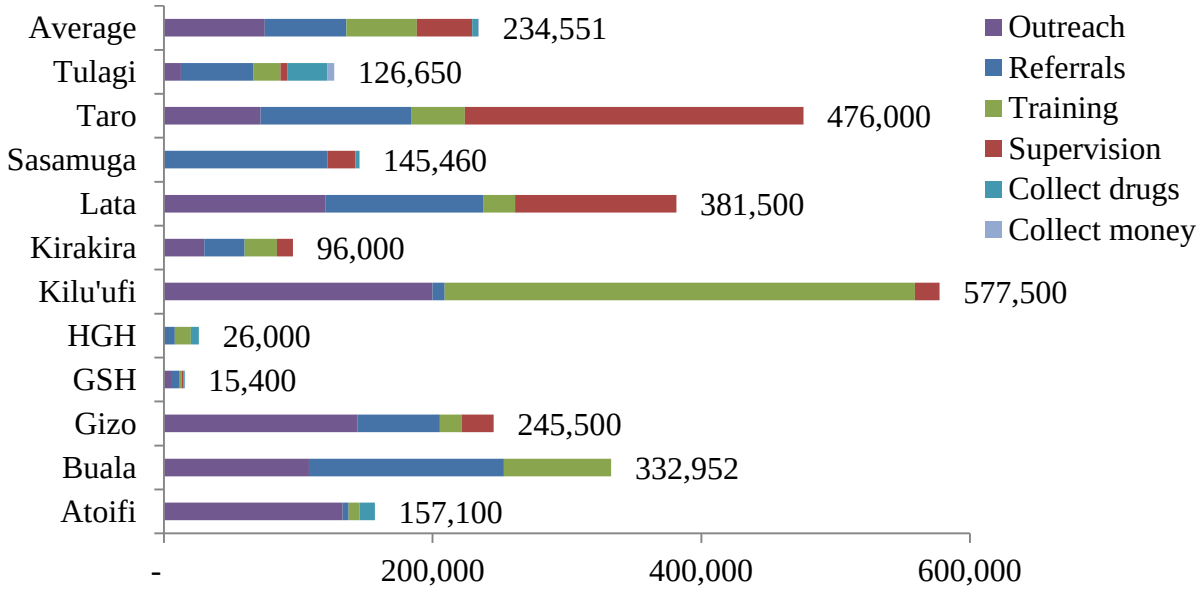
The overall estimated cost of transport for all outreach trips conducted in a year varied between facilities. Five hospitals (Atoifi, Buala, Gizo, Kilu'ufi and Lata) reported outreach trip costs ranging between SBD 100,000 and 200,000 per year, well above the average of SBD 74,973 per year for hospitals. For AHC, only Isabel and Western averaged outreach trip costs greater than SBD 10,000, well above the average of SBD 5,267 for AHC.

As shown in Figure 22, referral was on average the second highest transport cost for hospitals and the highest transport cost for AHC, RHC and NAP. Usually, a referring facility is responsible for paying the cost of transporting a patient to the referral clinic and the referral facility is responsible for the cost of a patient's return. Thus the cost of the round trip between the referring and referral facility has been divided between the referring and referral facilities.

Based on the HFS, hospitals made an average of 76 referrals per year, AHC made 252, RHC made 18 and NAP made 8. Referral numbers were the highest for AHC in HCC, which reported an average of 1,590 referral trips.[65] AHC also had a higher average cost per trip than hospitals: the average cost per referral trip was SBD 824 for hospitals, SBD 1,542 for AHC, SBD 789 for RHC and SBD 499 for NAP.

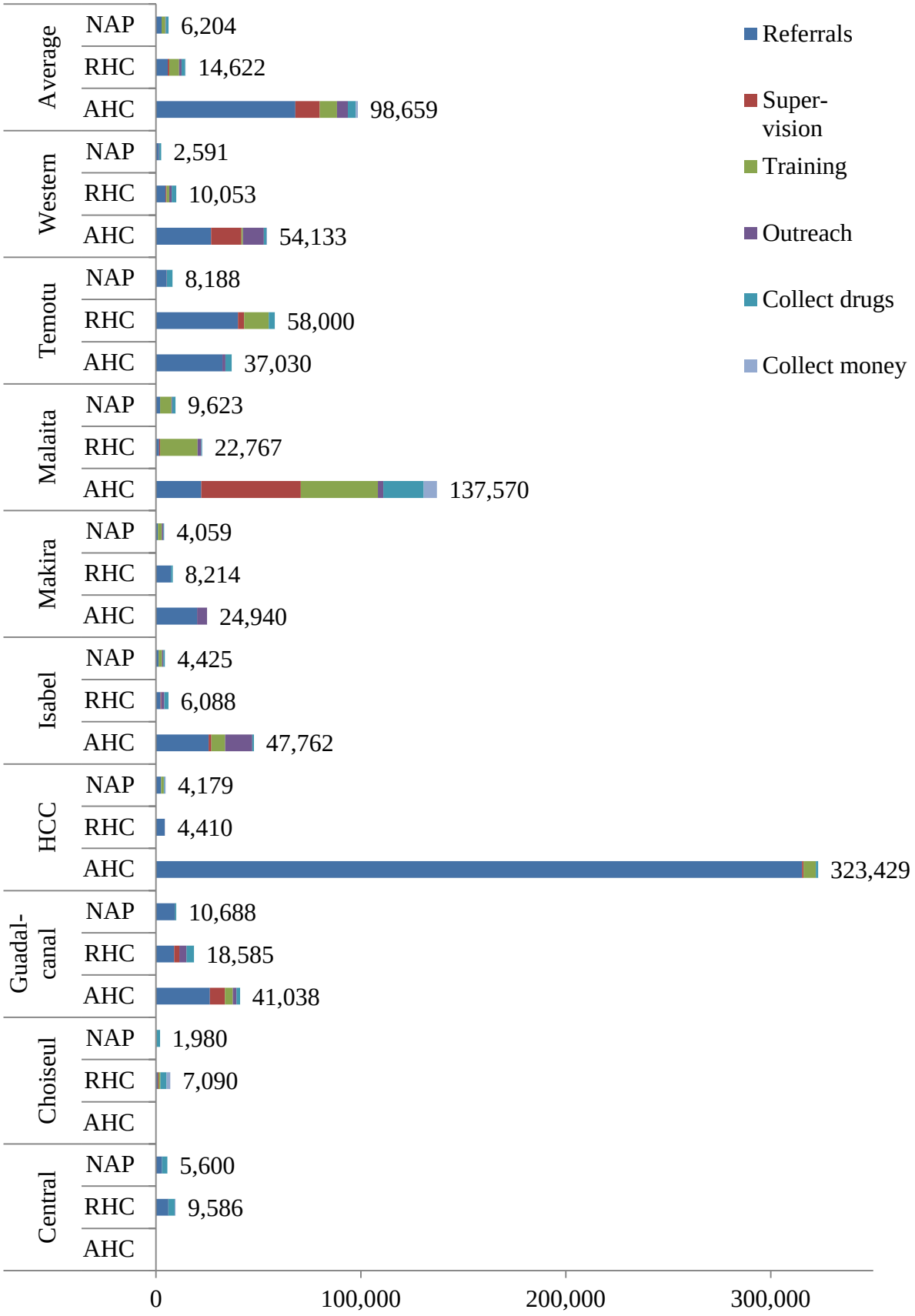
Hospitals, in the outer provinces, including Buala, Lata, Sasamuga and Taro, had referral costs totalling over SBD 100,000 per year, compared with the average of SBD 60,840. The average cost of referrals was also higher for AHC (SBD 68,042) than hospitals, but considerably lower for RHC (SBD 5,744) and NAP (2,738). Referral costs were highest for AHC in HCC (SBD 315,300), RHC in Temotu (SBD 40,000) and NAP in Guadalcanal (SBD 9,192).

Figure 23: Costs of transport for hospitals, 2013



[65] These data from the HFS is largely consistent with the 2012 HIS data on referrals, although the overall numbers differ slightly. According to HIS data, the AHC in HCC in the sample made or received an average of 1,499 referrals in 2012, including 931 referrals made to other facilities and 568 referrals received from NAP, RHC and other AHC. Of the 931 referrals made by AHC in 2012, at least 45% referrals were made to other AHC, reflecting the presence of specialist AHCs in HCC for certain conditions (e.g.: the diabetes centre at Kukum AHC) or population groups (e.g.: the Mataniko Pikinini Clinic).

Figure 24: Average cost of transport per facility for AHC, RHC and NAP by province, 2013



As shown in Figure 22, training was on average the third highest transport cost for hospitals and AHC and the second highest transport cost for RHC and NAP. This includes the cost of a return trip to undertake training for any purpose.[66] The average number of trips for training was 15 for hospitals, 5 for AHC, 1 for RHC and 2 for NAP, and the average cost of a training trip was SBD 3,286 for hospitals, SBD 869 for AHC, SBD 2,261 for RHC and 881 for NAP. RHC in five provinces and NAP in three provinces did not report undertaking any trips for training.

Malaita reported the highest training cost at all facility levels. The average number of trips for training of all hospitals and AHC: Kilu'ufi reported 100 trips per year, compared to the hospital average of 15 and AHC in Malaita reported 16 trips per year, compared to the average of 5. Training was the largest reported transport cost for Kilu'ufi, with a cost over 6 times the average (SBD 350,000 versus SBD 52,364), whereas the four church hospitals had the lowest reported training cost. Transport costs for training at AHC in Malaita were over 4 times the average (SBD 37,620 versus SBD 8,425), and three times the average at RHC (SBD 18,331 versus SBD 4,840) and NAP (SBD 5,538 versus SBD 1,772).

Nurse Area Managers based at hospitals, AHC and some RHC are responsible for conducting supervision to lower level facilities as noted in the *Health Services Act* (1979).[67] Thus the cost of return supervision trips departing from hospitals, AHC and RHC has been attributed to these facilities. As shown in Figure 22, supervision was on average the fourth highest transport costs for hospitals and the second highest transport cost for AHC but was the lowest for RHC and nil for NAP.

On average, hospitals made 5 supervision trips per year, AHC made 10, and RHC made 1.
There was significant variation between provinces. Taro, which is based in Choiseul where there is only one AHC, conducted the most supervision trips of any hospital (14). Two church hospitals (Atoifi and HGH), and Buala, did not conduct any supervision trips. For AHC the number of trips varied from 35 in Guadalcanal to zero in Makira and Temotu (the sole AHC in Temotu is based on an outer island, approximately 80km from the provincial capital).

The cost of an average supervision trip was SBD 7,400 for hospitals, SBD 3,717 for AHC, and SBD 562 for RHC. Lata, Taro and Kilu'ufi reported above average costs per supervision trips (SBD 30,000, SBD 18,000 and SBD 9,250 respectively), and Taro and Lata reported above average total costs (SBD 252,000 and SBD 120,000 respectively), as shown in Figure 23. AHC in Malaita averaged the highest cost per supervision trip, SBD 13,713 and, as shown in Figure 24, the overall highest cost per year, SBD 48,570, which may be because AHC are likely to supervise a higher number of RHC and NAP and thus need to take longer supervision trips. On average there is one AHC for every 10 RHC and NAP across the country, however in Malaita there is one AHC for every 17 RHC and NAP.

[66] Training was not defined in the survey. Training costs for NAP in HCC were amended to the national average for NAP as explained in the Technical Annex.
[67] *Health Services Act* (1979). Refer above page 20 for the relevant text of the legislation.

As shown in Figure 22, transport to collect drugs was on average the fifth highest transport cost for hospitals and AHC, and the third highest transport cost for RHC and NAP. Facilities reported the cost of return trips to collect drugs, which may include:

- For facilities that are supplied by an SLMS: the cost of transport from the SLMS to the facility;
- For facilities that are SLMS: the cost of collecting drugs from another SLMS; and
- For facilities that are supplied directly by the NMS in HCC and Guadalcanal, as well as outer islands: the cost of collecting drugs from the NMS when deliveries are not made.

Less than half of hospitals reported undertaking trips to collect drugs, with an average of 4 trips at SBD 704 per trip. Tulagi and GSH, which receive supplies directly from the NMS, reported the highest number of trips to collect drugs, 24 and 12 respectively. The other three church hospitals, Atoifi, HGH and Sasamuga all reported undertaking trips from the facility to collect medical supplies.

AHC recorded the most trips to collect drugs, 7 on average, with RHC averaging 4 and NAP averaging 3. AHC in Honiara averaged the most trips (24), but these were also the cheapest per trip (SBD 67 versus the average of SBD 591 per trip) given the facilities are located in close proximity as the NMS, which is where they collect their drugs from. AHC in Malaita reported the highest cost per trip to collect drugs (SBD 3,040) and the highest total cost of trips to collect drugs (SBD 19,680 versus the average of SBD 3,915). RHC in Guadalcanal reported a low number of trips to collect drugs (1.2), but the highest cost per trip (SBD 1,846 versus the average of SBD 481) and the highest total cost of trips to collect drugs (SBD 3,692 versus the average of SBD 1,883). NAP in Temotu reported taking the highest number of trips to collect drugs (6), the highest average cost per trip (SBD 630 versus an average of SBD 320) and the highest total cost of trips to collect drugs (SBD 2,910 versus the average of SBD 1,313).

A small proportion of facilities reported undertaking trips to collect money. Tulagi was the only hospital to report undertaking trips to collect money: 4 trips a year costing SBD 1,250 per trip. AHC in Malaita and Western, RHC in Central, Choiseul and Malaita and NAP in Guadalcanal also reported undertaking trips to collect money, with an average cost per trip of SBD 142 for AHC, SBD 28 for RHC and SBD 38 for NAP.

2.1.5 Utilities (electricity and water)

Most facilities that have adequate energy and water have relatively low utility costs given the high proportion of facilities fitted with solar power, water tanks and/or piped water. These cost estimates are presented in Figure 25 to Figure 30 and in more detail in Appendix A, Table 8 to Table 12.

Figure 25 shows the proportion of AHC, RHC and NAP with adequate power and water based on the assessment of health workers responding to the HFS. While almost all hospitals reported having adequate power (91%), on average only 44% of AHC, 33% of RHC and 16% of NAP did. A much lower proportion of hospitals (36%) reported having adequate water, but a higher proportion of AHC (59%), RHC (37%) and NAP (38%) reported having adequate water relative to power, although the proportion is still low. HCC was the only province in which more than half of AHC, RHC and NAP reported having adequate water and power.

Figure 25: Proportion of AHC, RHC and NAP with adequate power and water (%)

	AHC		**RHC**		**NAP**	
	Power	**Water**	**Power**	**Water**	**Power**	**Water**
Central			*0*	*0*	*0*	*0*
Choiseul			*50*	*50*	*50*	*50*
Guadalcanal	*58*	*100*	*62*	*62*	*8*	*31*
Honiara	*100*	*100*	*50*	*50*	*100*	*100*
Isabel	*0*	*33*	*0*	*50*	*0*	*0*
Makira	*0*	*50*	*21*	*0*	*0*	*95*
Malaita	*75*	*25*	*56*	*30*	*19*	*16*
Temotu	*0*	*0*	*0*	*0*	*0*	*50*
Western	*20*	*46*	*18*	*59*	*23*	*59*
Total	*44*	*59*	*33*	*37*	*16*	*38*

Notwithstanding the adequacy of the power supply, costs were applied for power sourced from town supply and/or generators, and a zero cost was assumed for facilities relying solely on solar or with no power (although some maintenance cost would be used for the upkeep).

Figure 26 shows the proportion of hospitals, AHC, RHC and NAP using different types of power sources. Close to half of AHC and NAP and three quarters of RHC rely solely on solar panels whereas close to three quarters of hospitals (all provincial hospitals) rely on town power supply to some extent. A high proportion of NAP (39%) also reported having no power, but this proportion was smaller for RHC (14%) and AHC (10%).

Electricity costs are presented in Figure 27 for hospitals and Figure 28 for AHC, RHC and NAP. As shown in Figure 27 there is some variation in energy costs between hospitals Sasamunga was the only hospital not using town or generator power. The average total electricity cost was SBD 403,986 for hospitals per year (compared to SBD 11.2 million for the NRH). Gizo had the highest estimated electricity cost (SBD 1.4 million), which was based on bills from the Solomon Islands Electricity Authority (SIEA) and did not include any arrears payments.

Figure 26: Energy source(s) by facility type (%)

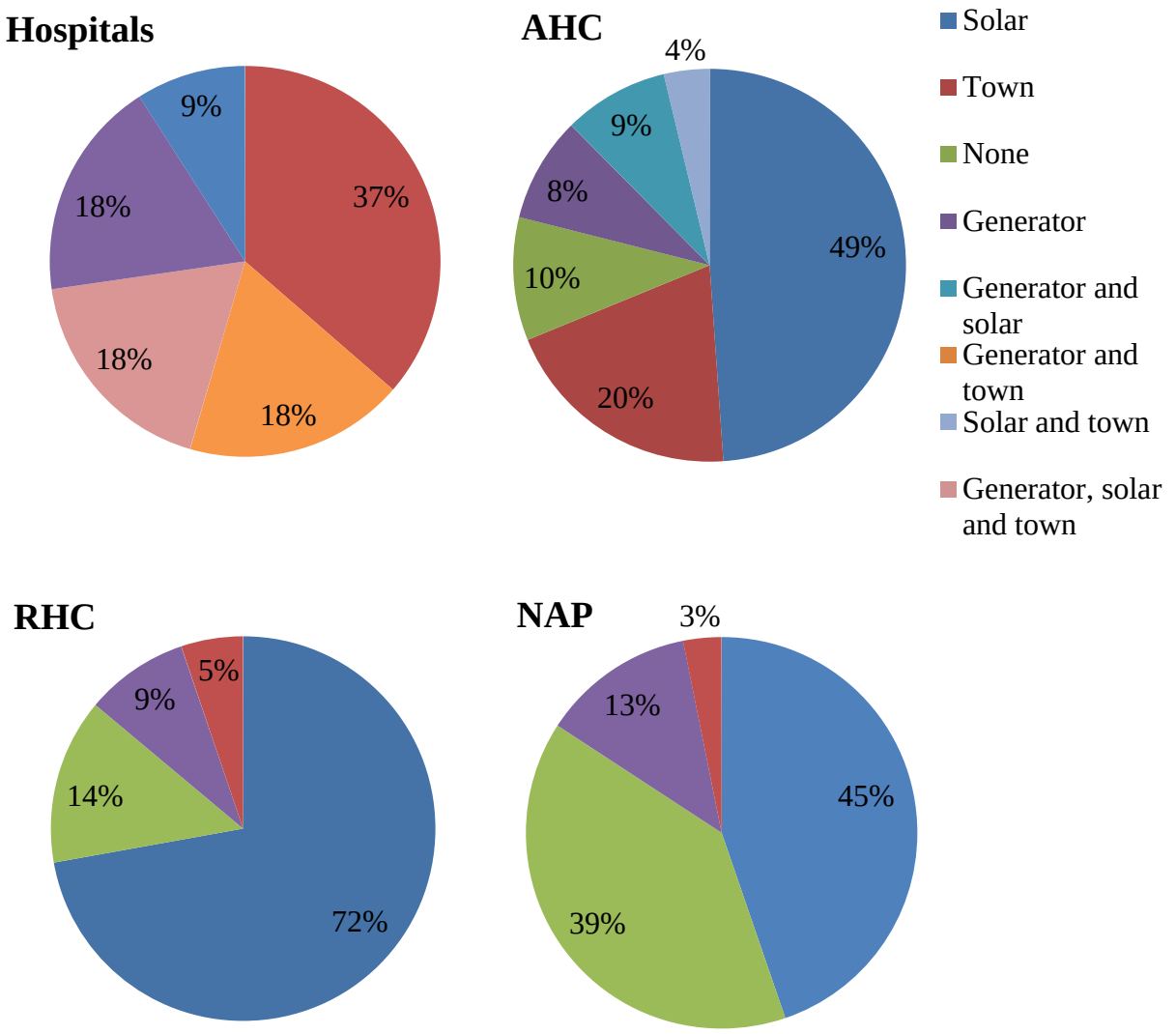
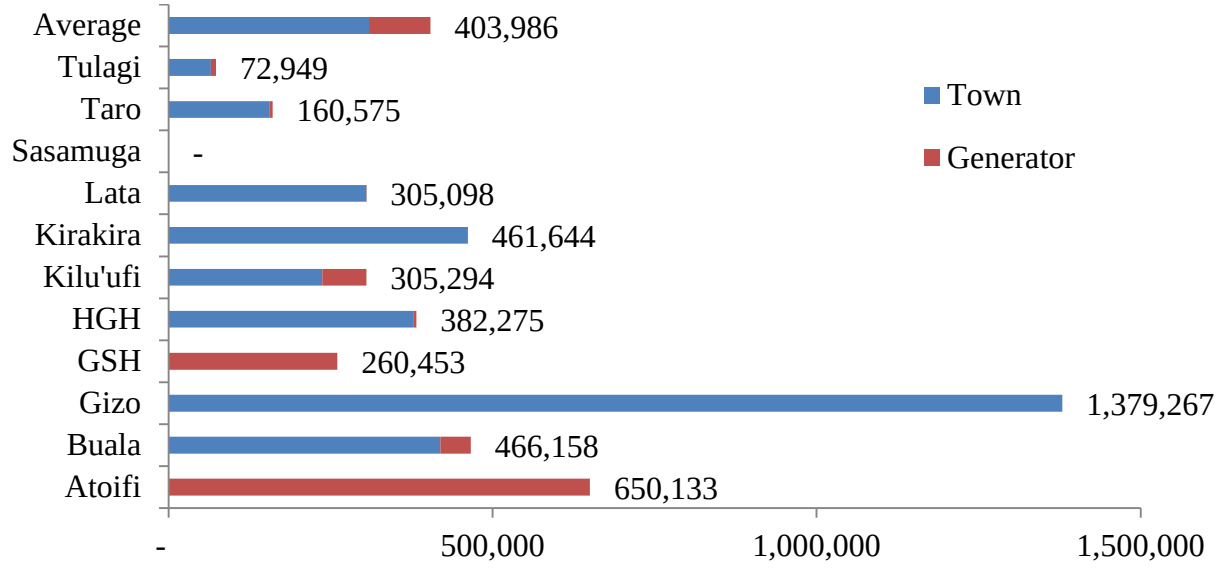


Figure 27: Costs of electricity mains and generator power for hospitals, 2013



Power sources and the associated cost varied in different provinces for lower level facilities. All AHC, RHC and NAP in Choiseul, Isabel, Malaita, Makira and Temotu with power relied solely on solar, except for 25% of AHC in Malaita that also used town supply. Thus there is a zero cost for facilities in these provinces. AHC, RHC and NAP in Guadalcanal, Central and Western used a combination of generator and solar, except for 26% of AHC in Western that also used town supply. All facilities in HCC used town supply. As shown in Figure 28, the average cost of power was SBD 26,881 for AHC, SBD 12,636 for RHC and SBD 5,064 for NAP

Figure 28: Average costs of electricity mains and generator fuel per facility for AHC, RHC and NAP by province, 2013

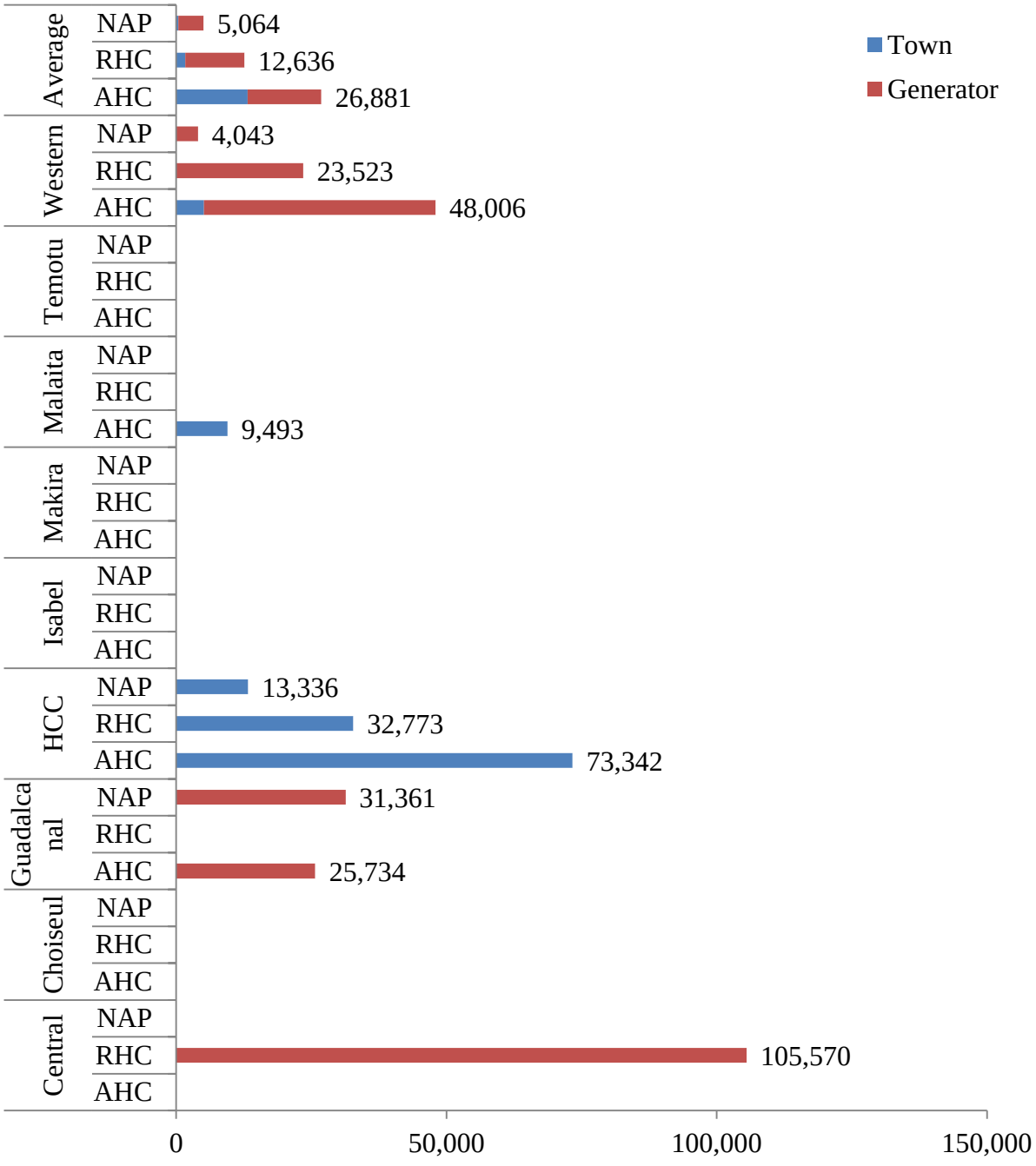
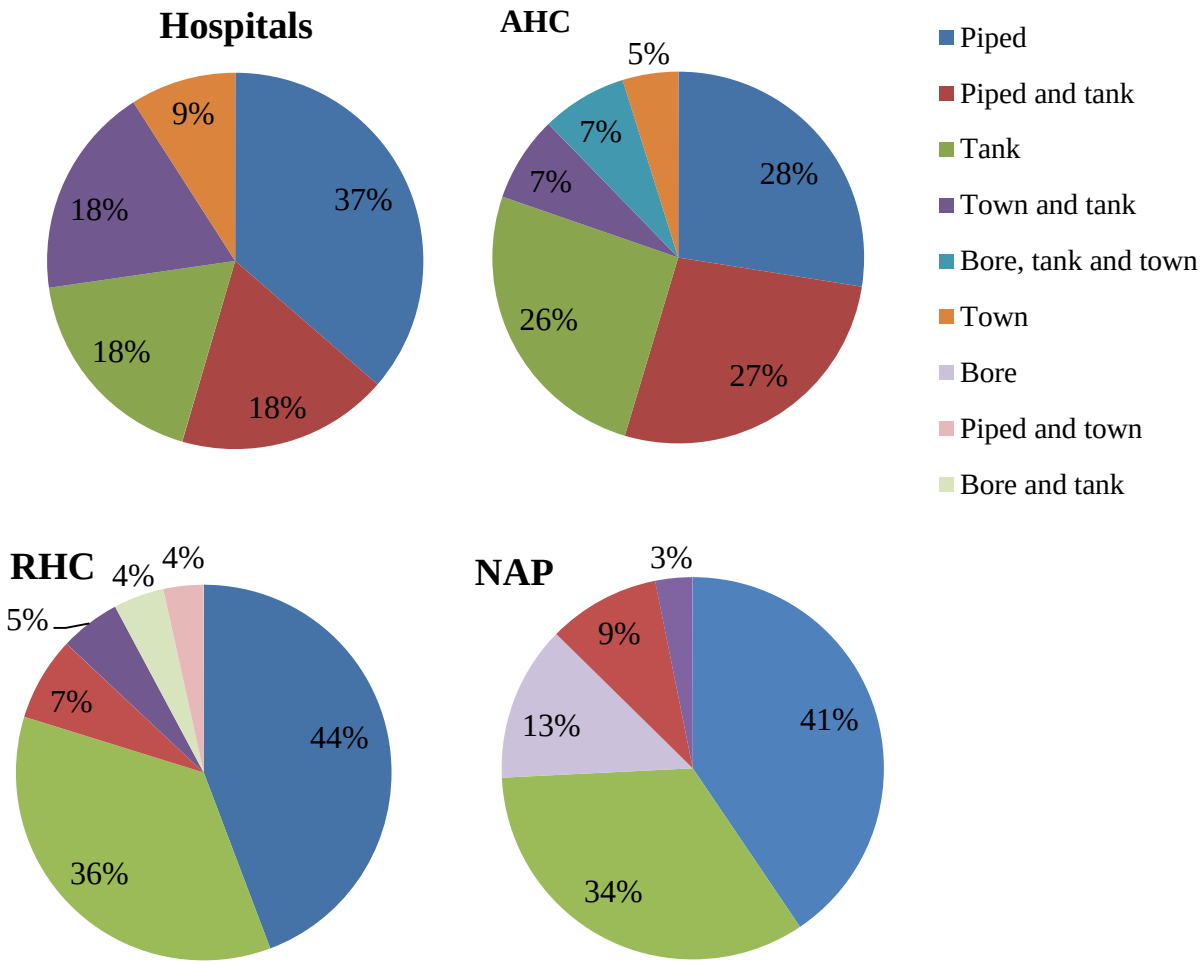


Figure 29 shows the proportion of hospitals, AHC, RHC and NAP using different types of water sources. A similar pattern is present: 81% of AHC, 91% of RHC and 97% of NAP rely predominantly on tank, piped and/or bore water sources, whereas 55% of hospitals use town water to some extent. Again there are differences between provinces; only facilities in HCC, some AHC and RHC in Western used town water to some extent.

Figure 29: Water source(s) by facility type (%)

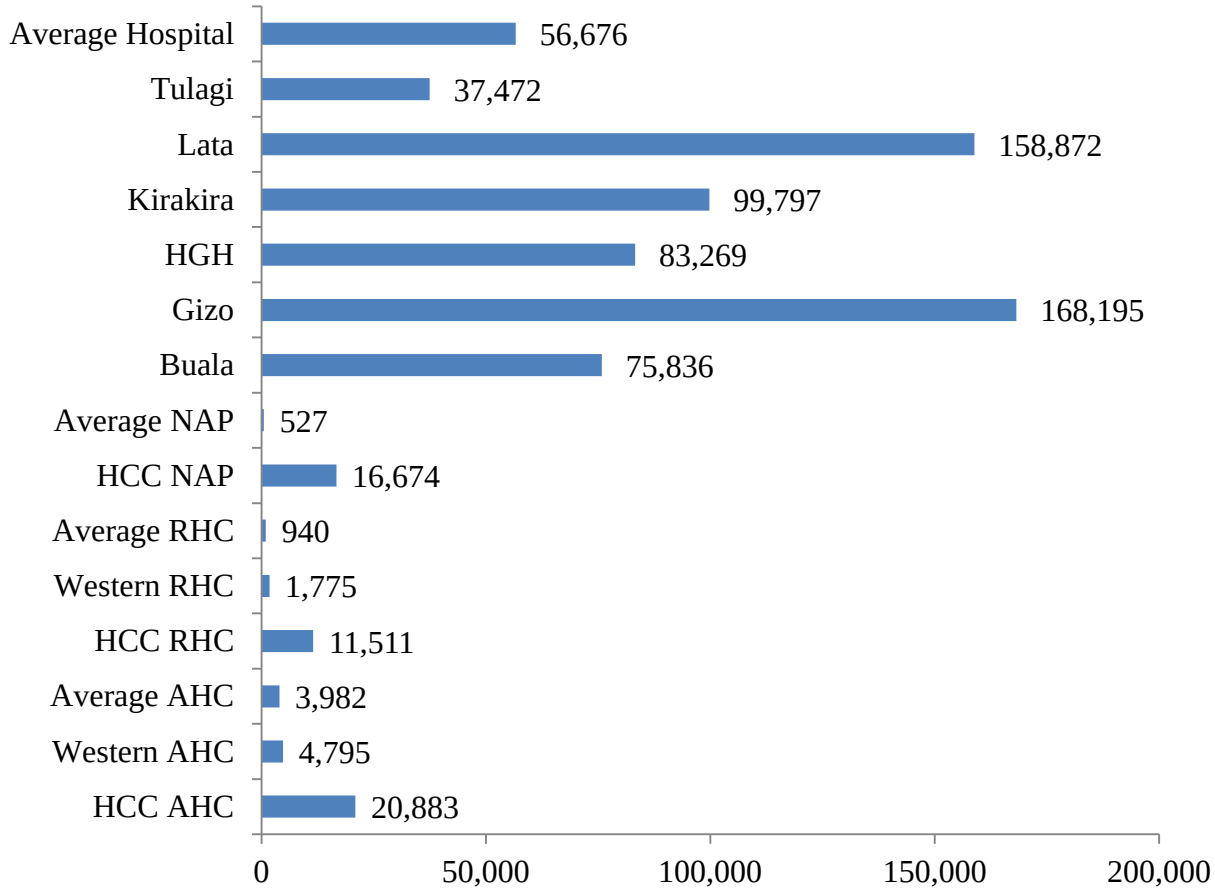


A cost was applied to town water and a zero cost was assumed for facilities relying solely on tank, piped or bore water (although some maintenance cost would be used for the upkeep). The Solomon Islands Water Authority (SIWA) is only responsible for town water in HCC, Auki (the capital of Malaita where Kilu'ufi hospital is based) and Tulagi (the capital of Central where Tulagi hospital is based). In other provinces, the provincial government is responsible for the town water supply and have the authority to charge a water supply tax. Based on a review of PHO expenditure records, only HCC and Temotu have recorded water related costs. The cost of town water supply has nonetheless been costed for facilities in all provinces that use town water to reflect the actual cost.

Figure 30 shows the estimated cost for the hospitals, AHC, RHC and NAP in HCC and AHC and RHC in Western that use town water. The average cost of town water supply was SBD

56,676 per year for hospitals (compared to SBD 2.8 million for the NRH). The average cost of town water supply was SBD 3,982 for AHC, SBD 940 for RHC and SBD 527 for NAP.

Figure 30: Average costs of water for facilities using town water for hospitals, AHC, RHC and NAP by province, 2013



2.1.6 Maintenance

As explained in the Technical Annex a standard maintenance cost of 5.1% of expenditure from provincial health service grants was applied per facility. This percentage is based on total expenditure on repairs and maintenance as a proportion of total recurrent expenditure from provincial health service grants in 2012 and 2013 for provinces for which data are available.[68] Thus maintenance costs were estimated by calculating 5.1% of the expenditure from provincial health service grants that are included in this facility costing: DWE staffing, other supplies for hospitals, transport and utilities.

The average estimated maintenance cost was SBD 52,050 for hospitals, SBD 17,956 for AHC, SBD 6,459 for RHC and SBD 2,918 for NAP (compared to SBD 793,151 for the NRH). These costs are presented by province and facility type in the Section 2.1.7 and presented in detail in Appendix A, Table 13.

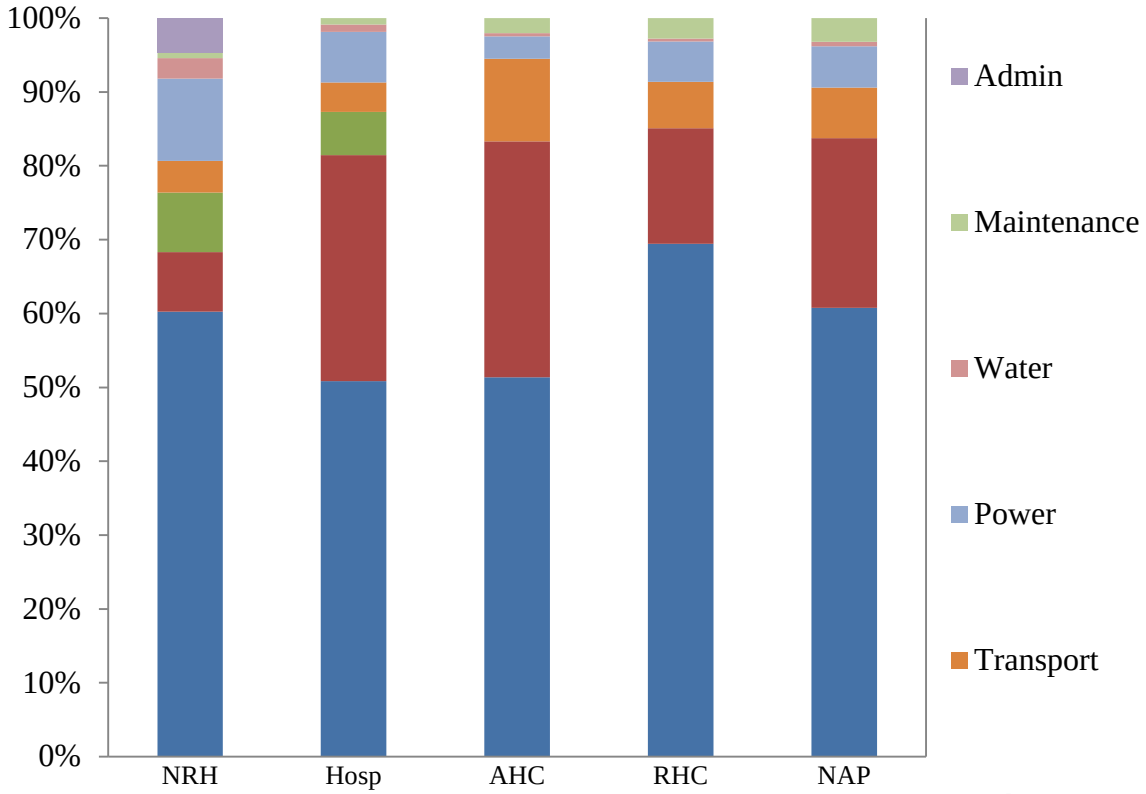
[68] Data were available for Guadalcanal, HCC, Isabel, Malaita, Temotu and Western in 2012 and Choiseul, Guadalcanal, HCC, Isabel, Rennell and Bellona, Temotu and Western in 2013.

2.1.7 Recurrent costs per facility summary

The estimated average annual recurrent costs per facility are shown in Figure 31 to Figure 35 for hospitals, AHC, RHC and NAP and presented in detail in Appendix A, Table 14.

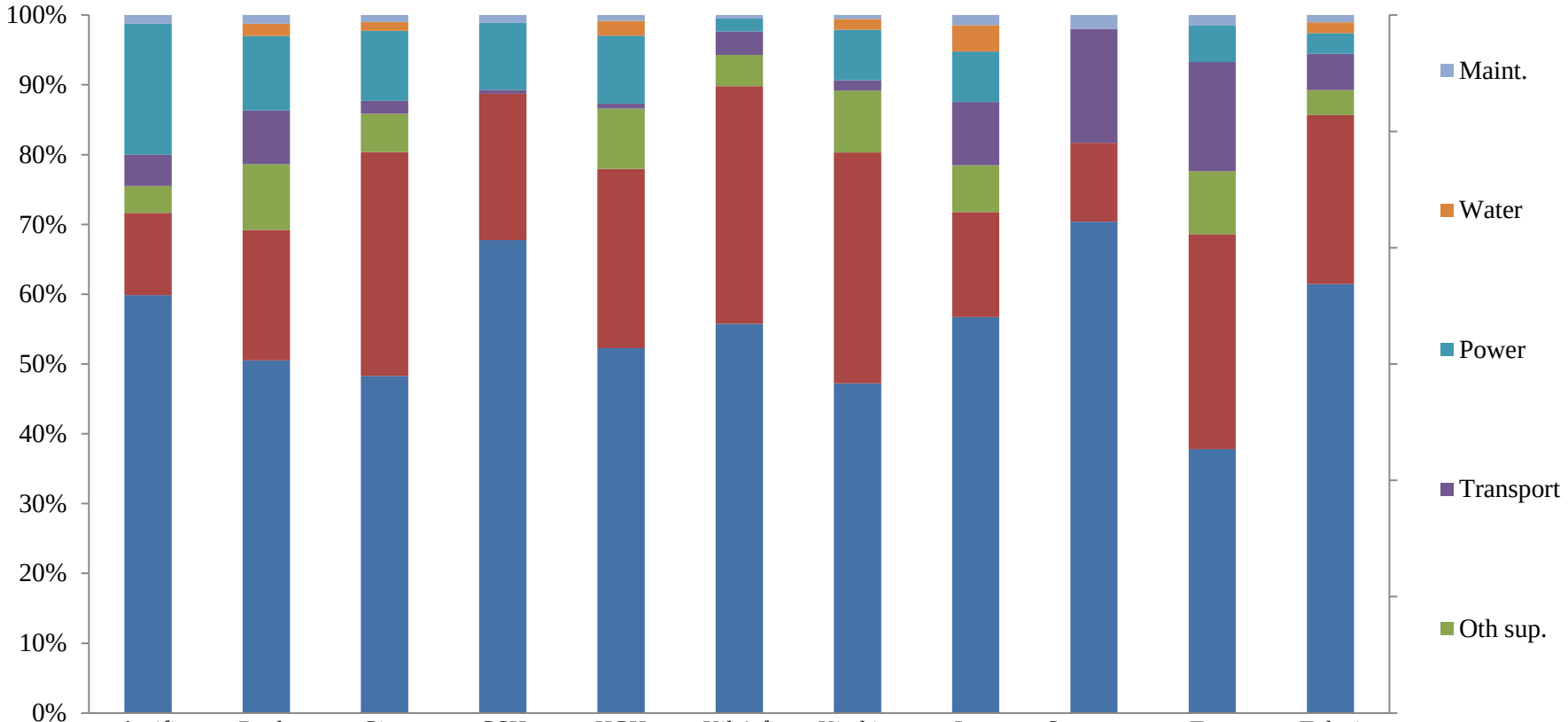
Figure 31 compares the average cost across facility types. While there is significant variation between facility types, staff was the major cost for all facility levels (including the NRH), varying from 69% of recurrent costs at RHC to 51% or recurrent costs at hospitals and AHC. The next highest costs (excluding the NRH) were medical supplies and freight supplies, which varied from 32% at AHC to 16% at RHC (and 8% at the NRH). Together these two costs, staffing and drugs supplies, constituted an average of 80% of the total recurrent costs at hospitals, AHC, RHC and NAP.

Figure 31: Average recurrent costs per facility by facility type and cost category (%), 2013



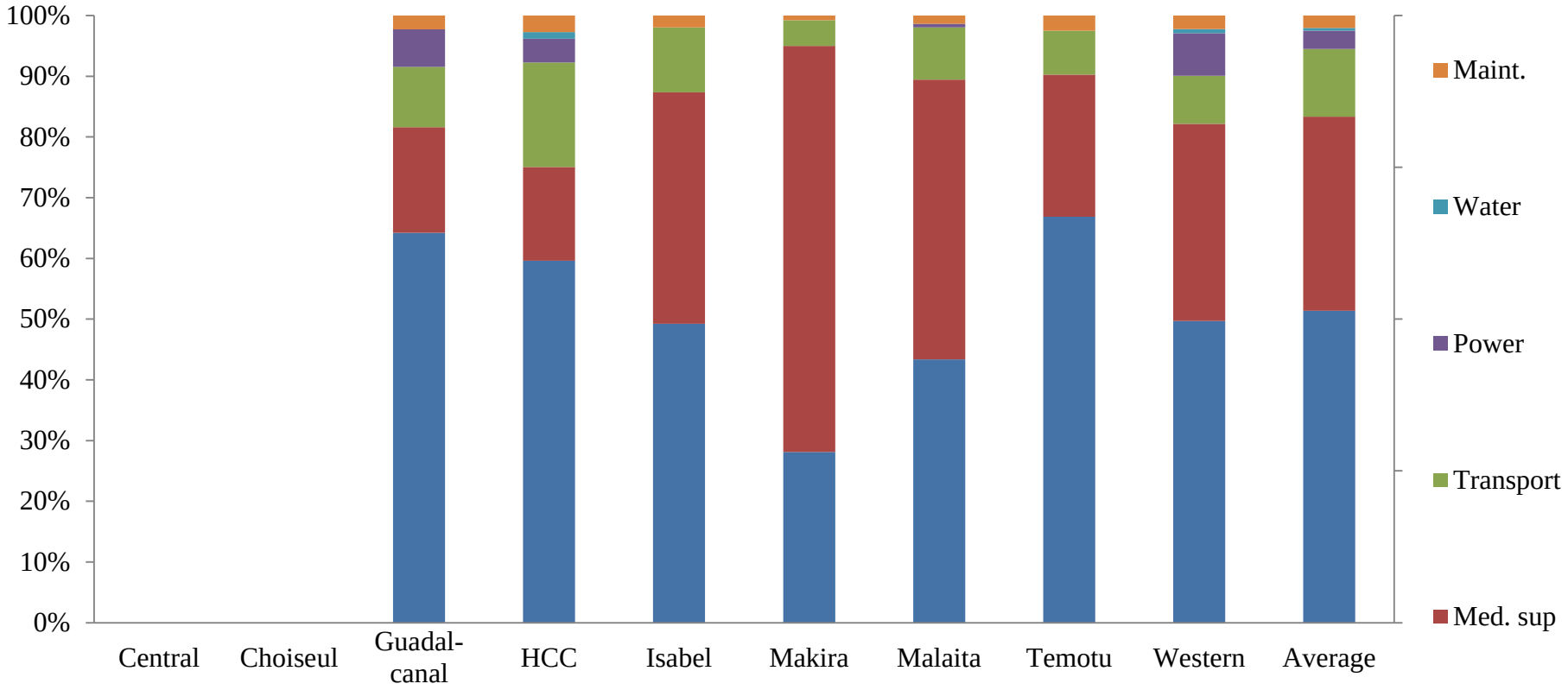
	NRH	Hosp	AHC	RHC	NAP
Admin	4,659,938	-	-	-	-
Maintenance	793,151	52,050	17,956	6,459	2,918
Water	2,820,958	56,676	3,982	940	527
Power	11,224,424	403,986	26,881	12,636	5,064
Transport	4,345,474	234,551	98,659	14,622	6,204
Other supplies	8,123,491	346,037	-	-	-
Drug supplies	8,140,051	1,801,191	282,549	36,432	20,781
Staff	60,801,207	2,993,230	454,510	161,439	54,954
Average Total	100,908,694	5,887,720	884,536	232,528	90,447
Number of fac.	1	11	27	115	190

Figure 32: Recurrent costs at hospitals by cost category, 2013



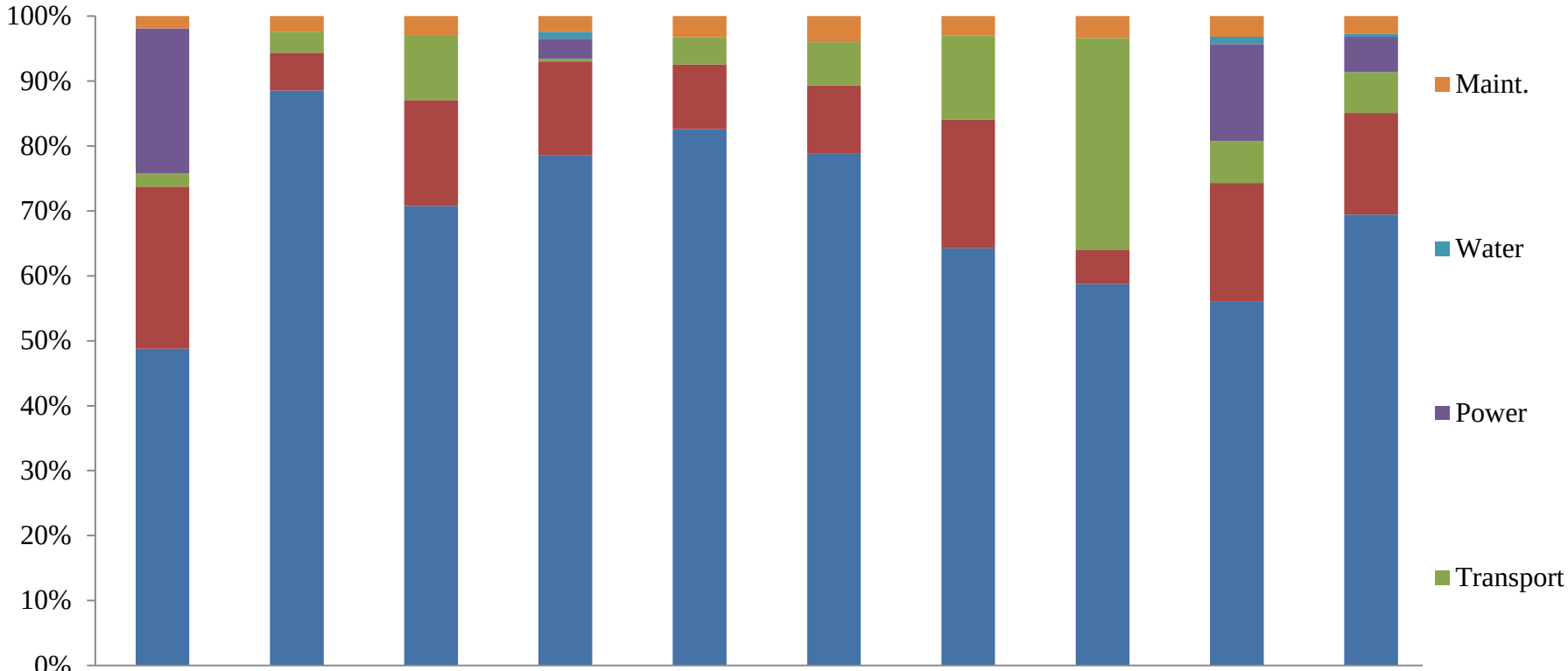
	Atoifi	Buala	Gizo	GSH	HGH	Kilu'ufi	Kirakira	Lata	Sasamuga	Taro	Tulagi
Maint.	43,382	54,124	140,071	30,853	32,628	88,400	35,332	61,035	17,541	43,822	25,359
Water	-	75,836	168,195	-	83,269		99,797	158,872	-	-	37,472
Power	650,133	466,158	1,379,267	260,453	382,275	305,294	461,644	305,098	-	160,575	72,949
Transport	157,100	332,952	245,500	15,400	26,000	577,500	96,000	381,500	145,460	476,000	126,650
Oth sup.	133,677	411,159	762,102	490	339,561	755,309	567,815	282,432	-	274,546	87,383
Med sup.	410,179	813,847	4,389,315	570,072	1,006,250	5,769,176	2,113,914	633,089	100,312	935,869	592,711
Staff	2,079,586	2,199,898	6,619,868	1,842,656	2,046,875	9,444,929	3,022,443	2,391,812	626,345	1,149,425	1,501,691
Total	3,474,057	4,353,974	13,704,318	2,719,923	3,916,857	16,940,608	6,396,944	4,213,837	889,658	3,040,237	2,444,215

Figure 33: Average recurrent costs per AHC by province and cost category, 2013



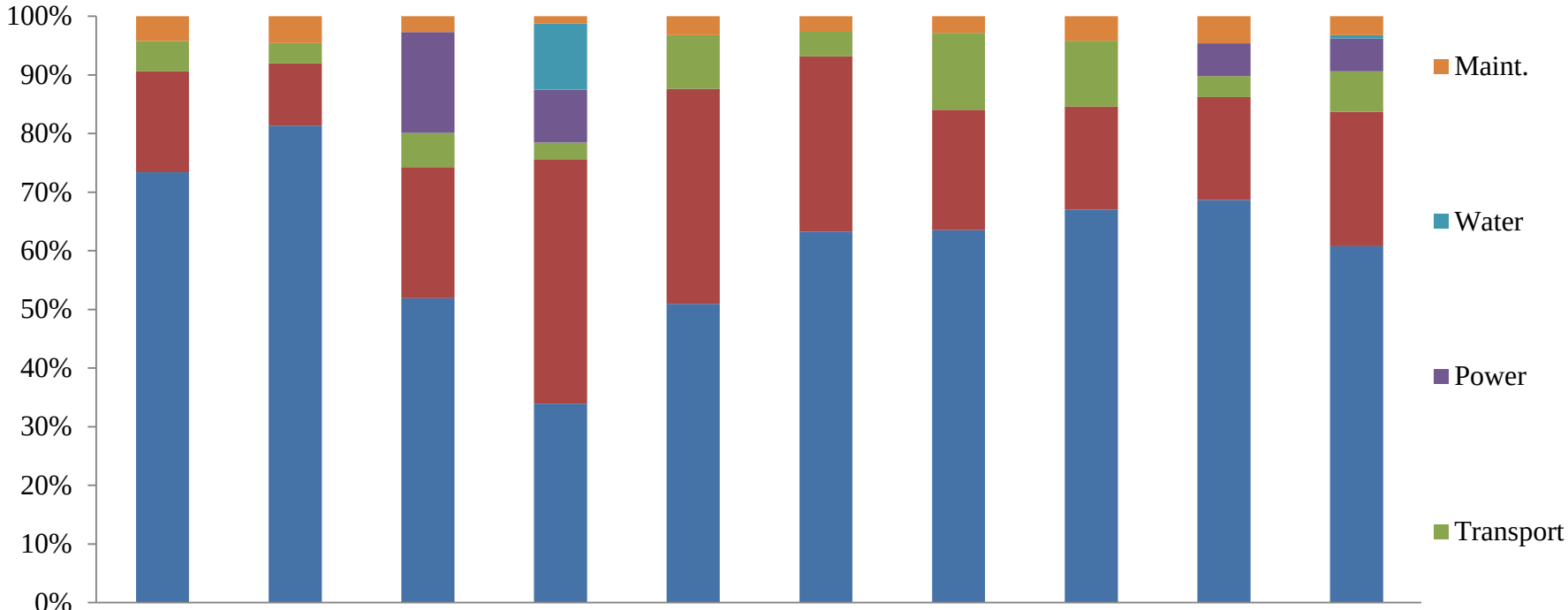
	Central	Choiseul	Guadal-canal	HCC	Isabel	Makira	Malaita	Temotu	Western	Average
Maint.			9,438	51,146	8,745	4,610	21,671	12,772	15,067	17,956
Water			0	20,883	0	0	0	0	4,795	3,982
Power			25,734	73,342	0	0	9,493	0	48,006	26,881
Transport			41,038	323,429	47,762	24,940	137,570	37,030	54,133	98,659
Med. sup			72,194	289,941	169,974	394,270	736,138	119,629	221,804	282,549
Staff			266,257	1,120,867	219,920	165,639	693,212	341,898	339,883	454,510
Total			414,661	1,879,607	446,400	589,459	1,598,084	511,330	683,688	884,536

Figure 34: Average recurrent costs per RHC by province and cost category, 2013



	Central	Choiseul	Guadal-canal	HCC	Isabel	Makira	Malaita	Temotu	Western	Average
Maint.	8,872	5,355	5,437	25,733	4,782	4,928	5,208	5,965	5,016	6,459
Water	0	0	0	11,511	0	0	0	0	1,775	940
Power	105,570	0	0	32,773	0	0	0	0	23,523	12,636
Transport	9,586	7,090	18,585	4,410	6,088	8,214	22,767	58,000	10,053	14,622
Med. sup	118,025	12,894	30,332	154,304	14,459	13,006	34,676	9,236	28,766	36,432
Staff	230,306	195,576	131,636	835,867	120,225	97,219	112,597	104,185	87,995	161,439
Total	472,358	220,915	185,989	1,064,597	145,554	123,367	175,248	177,385	157,128	232,528

Figure 35: Average recurrent costs per NAP by province and cost category, 2013

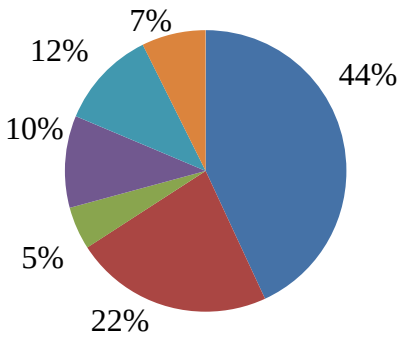


	Central	Choiseul	Guadal-canal	HCC	Isabel	Makira	Malaita	Temotu	Western	Average
Maint.	4,557	2,586	4,873	1,837	1,561	2,520	2,094	3,070	3,351	2,918
Water	0	0	0	16,674	0	0	0	0	0	527
Power	0	0	31,361	13,336	0	0	0	0	4,043	5,064
Transport	5,600	1,980	10,688	4,179	4,425	4,059	9,623	8,188	2,591	6,204
Med. sup	18,507	5,994	40,677	61,693	17,720	28,642	15,048	12,791	12,684	20,781
Staff	79,188	46,135	94,650	50,192	24,623	60,660	46,619	48,941	49,703	54,954
Total	107,852	56,964	182,250	147,912	48,328	95,881	73,384	72,990	72,372	90,447

2.1.8 Recurrent costs by facility type and province

The total annual recurrent costs per facility type and province are shown in Figure 36 to Figure 38, and detailed in Appendix A, Table 15 and Table 16. The total recurrent cost for all facilities is estimated to be just under SBD 231 million, of which 44% is spent at the NRH, as shown in Figure 36. The remaining is spent on provincial and church hospitals, AHC, RHC and NAP.

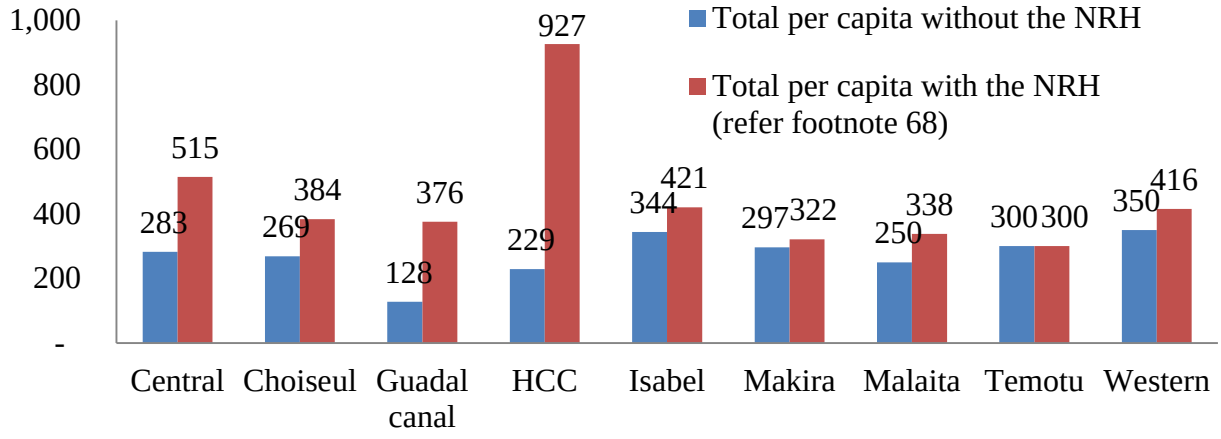
Figure 36: Total recurrent costs for all facilities by facility type, 2013



	Facility type	Recurrent costs	%
	NRH (1)	100,908,694	44
	Provincial Hospital (7)	51,094,028	22
	Church Hospital (4)	11,000,495	5
	AHC (27)	23,882,477	10
	RHC (115)	26,740,727	12
	NAP (190)	17,184,888	7
	Total for all facilities	**230,811,309**	

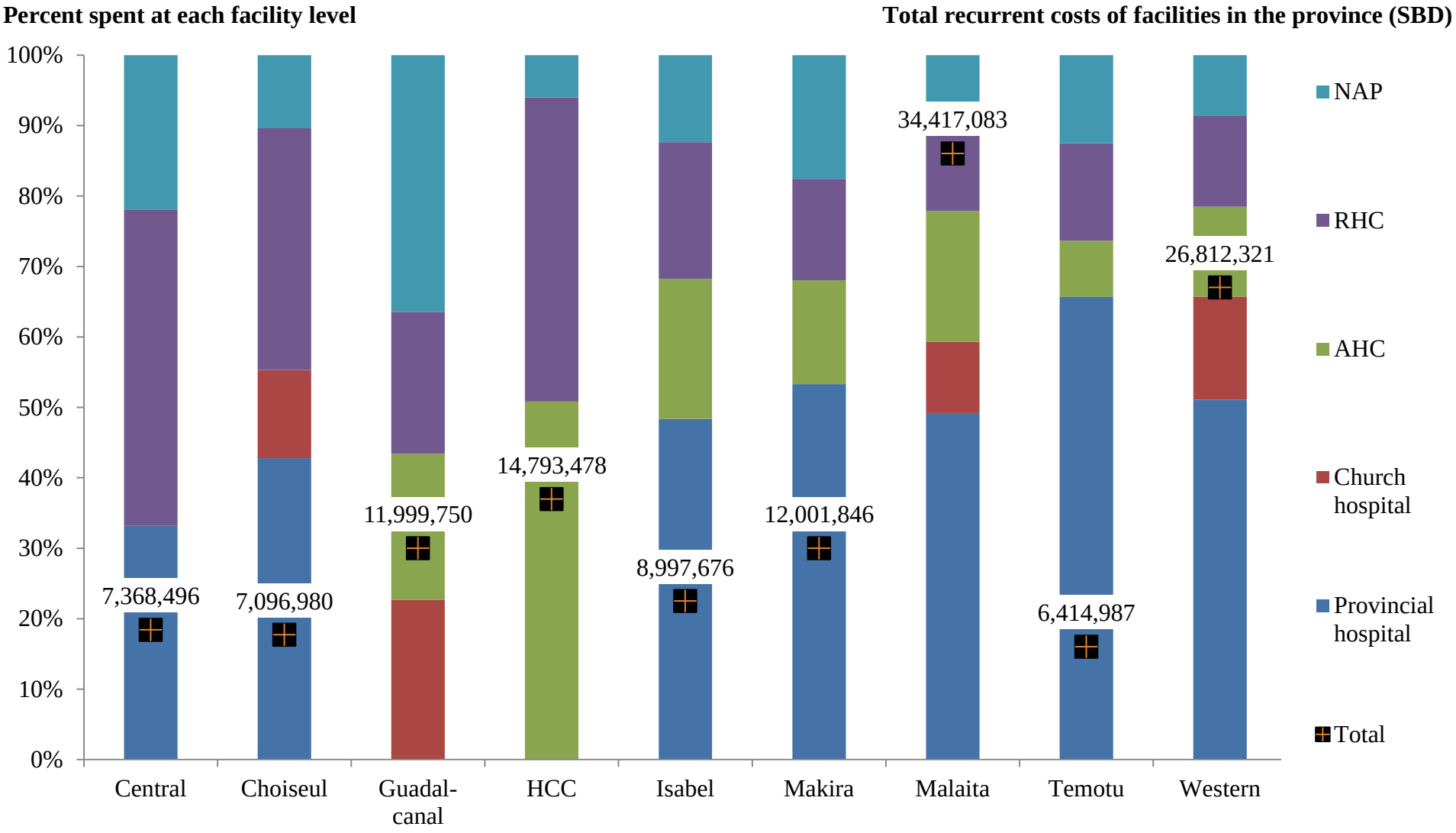
Figure 38 shows the total recurrent costs per province (including hospitals, AHC, RHC and NAP but excluding the NRH), which range from SBD 6.4 million in Temotu to SBD 34.4 million in Malaita. The total cost per province, excluding the NRH, were used to estimate the cost per capita in each province, which varied SBD 128 in Guadalcanal to SBD 350 in Western, as shown in Figure 37. Alternative costs per province including NRH cost distribution were also calculated, based on the number of formal referrals to the NRH reported by all facilities in each province in the Health Information System in 2012, as also shown in Figure 37.[69] The estimated cost per capita, varied from SBD 128 in Guadalcanal to SBD 350 in Western, and SBD 229 in HCC. However, including the NRH, total recurrent spending per capita varied between SBD 300 in Temotu to SBD 515 in Central, and SBD 927 in HCC (inclusive of the SBD 229 per capita spent in HCC and SBD 698 spent at the NRH on HCC residents).[70]

Figure 37: Total recurrent cost per capita by province with and without the NRH, 2013



[69] The NRH costs were distributed to the provinces based on the proportion of formal referrals from each province to the NRH in 2012 as recorded in the HIS. Data for Kilu'ufi were imputed based on nine months of data for 2013 as no data was available for 2012. Renbel costs were excluded. The HIS data does not include self-referrals.
[70] The analysis of the HIS data found that 45% of the referrals from the provinces to the NRH were from HCC.

Figure 38: Total recurrent costs by province (including hospitals, AHC, RHC and NAP but excluding the NRH), 2013



2.2. NRH

Figure 39 presents a summary of the recurrent costs incurred at the NRH. The largest cost at the NRH was staffing (60%), followed by electricity (11%) and then medical supplies (8%); this is in contrast to the other hospitals and facilities where medical supplies were the second largest expenditure followed by transport.

Figure 39: Total recurrent costs for the NRH, 2013

	Recurrent cost	
	SBD	**%**
Staffing	60,801,207	60%
Electricity	11,224,424	11%
Pharmaceuticals	8,140,051	8%
Admin/Overheads	4,659,938	5%
Transport	4,345,474	4%
Laboratory	3,734,962	4%
Kitchen	3,700,662	4%
Water	2,820,958	3%
Maintenance	793,151	1%
Imaging	687,867	1%
Total	**100,908,694**	

In 2013 there was a total of 621 staff employed at the NRH, of which 497 were clinical staff. This includes 73 doctors, 236 nurses and 85 nurse aids (see Figure 40). Nearly 20% of all staff were non-clinical, assuming administrative, domestic or other roles (see Figure 41). Figure 42 presents the number and type of staff in each clinical and administrative area[71] and the total salary and allowance cost of these staff in each section.[72] The salary cost estimates were based on 2013 figures provided by the Ministry of Finance and Treasury, and do not take into account proposed increases to doctor salaries due to come into effect in 2014. All employees were full time.

Electricity was the next highest cost at the NRH; the estimates above are based on the SIEA bill. The high cost of electricity at the NRH may be due to use of electricity by staff residing in the nearby staff compound; there is one electricity meter for the NRH and the compound. The water costs were based on the SIWA bills. The NRH may be paying an inflated cost for water due to a broken water meter.

[71] Staff were allocated to outpatient clinics if they worked in those clinics for more than 20 hours a week.
[72] To maintain anonymity of the staff the costs of staff by type (e.g.: doctor, nurse etc) and section have not been presented. For example, there is only one doctor in the laboratory and one nurse aid in the imaging departments. They are available on request.

Figure 40: Number and type of clinical staff at NRH, 2013

Cadre of staff	Doctors	Nurses	Nurse Aids	Dentists and assistants	Radiographer and assistants	Pharmacist and assistants	Laboratory staff, assistants and health/ biomedical technicians	Allied health professionals and educators	Total
Number	73	236	85	19	12	21	38	13	497

Figure 41: Number and type of non-clinical staff at NRH, 2013

Cadre of staff	Administration	Domestic[73]	Cooks	Driver	Security	Non-health technicians	Total
Number	32	50	14	9	11	8	124

[73] Domestic staff includes cleaners and laundry assistants.

Figure 42: Number of staff at NRH by section and post and total staff costs by section, 2013

		Total Staff	Doctors and dentists	Nurses	Nurse Aids	Other clinical staff[74]	Admin-istration	Other non-clinical staff[75]	Total costs (SBD)
IP	Medical	50	20	25	4	1	0	0	$6,217,774
	Surgery	38	12	20	5	1	0	0	$3,509,384
	Labour	28	0	23	5	0	0	0	$2,339,385
	Paediatrics	24	5	13	6	0	0	0	$2,902,816
	Postnatal	24	0	19	5	0	0	0	$2,173,097
	Orthopaedic	22	0	14	8	0	0	0	$2,754,423
	Gynaecology	18	6	9	3	0	0	0	$2,392,210
	Nursery	18	0	15	3	0	0	0	$1,777,798
	TB	15	0	6	9	0	0	0	$1,231,981
	Antenatal	13	0	9	4	0	0	0	$1,192,409
	Rehab	6	0	0	0	6	0	0	$730,714
OP	Emergency	50	8	32	10	0	0	0	$4,213,245
	Dental	32	15	0	0	14	2	1	$3,776,805
	Eye	18	3	6	5	3	1	0	$2,212,095
	Diabetic	10	0	6	4	0	0	0	$911,907
	Other[76]	19	6	9	4	0	0	0	$2,633,220
Other	Cleaning	49	0	0	0	0	1	48	$2,004,387
	Administration/finance	35	0	8	0	2	25	0	$3,074,981
	Laboratory	31	1	0	0	29	1	0	$3,131,229
	Pharmacy	22	0	0	0	22	0	0	$2,156,129
	Theatre	21	0	16	4	1	0	0	$3,199,238
	Imaging	20	4	1	1	12	1	1	$2,429,436
	Infection Control	10	0	5	5	0	0	0	$747,783
	Other[77]	48	0	0	0	5	1	42	$3,088,762
	Total	**621**	**80**	**236**	**85**	**96**	**32**	**92**	60,801,207

[74] Includes allied health professionals, dental assistants, educators, laboratory assistants, laboratorists, pharmacists, pharmacy assistants, radiographers, radiography assistants, technicians – biomedical, technicians - health

[75] Includes cleaners, cooks, drivers, laundry assistants, security guards, technician – non-health

[76] Includes Fracture; Ear Nose and Throat; Obstetrics and Gynaecology; and the referral/consultant clinics (Surgical, Paediatrics, Orthopaedics, and the GP clinic).

[77] Includes kitchen, maintenance, security and transport

3. Service delivery costs

3.1 Services costs at hospitals, AHC, RHC and NAP

Figure 43 to Figure 46 present the average annual number of services provided by hospitals, Area Health Centres (AHC), Rural Health Clinics (RHC) and Nurse Aid Posts (NAP) by province and service type, based on the data available from the Health Information System (HIS).[78] Greater detail is provided in Appendix A, Table 17 to Table 20.

Figure 43 shows the average annual number of patient contacts for:

- Inpatients;
- Outpatients (including new, return and chronic outpatient visits, as well as family planning, maternal health and child welfare visits in the clinic); and
- Outreach (including antenatal, postnatal and child welfare contacts on tour) per facility.

This data were extracted from the HIS, except for the National Referral Hospital (NRH), which does not report to the HIS.

Figure 43: Average number of patient contacts by facility type, 2012[79]

	Inpatients	Outpatients	Outreach contacts
NRH) (1)	12,407	62,985	N/A
Hospital (11)	1,054	14,735	146
AHC (27)	144	12,078	33
RHC (115)	48	4,970	44
NAP (190)	14	1,831	3

Hospitals served an average of 1,054 inpatients and 14,735 outpatients in 2012. Figure 44 shows the number of inpatient admissions and outpatient visits per year. Kilu'ufi had the highest number of inpatients (2,800), but an average number of outpatients (11,569 compared to an average of 14,735). The relatively lower number of outpatients at Kilu'ufi is likely due to the fact that there is an AHC in Auki (the capital of Malaita where Kilu'ufi is based), which patients are encouraged to attend before the hospital and where all family planning, antenatal, postnatal and child welfare clinics take place. Good Samaritan Hospital (GSH) had the highest number of outpatients (28,479).

AHC, RHC and NAP provide limited inpatient services: inpatients at these facilities, particularly RHC and NAP, are likely to either be deliveries, patients who are waiting for transport for referral, or patients who are waiting until they are well enough to travel home. An average of 144 admissions per year was made by AHC, 48 by RHC and 14 by NAP. Figure 45, which shows average inpatient and outpatient services per facility by province and facility type,

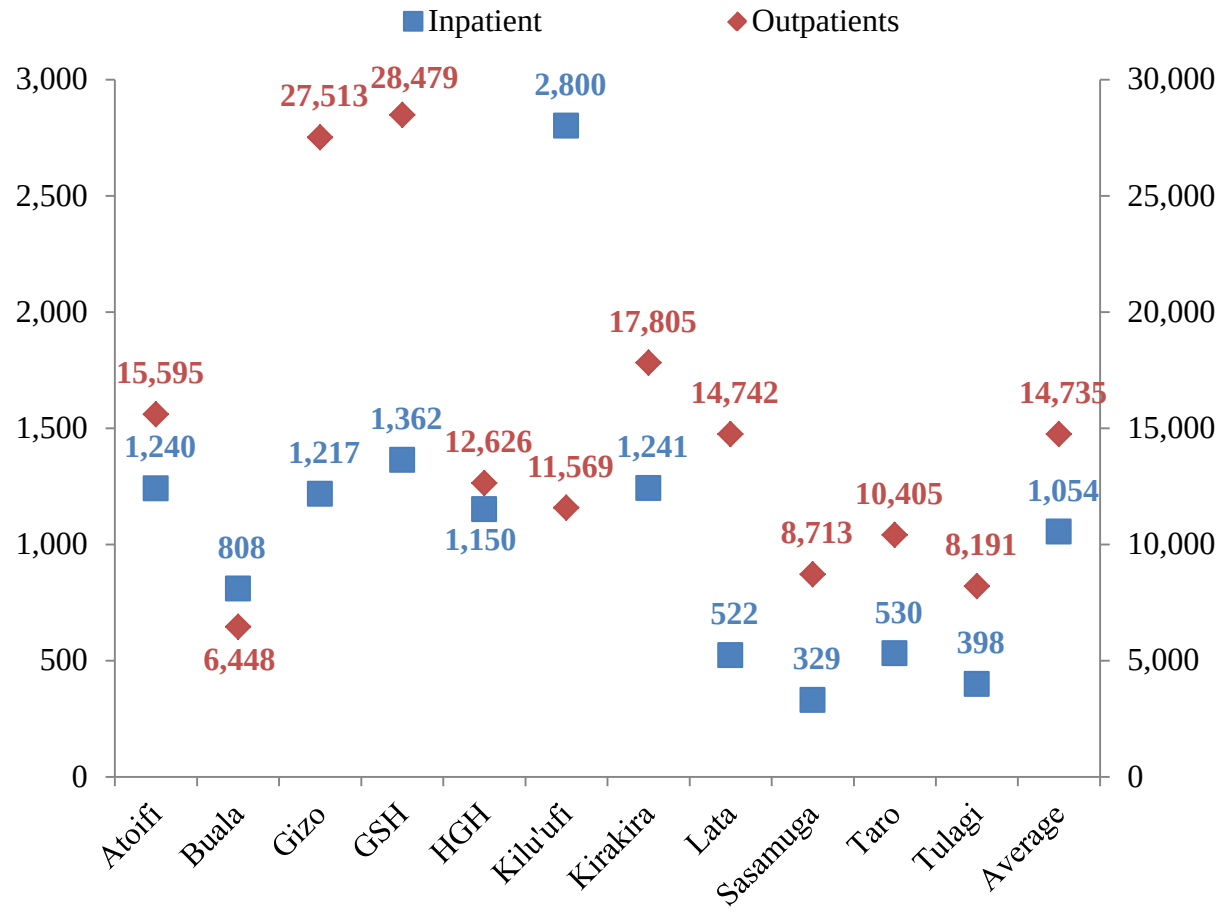
[78] For definitions used for the monthly reporting form, see: MHMS (2007), 'Solomon Islands Primary Health Care Health Information System: Guidelines for Monthly Reporting from Hospitals and Clinics'. Copy on file with author.
[79] Source: HIS. Data from the HIS is for 2012 only.

indicates that there was some variation. AHC in Malaita, Western and Temotu had a greater average number of admissions (344, 243 and 203 respectively). Makira had a low number of admissions at AHC, but the reverse at RHC and NAP.

On average AHC performed 12,078 outpatient consultations in 2012, RHC performed 4,970 and NAP performed 1,831. Although most AHC, RHC and NAP in Honiara City Council (HCC) do not admit inpatients, they provide a higher volume of outpatient services compared with AHC, RHC and NAP in other provinces. There was greater consistency across the other provinces, although still some variation. AHC in Western and Temotu[80] average over 9,500 outpatient visits per year, more than double the number provided by AHC in Makira. Similarly, RHC in Malaita average close to double the number of outpatient visits compared to those in Isabel and Choiseul.

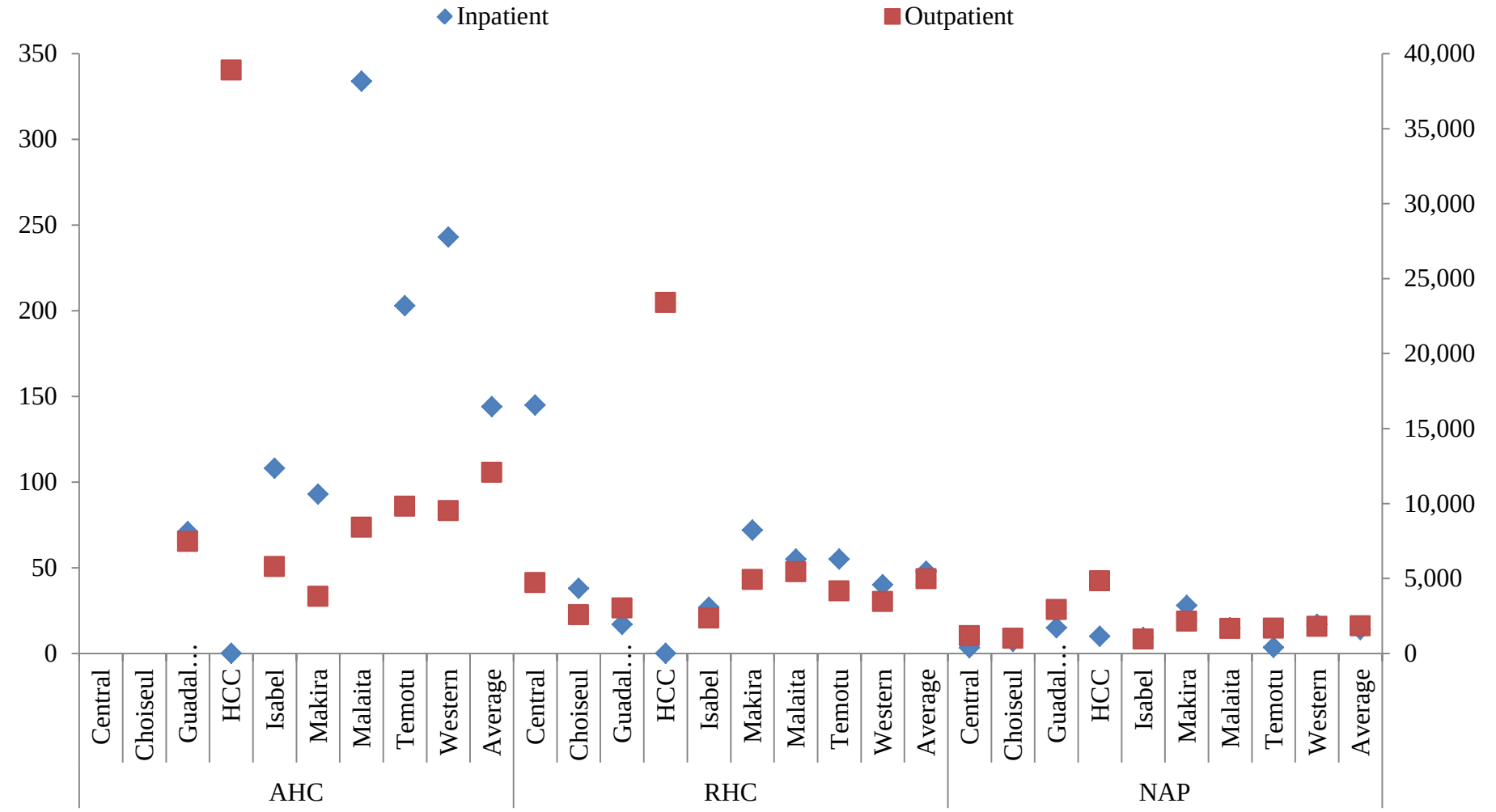
Figure 46 shows the number of outreach contacts (for antenatal, postnatal and child welfare) by facility type.[81] As shown Figure 46, hospitals average the highest number of outreach contacts (146) followed by RHC (44), AHC (33), and NAP (3).

Figure 44: Number of inpatient and outpatient services provided at hospitals, 2012[82]



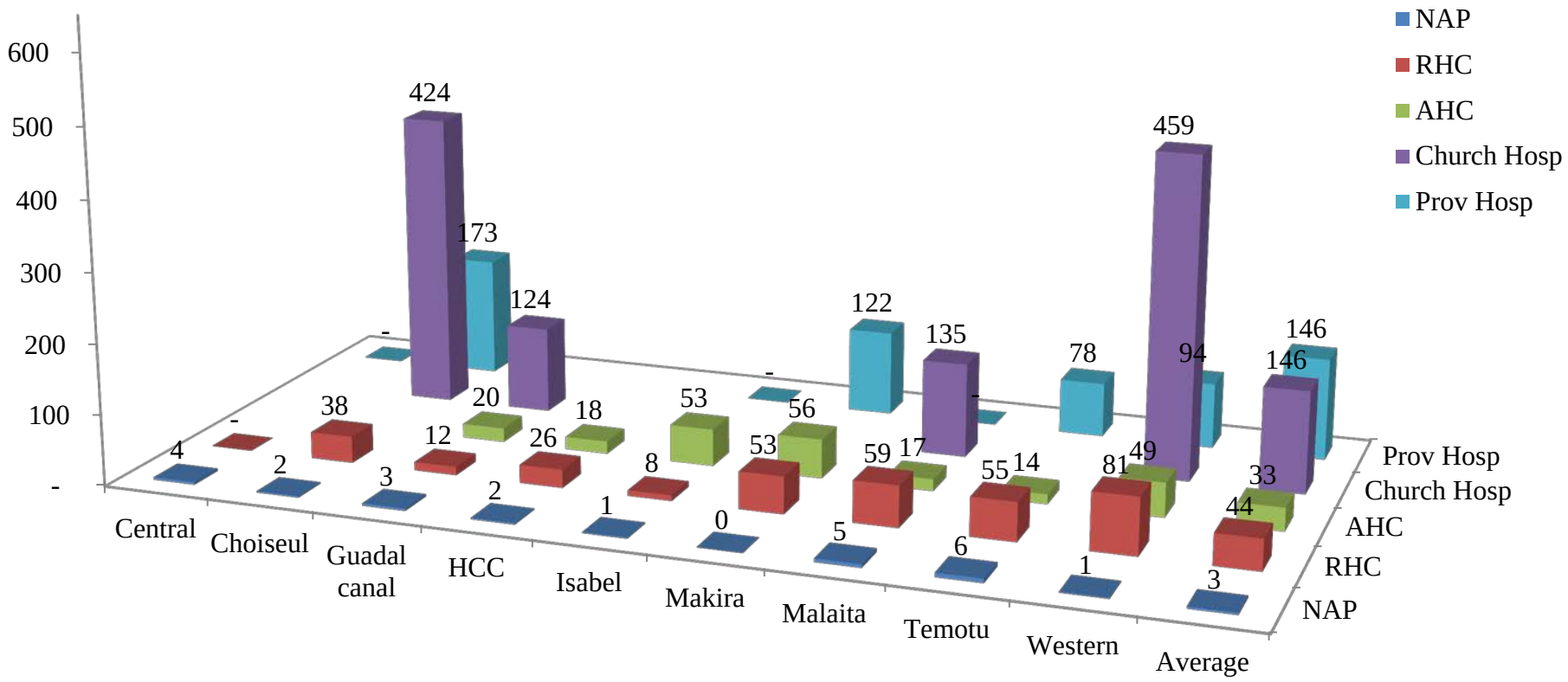
[80] Note that there is only one AHC in Temotu.
[81] Ibid.
[82] Source: HIS. Data from the HIS is for 2012 only, except for Kilu'ufi which was only available for 2013.

Figure 45: Average number of inpatient and outpatient services provided at AHC, RHC and NAP by province, 2012[83]



[83] Source: HIS. Data from the HIS is for 2012 only.

Figure 46: Average number of outreach contacts (for antenatal, postnatal and child welfare) by province, 2012[84]



[84] Source: HIS. Data from the HIS is for 2012 only. No HIS outreach data were available for Kilu'ufi

The recurrent costs described above in Section 2 were allocated to inpatient, outpatient and outreach services as per the method set out in the Technical Annex. The results of this analysis are presented in Figure 47 to Figure 50.

Figure 47 show the average proportion of costs spent on inpatient, outpatient and outreach services. As shown in Figure 47, while 76% of recurrent costs are spent on inpatient services at hospitals (compared to 71% at the NRH); 67% of recurrent costs are spent on outpatient services at AHC, RHC and NAP.

Figure 47: Proportion of costs allocated to inpatient, outpatient and outreach services by facility type

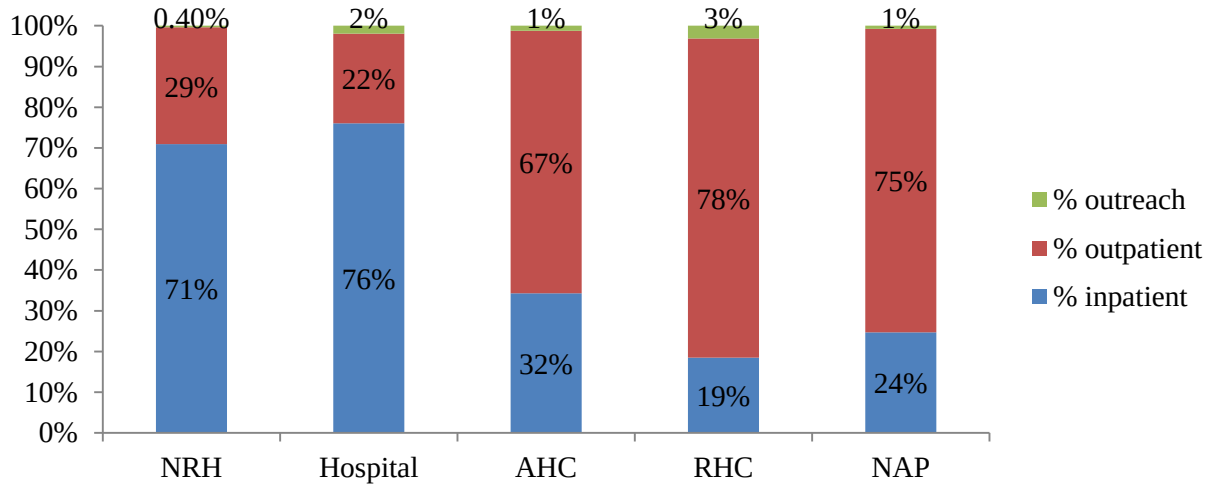


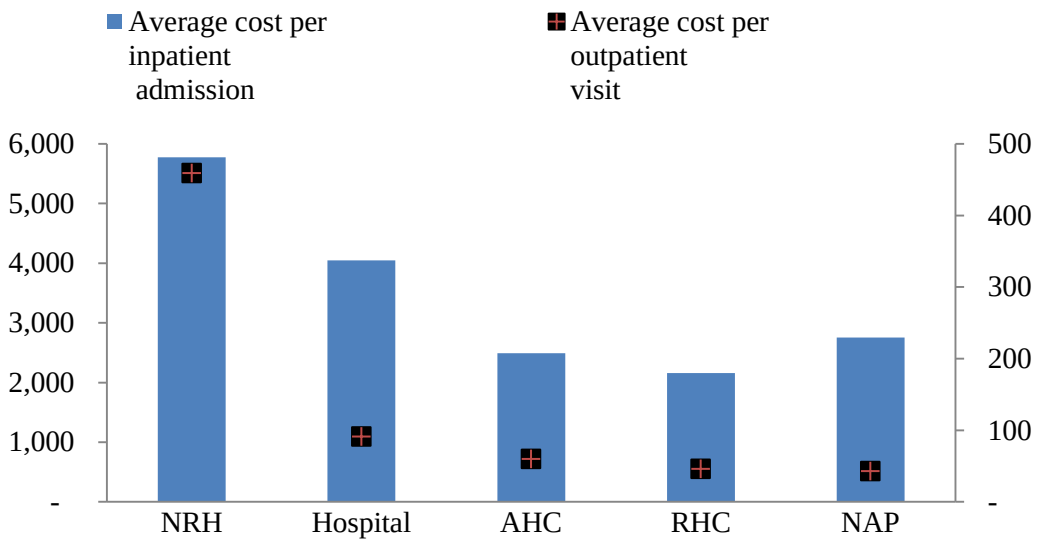
Figure 48 shows the average cost of inpatient admissions and outpatient visits by facility type. Note that the average costs in the NRH and hospitals is higher on average than in the lower level facilities, as there is no doctor at lower level facilities, and they use less energy intensive resources at AHC, RHC and NAP. The average $5.6 million in recurrent costs for hospitals was spent as follows: SBD 4.3 million or 76% of recurrent costs were expended on inpatient services, SBD 1.2 million or 22% on outpatient services and SBD 112,891 or 2% on outreach. This equates to average costs of SBD 4,045 per inpatient admission at hospitals; an outpatient visit costs, on average SBD 91 at hospitals; and an outreach contact costs SBD 775.

The average cost per inpatient admission and outpatient visit is shown per hospital in Figure 49. The highest cost per inpatient admission was at Gizo (SBD 8,347), whereas the lowest was at GSH (SBD 1,643). The cost of inpatients at Gizo, which was higher than the NRH, was due to the relatively higher cost of each recurrent cost input. For example, as shown in Figure 32, Gizo and Kirakira, which have a similar number of annual inpatient admissions (see Figure 44), spend a very similar proportion on each recurrent cost input. Yet the cost of all inpatient services at Gizo was SBD 10.2 million, whereas it was SBD 4.9 million at Kirakira, and Gizo has a slightly less inpatients than Kirakira (1,217 and 1,241 respectively).

The highest cost for outpatient visit was at Kilu'ufi (SBD 289), whereas the lowest was at Sasamuga (SBD 10). In addition to Sasamuga, the estimated cost per outpatient visit at GSH

(SBD 17) was estimated to be less than the average cost for RHC and NAP. While these two hospitals do not have doctors, they conduct a much higher number of outpatient visits, they have a much higher number of outpatient visits (8,713 and 28,479 respectively) than RHC and NAP (4,970 and 1,831 respectively), which reduces the average cost per visit. The highest outreach contact cost was at Gizo (SBD 1,631), whereas the lowest was at Sasamuga (SBD 62).

Figure 48: Average recurrent cost of inpatient and outpatient visits by facility type, 2013



	NRH	Hospital	AHC	RHC	NAP
Average cost per inpatient admission	5,772	4,045	2,489	2,160	2,753
Average cost per outpatient visit	459	91	60	46	43

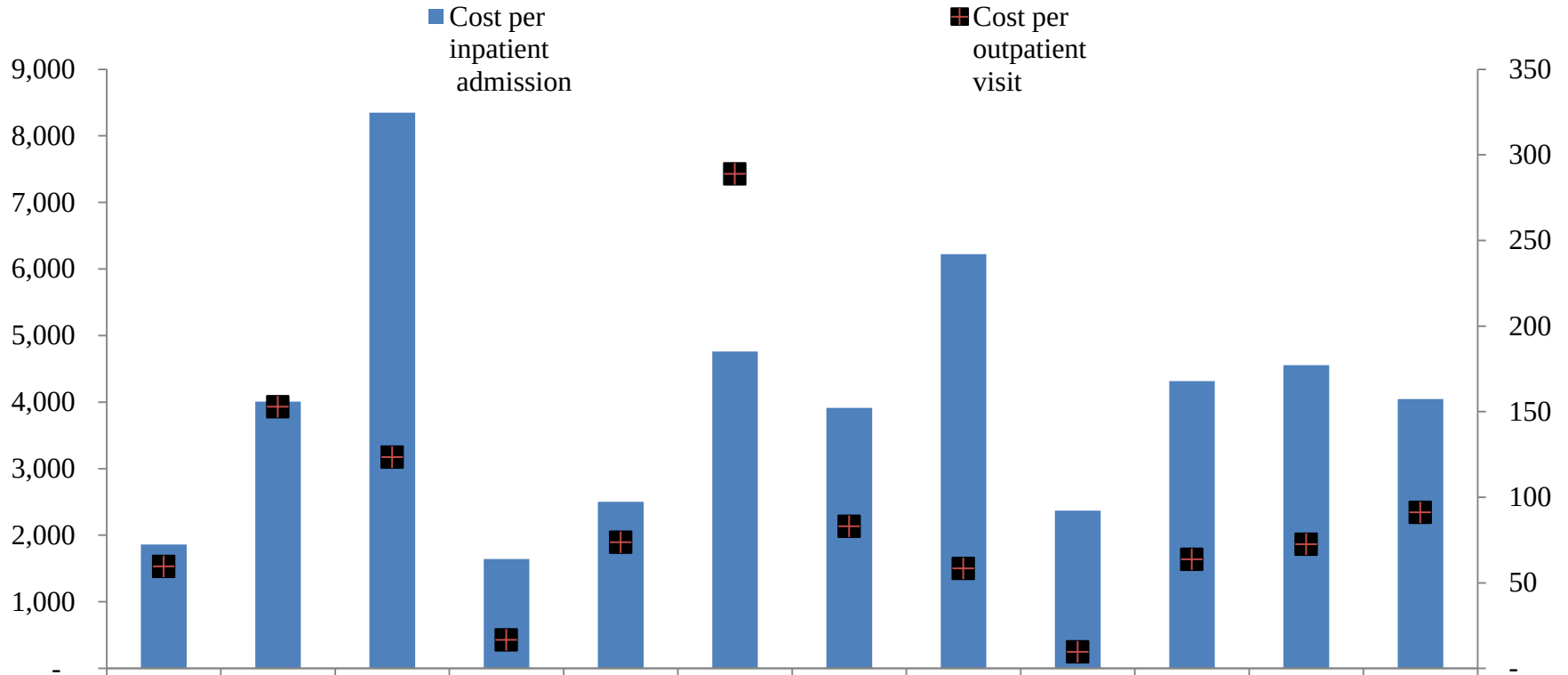
The average estimated annual recurrent cost for AHC of SBD 884,536 breaks down to SBD 281,028 (32%) for inpatient services, SBD 592,063 (67%) for outpatient services and SBD 11,445 (1%) for outreach services. This equates to average costs of SBD 2,489 per inpatient admission; SBD 60 per outpatient visit; and SBD 1,090 per outreach contact.

The average estimated recurrent cost for RHC was SBD 232,528. This breaks down to SBD 43,685 (19%) for inpatient services, SBD 181,643 (78%) for outpatient services and SBD 7,200 (3%) for outreach services. On average at RHC an inpatient admission costs SBD 2,160; an outpatient visit costs SBD 46; and an outreach contact costs SBD 156.

The average estimated recurrent cost for NAP was SBD 90,447. This breaks down to SBD 21,906 (24%) for inpatient services, SBD 67,847 (75%) for outpatient services and SBD 694 (1%) for outreach services. On average at NAP an inpatient admission costs SBD 2,753; an outpatient visit costs SBD 43; and an outreach contact costs SBD 203. The high cost of admissions at NAP (relative to RHC), is likely due to the smaller number of admissions. The cost per inpatient admission and outpatient visit for AHC, RHC and NAP is shown by province in Figure 50.

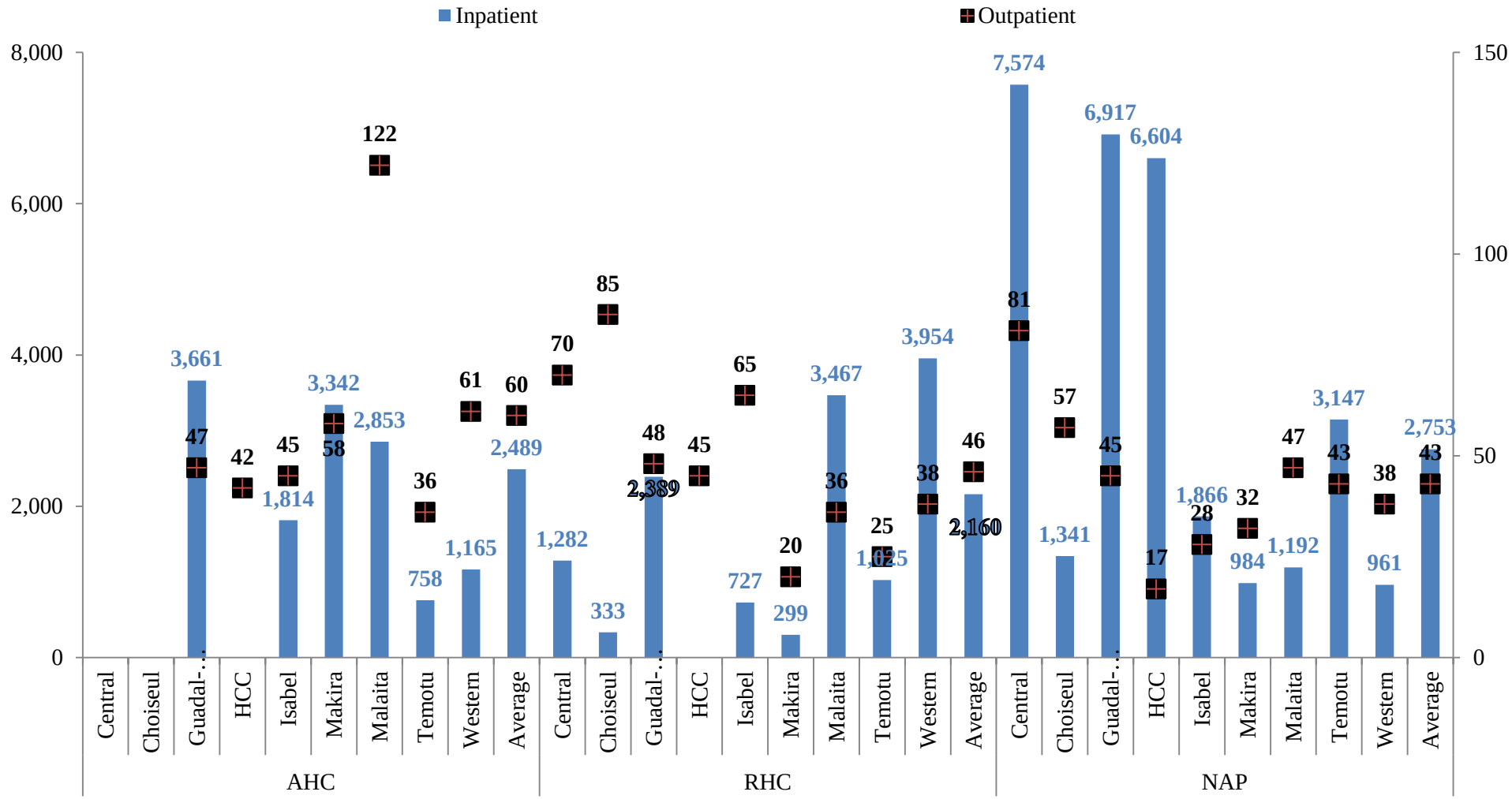
Figure 49: Average recurrent cost of inpatient admissions and outpatient visits for hospitals, 2013

Cost per inpatient admission **Cost per outpatient visit**



	Atoifi	Buala	Gizo	GSH	HGH	Kilu'ufi	Kirakira	Lata	Sasamuga	Taro	Tulagi	Average
Cost per inpatient admission	1,861	4,009	8,347	1,643	2,504	4,759	3,913	6,222	2,370	4,315	4,554	4,045
Cost per outpatient visit	59	153	123	17	74	289	83	58	10	64	72	91

Figure 50: Average recurrent cost of inpatient admissions and outpatient visits per facility for AHC RHC and NAP by province, 2013



3.2 Service costs at the NRH

Figure 51 reports the number of inpatient admissions at the NRH in 2012.[85] Over half of the activity at the NRH was related to childbirth (51%), on the antenatal and postnatal wards, although these patients had the shortest length of stay (LOS). Gynaecology and surgery were the next most populous wards. The tuberculosis and rehabilitation wards had the longest lengths of stay.

Figure 51: Number of inpatient admissions and average length of stay, 2012[86]

	Admissions		Length of stay	
	Number	**%**	**Average**	**% of bed days**
Childbirth[87]	6,335	51	2	14
Eye	123	1	8	1
Gynaecology	1,080	9	5	6
Medical	600	5	16	11
Orthopaedics	716	6	17	14
Paediatrics-med	651	5	9	7
Paediatrics -surgery	591	5	10	7
Special care nursery	785	6	9	8
Surgical	1,354	11	10	15
Tuberculosis	88	1	70	7
Rehabilitation	86	1	102	10
Total	**12,407**		**7.33**	

Overall there were an estimated 62,985 outpatient visits, 45% of which were to the general outpatients department, as shown in Figure 52.[88]

Figure 52: Estimated NRH outpatient clinic attendances, 2013

Outpatient clinic	**Number of patients**	**% of outpatients**
Emergency (General Outpatients Department)[89]	28,203	45
Referral/Consultant[90]	8,311	13
Ear, Nose and Throat (ENT)	7,240	11
Eye	6,144	10
Non Communicable Disease (NCD)	5,286	8
Obstetrics and Gynaecology	3,950	6
Fracture	3,851	6
Total	**62,985**	

[85] Inpatient activity at the NRH is reported using a bed census; this reports on a daily basis (with monthly summaries) the throughput in each ward (admissions, discharges, transfers in and out and deaths). A monthly summary and an annual summary of the bed census for 2012 are available; these differ somewhat, but not significantly. The average of these two sources is presented in Figure 51.
[86] Ibid.
[87] Childbirth includes the data from the inpatient and outpatient wards
[88] There is no collation of outpatient attendances in the NRH, but a review of all the registers in the various clinics by the study team allowed for an estimate of the number of outpatient attendances at the NRH.
[89] The Emergency Department at the NRH is also referred to the General Outpatients Department.
[90] Complete 2013 figures were not available, these are for 2012. Includes: Surgical, Paediatrics, Orthopaedics, and the General Practice clinic (the General Practice clinic is for provinces that do not have a doctor).

The cost of referrals at the NRH is presented in Figure 53 by province and Figure 54 by ward. The NRH Accounts department maintains detailed records on patient referrals where the NRH paid for the return voyage (that is an oneway fare to repatriate the patient).[91] These records were obtained for a 10 month period in 2013. During this time there were 2,894 referrals from all provinces except HCC (which suggests there are 3,472 referrals annually, excluding HCC[92]), and the average size of a referral party was 1.76 (that is the patient and most of the time one other). The average cost of referral (oneway fare to repatriate the patient) was SBD 686.

The province to which the highest number patients were being returned to was Malaita (33%); the highest provincial average cost was the fare to Temotu (SBD 1,311). The ward with the highest number of patients being returned to their home province was Emergency (15%), followed by Gynaecology (11%) and Orthopaedics (11%).

Imputing for referrals from HCC, (2,092 were recorded in the HIS for 2012), an estimated 5,564 patients are referred to the NRH annually. In the unlikely circumstance that all of these referred patients, whether they are referred to an inpatient ward or outpatient clinic, end up being admitted, formal referrals account for a maximum of 44% of all inpatient admissions at the NRH. In contrast, 18% of admissions in the sample from inpatient case notes were recorded as referrals.

Figure 53: Referrals to the NRH March to December by province, 2013

Province (excluding HCC)	Number of referrals	Percent of referrals	Percent of population (excluding HCC)	Average number in travel party	Average cost of referring all parties ($)
Central	213	7	6	1.75	394
Choiseul	167	6	6	1.83	857
Guadalcanal	380	13	21	1.82	492
Isabel	195	7	6	1.75	616
Makira	195	7	9	1.8	764
Malaita	957	33	30	1.74	609
Rennell	213	7	1	1.76	910
Temotu	115	4	5	1.79	1,311
Western	459	16	17	1.72	818
Total	**2,894**			**1.76**	**686**

[91] No data were available on international referrals.

[92] This excludes referrals from HCC to the NRH (2,092 annually according to the HIS). By comparison, the number of emergency and non-emergency referrals to the NRH recorded in the HIS in 2012 was 4,671 (adjusted for Kilu'ufi), or 2,578 excluding HCC. Thus, excluding HCC, the accounts register has (for 10 months in 2013) a greater number of referrals than the HIS for 2012. This may be due to: (i) the fact that the NRH pays for some patients who do not go through the formal referral process; (ii) the incompleteness of data in the HIS; or (iii) an increase in referrals between 2012 and 2013.

Figure 54: Referrals to the NRH March to December by ward or department, 2013

Ward or Department	Number of referrals	Percent of referrals	Average number in travel party	Average cost of referring all parties ($)
Emergency	425	15%	2	652
Gynaecology	316	11%	2	711
Orthopaedics	310	11%	2	747
Medical	300	10%	2	606
Surgical	275	10%	2	747
Post natal	187	6%	2	755
Eye	186	6%	2	678
Child Welfare Department	179	6%	2	726
ENT	127	4%	2	653
Dental	114	4%	2	558
Medical outpatients (including Consultant clinics)	133	5%	2	692
Medical outpatients (General Practice clinic)	96	3%	2	744
Surgical outpatients	79	3%	2	694
Mental	62	2%	2	632
Tuberculosis	36	1%	2	548
Rehabilitation	16	1%	2	656
NCD	16	1%	2	681
Diabetic	11	0%	2	831
Other	26	1%		

Using the allocation rules detailed in the Technical Annex it was possible to allocate the recurrent costs detailed in Figure 39 to the inpatient and outpatient services. Figure 55 presents the breakdown of total recurrent inpatient, outpatient and outreach costs. Also presented is the number of services (outputs), and the cost per output. The cost of an inpatient admission at the NRH was SBD 5,772 (see Figure 51 for length of stay). The cost of an outpatient attendance was SBD 459. Note that in the NRH expenditure breakdown there is a budget line for 'tours and travel', which was assumed to represent outreach. Further information was not available regarding what outreach services were offered and how many.[93] Outreach makes up a very small proportion of the NRH budget (SBD 402,928 0.40%).

Figure 55: Estimated recurrent cost per inpatient and outpatient service, 2013

	Total Recurrent Cost	Total outputs	Cost per output
Inpatient	$71,612,603	12,407	$5,772
Outpatient	$28,893,163	62,985	$459
Outreach	$402,928	n/a	n/a

[93] As confirmed with the accountant at the NRH.

3.3 Major outpatient conditions

The outpatient conditions and cost by condition are summarised in Figure 56 and Figure 57 and presented in detail in Appendix A, Tables 21 to 25. Average outpatient presentations at the NRH, hospitals, AHC, RHC and NAP are presented below in Figure 56 based on the International Classification of Disease (ICD-10). Reasons for presentation were first coded as International Classification of Primary Care (ICPC-2), which is a coding system used in primary care. Patient presentations by ICPC-2 codes are shown in Appendix A Table 21 and Table 23. ICPC-2 codes were then converted to ICD-10 codes, which are more commonly used when presenting disease based costings. ICD-10 codes are also presented here so the proportion and cost of outpatient attendances can be compared to inpatient admissions, which are always coded using ICD-10.

At the NRH emergency department (general outpatients) and NAP the most common reason for outpatient presentation was signs and symptoms of circulatory and respiratory diseases (16% and 11% respectively).[94] This was also the second most common reason for presentation at AHC and the third at RHC.

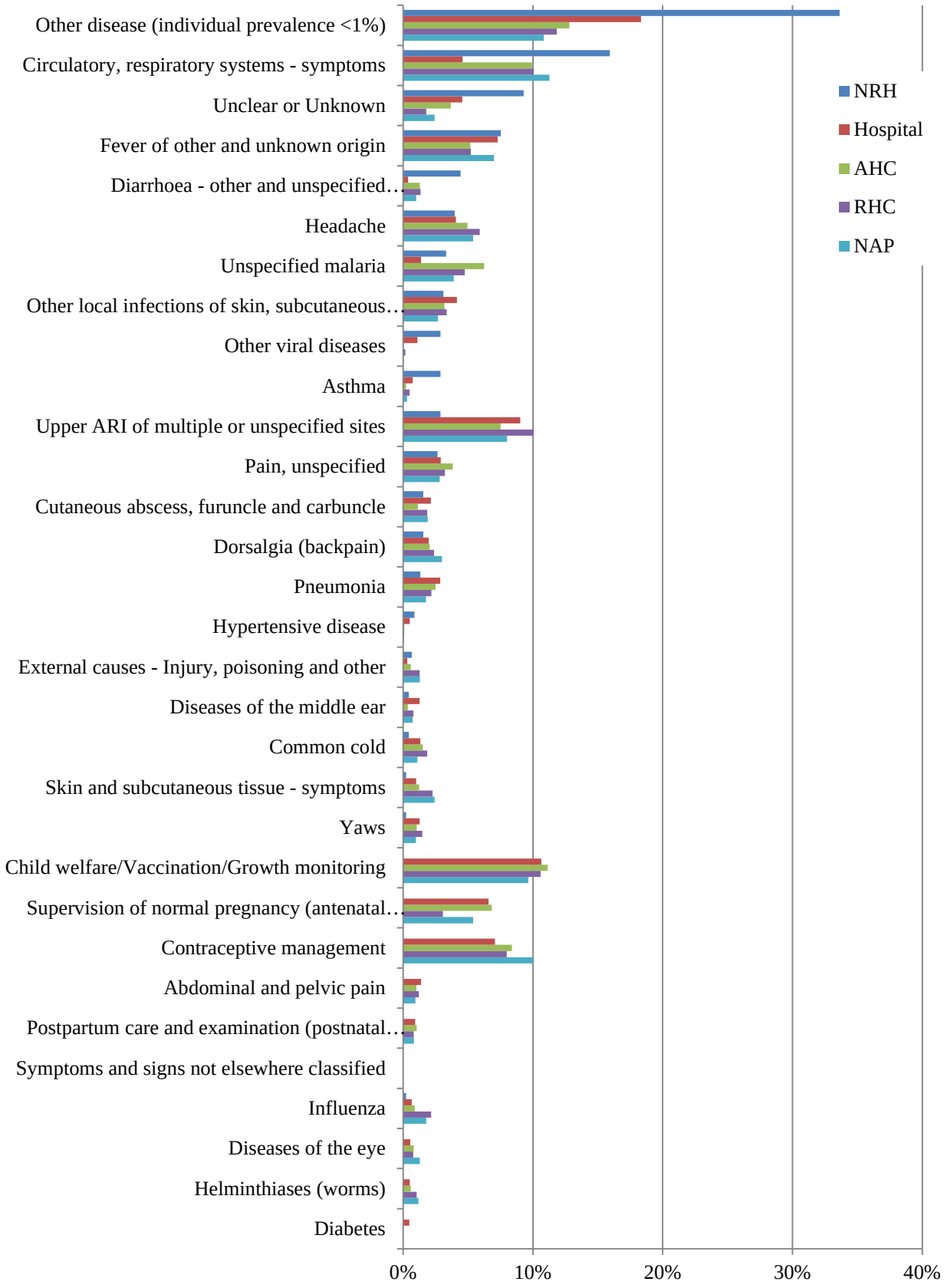
The most common reason for outpatient presentation at hospitals, AHC and RHC and the third most common reason at NAP was child welfare visits. Like antenatal, postnatal, and family planning visits, these visits often take place at hospitals, AHC, RHC and NAP, but not the NRH. The second most common reason for outpatient presentations at hospitals and RHC, and the fourth most common reason at AHC and NAP were upper acute respiratory infections (ARI). Upper ARI represented 9% of outpatient presentations at hospitals and 9% at AHC, RHC and NAP on average. There is considerable variation across the levels of the health care system, which reflects the different levels of patient severity expected to present at each facility type. Hospitals have a high number of presentations for skin infections, while the NRH has a high number of presentations for gastroenteritis/diarrhoea.

The cost per disease was also found to differ. Every disease was found to be more expensive to treat in the NRH than any other facility type. This variation is in part due to the cost inputs, higher staff costs, but also about the number of presentations and the type of presentation. For example the cost by condition at RHC and NAP is on average very similar, this is likely to be a result of these two facilities seeing similar proportions of cases and having similar input costs. AHC on the other hand, have higher disease costs, which is likely to be a consequence of seeing more severe cases.

Only outpatient presentations from the NRH emergency department are included in this analysis. Limited information was available for other clinics, but they were costed based on what was available. The Obstetrics and Gynaecology clinic costs SBD 461 per consultation; Consultant clinic costs SBD 461 per consultation; the Fracture clinic costs SBD 459 per consultation; diabetes in the NCD clinic costs SBD 454 per consultation; hypertension in the NCD clinic costs SBD 455 per consultation; the Eye clinic costs SBD 447 per consultation; and the ENT clinic costs SBD 449 per consultation.

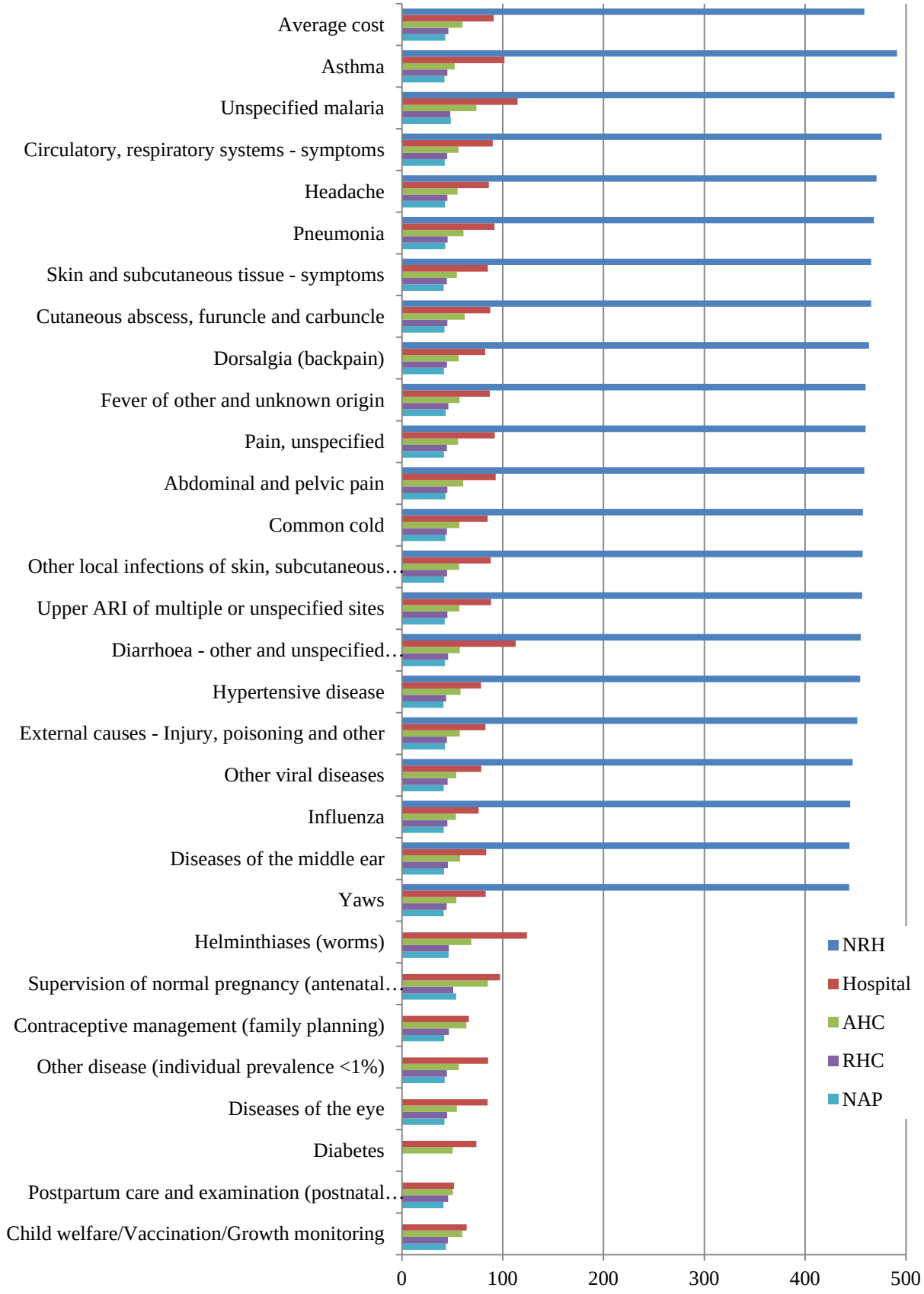
[94] Signs and symptoms of circulatory and respiratory conditions include presentations for abnormal heart beat, abnormal blood pressure (without diagnosis), cough, shortness of breath, chest pain, throat pain, etc.

Figure 56: Average proportion of outpatients by ICD-10 coded reason for visit by facility type[95]



[95] The data for the NRH includes the Emergency Department (GOPD) only.

Figure 57: Average recurrent cost per outpatient visit by ICD-10 coded reason for visit by facility type, 2013[96]



[96] The data for the NRH includes the Emergency Department (GOPD) only.

3.4 Major inpatient conditions

The inpatient conditions and cost by condition are summarised in Figure 58 to Figure 59 and presented in detail in Appendix A, Tables 26 to 28.

Reasons for inpatient presentations at hospitals, AHC, RHC and NAP are presented below in Figure 58 based on ICD-10 codes.

As shown in Figure 58, (uncomplicated) delivery was the main reason for admission at all facility levels, except for the NRH. At the NRH complications of labour and delivery were the most common reason for admission, accounting for 24% of admissions, and (uncomplicated) deliveries were the second highest, accounting for 21% of admissions. Diseases in the perinatal period and maternal care were the third and sixth highest reasons for admission at the NRH, accounting for 7% and 4% of admissions respectively. Diseases of the genitourinary system were the fourth most common reason for admission at the NRH (6%).

Deliveries accounted for 29% of admissions at hospitals, 14% at AHC, 36% at RHC and 42% at NAP. There was some variation between provinces: in Malaita and Western a greater proportion of admissions were deliveries at the hospitals (46% and 38% respectively) and a smaller proportion of admissions were due to deliveries at AHC (10% and 5% respectively), and also for RHC (13%) and NAP (6%) in Malaita. The reverse is true in Isabel, Central, Makira and Temotu.

Injury was the second highest reason for admission at hospitals (8%), the fourth highest at AHC (7%) and the fifth highest at the NRH (5%). With respect to NCD, on average, diabetes accounted for less than 1.5% of admissions at all facility levels and diseases of the circulatory system including hypertension accounted for less than 3%.

With respect to infectious diseases, pneumonia was the third most common reason for admission at hospitals (7%), and the second most common reason for admission at AHC (10%), RHC (15%) and NAP (13%). Acute ARI was the third most common reason for admission at AHC (8%) and NAP (8%), although it accounted for less than 2.1% of presentations at hospital and the RHC. Malaria was the third most common reason for admission at RHC (9%), the fourth highest at NAP (7%) and fifth highest at AHC (7%). Diarrhoea and skin infections also accounted for between 1-6% of admissions at AHC, RHC and NAP.

Figure 59 shows the average cost of admissions by ICD code and facility type. Tuberculosis had the highest average cost per admission, ranging from SBD 40,344 at the NRH to SBD 1,266 at NAP. The high cost is primarily due to the length of stay, which is 70 days at the NRH. Similarly diabetes also has a high cost per admission, ranging from SBD 26,465 at the NRH to SBD 1,073 at RHC, as well as diseases of the circulatory system including hypertension, ranging from SBD 18,348 at the NRH to SBD 1,399 at RHC. There is a much lower cost per admission at the NRH for deliveries (SBD 2,250) relative to tuberculosis, diabetes, hypertension and other diseases, although the cost is more comparable at AHC, RHC and NAP.

Figure 58: Average proportion of inpatients by ICD-10 coded reason for admission and facility type, 2013

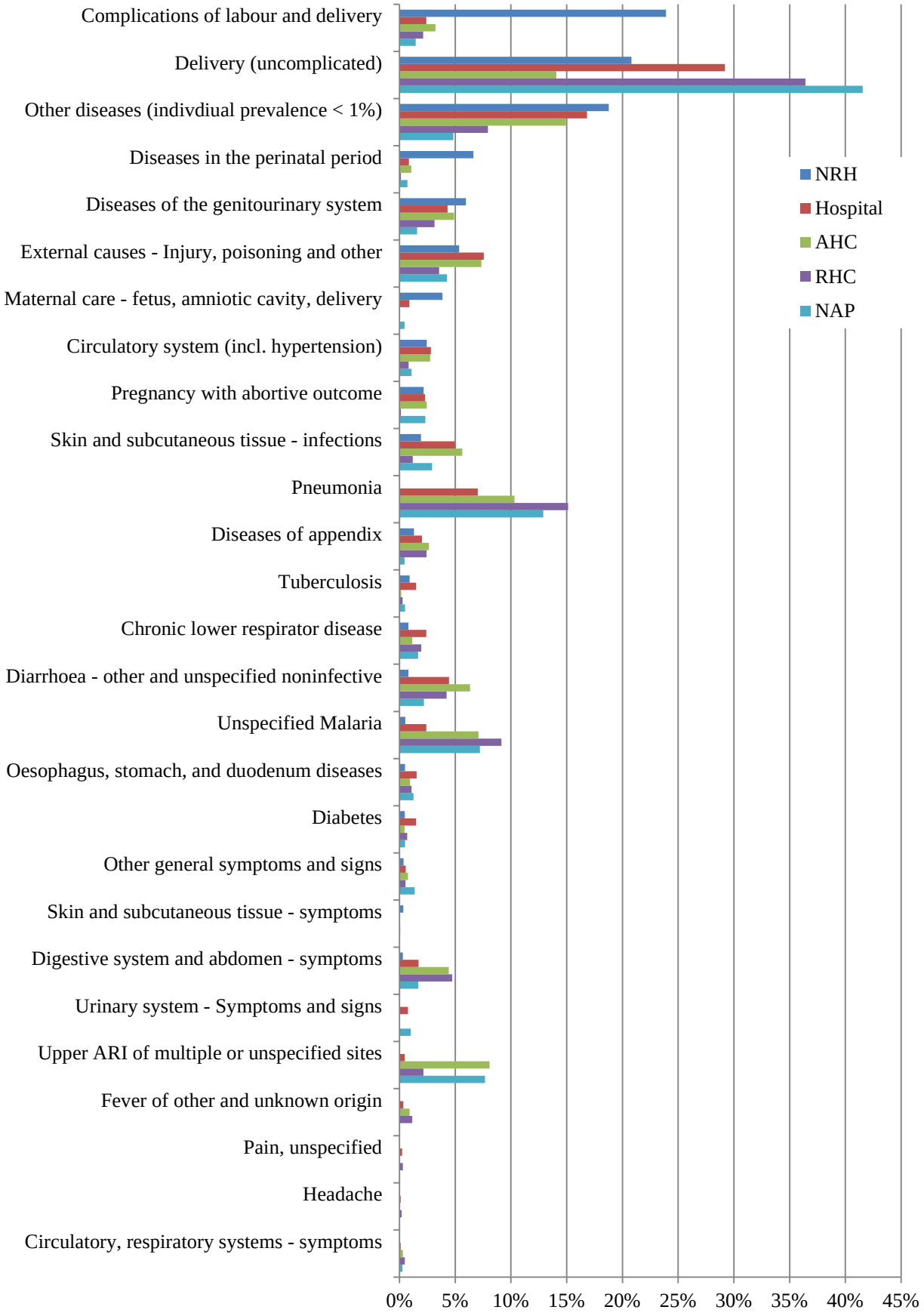
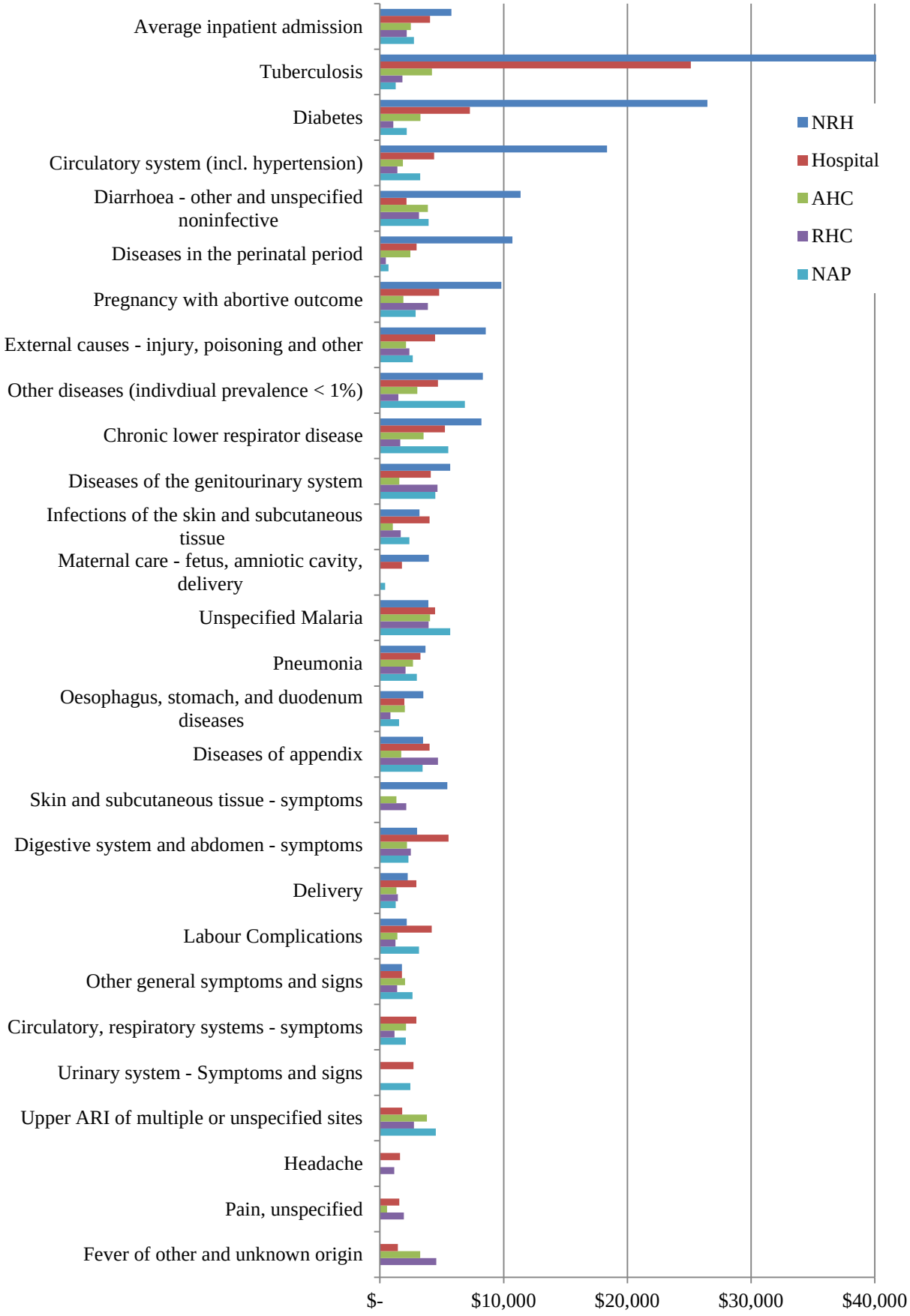


Figure 59: Average recurrent cost per inpatient by ICD-10 coded reason for admission and facility type, 2013



4. Patient costs

4.1 Demographics

The Patient Exit Survey (PES) was conducted with 698 respondents at all levels of the health system to estimate the out of pocket costs incurred by patients. The results of the PES were weighted, as described in the Technical Annex, to be representative of the outpatient population. The weighted results are shown in Figure 60 to Figure 72, and in greater detail in Appendix A, Tables 29 to Table 30. The average age of respondents was 33 years[97] and 61% were female. Most respondents had recently visited a health facility as a patient or a carer (90%), although some respondents were in proximity to a health centre (if insufficient patients were at the facility) and related their experience of a recent visit to a facility (10%).

The socio-economic status of the respondents was ranked using 11 dwelling and asset questions that were also included in the 2013 Household Income and Expenditure Survey (HIES).[98] If the PES survey sample was representative of the population of Solomon Islands, then 20% of surveyed patients would be in each quintile. This was not the case, as shown in Figure 60. There was an under-representation in the poorest or first quintile (12%) and wealthiest or fifth quintile (13%) and greater representation from individuals classified as being in the second (33%), third (24%) of fourth (19%) wealth quintiles. This may be for a number of reasons. As shown in Figure 60 and Figure 61, wealth quintiles were correlated with both facility type and province.[99]

Figure 60: Percent of respondents by facility type and wealth quintile (%)

	National Referral Hospital (NRH)	Hospital	Area Health Centre (AHC)	Rural Health Centre (RHC)	Nurse Aid Post (NAP)	Total
1 Poorest	0	12	9	13	14	12
2	28	40	27	30	39	33
3	10	22	22	23	29	24
4	21	16	27	24	9	19
5 Richest	41	11	16	10	9	13

Figure 61: Percent of respondents by province and wealth quintile (%)

	Central	Chois-eul	Guadal canal	Honi-ara	Isabel	Makira	Malaita	Temotu	West-ern	Total
1Poorest	10	2	22	0	11	42	5	15	16	12
2	58	50	40	13	35	41	39	36	30	33
3	15	24	11	7	46	17	40	25	35	24
4	9	20	20	37	6	0	16	16	13	19
5 Richest	8	4	6	43	1	0	0	7	6	13

[97] Approval from the Monash University Human Research Ethics Committee was provided on the basis that only patients over 18 years would be interviewed.
[98] As described in the Technical Annex Section 3.8.
[99] See the results of the regression analysis in Appendix A, Table 30, for more information. For wealth quintile and facility type p = 0.0011 and for wealth quintile and province p = 0.0000

The correlation between wealth quintile and facility type and province suggests that the poorest quintile may be underrepresented as a result of the sample. This relationship could not be investigated further as the full results of the HIES were not available at the time this report was submitted; however efforts were made to control for the relationship using a regression which is presented in Appendix A.

With respect to education, most respondents had finished primary school (34%) or the first four (27%) or five (19%) years of secondary school, as shown in Figure 62. In total, 87% of respondents had some level of primary or secondary education.[100]

Figure 62: PES respondents by highest level of education

Education level	Percent	Education level	Percent
No education	4%	Form 7	0%
Primary	34%	Trade certificate	3%
Form 1-4	27%	Other certificate	4%
Form 5	19%	Diploma	2%
Form 6	7%	Degree	0%

Most respondents were visiting the facility primarily to receive treatment (70%) or to accompany a child (23%), yet the reasons varied across facility types, provinces and wealth quintiles. A greater proportion of respondents from the NRH, in Honiara City Council (HCC) and the wealthiest quintile were receiving laboratory results (86%, 22% and 19% respectively, compared to the average of 4%) and undergoing minor surgery (62%, 16% and 11% respectively, compared to the average of 6%). A greater proportion of respondents were giving birth at hospitals (11% compared to the average of 2%) and having their child immunised at AHC and RHC (14% and 19%, compared to an average of 11%). Figure 63 shows how the reasons for visiting the facility vary across by facility type.

Most respondents chose the facility that they visited because it was the closest to home (71%), there was no other option (35%), it has good service (28%) or it usually had drugs available (23%). Again, reasons differed by facility type, province and wealth quintiles. A smaller proportion of respondents at the NRH, hospitals, and HCC, reported that they chose the facility because it was the closest to home (34%, 51% and 53% respectively, compared to an average of 71%). Fewer respondents at the NRH, hospitals, HCC and those in the wealthiest quintile also reported that they chose the facility because there was no other option (24%, 27%, 18% and 13% respectively, compared to an average of 35%). Conversely, a greater proportion of respondents at the NRH reported that they chose the facility because drugs were available (100%, compared to an average of 23%) or they gave good service (72%, compared to an average of 28%). A greater proportion of respondents at the NRH and in the wealthiest quintile also reported that they were referred (86% and 17% respectively, compared to an average of 8%) or wanted to see the health worker present (79% and 25% respectively, compared to an average of 11%). Figure 64 shows how reasons for choosing the facility vary across by facility type.

[100] This is greater than the figures reported in the most recent census, in which 76% of the population had primary or secondary education. See: SIG (2009), above footnote 14.

Figure 63: PES respondents, reason for visiting the facility by facility type (%)[101]

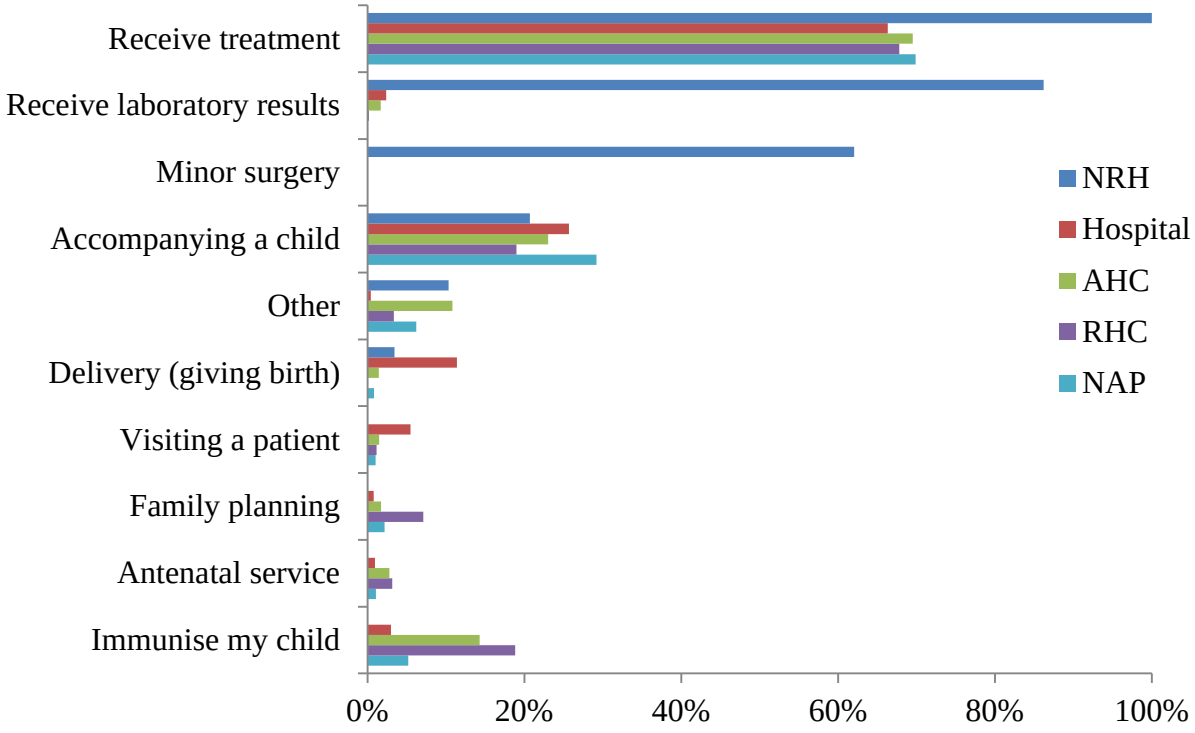
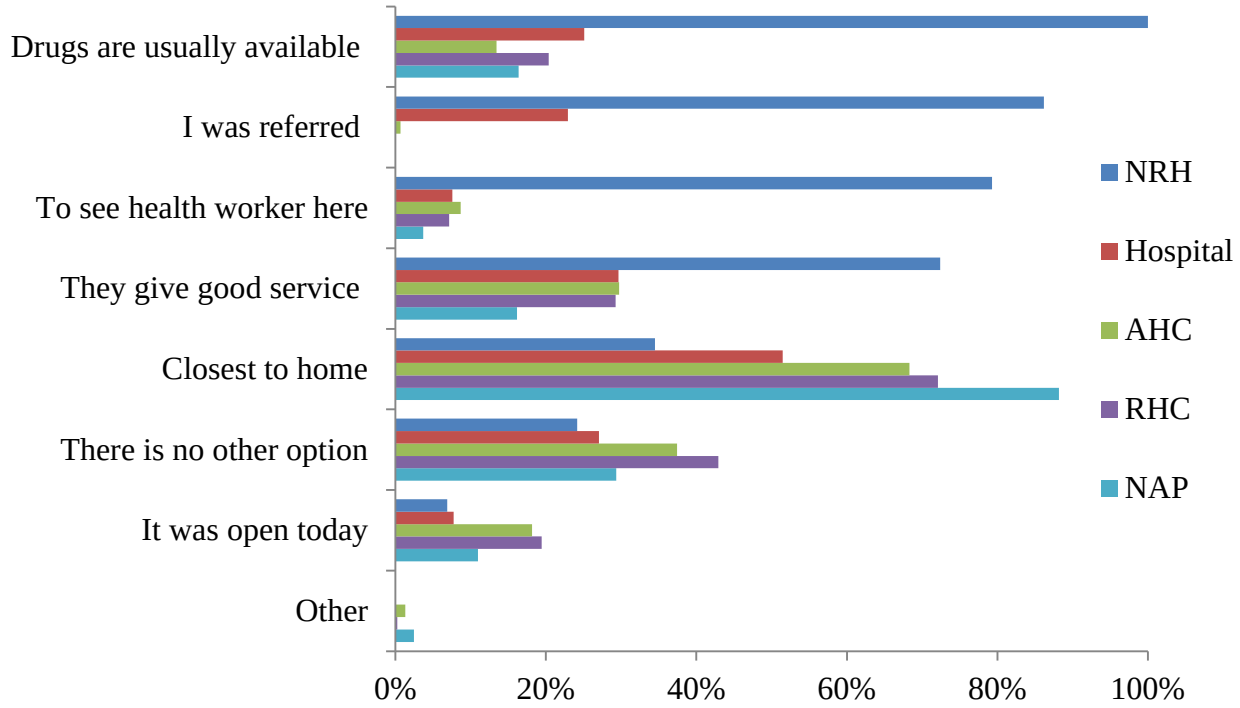


Figure 64: PES respondents, reason for choosing the facility, by facility type (%)[102]



[101] The figures do not amount to 100 percent as respondents could give more than one response.
[102] The figures do not amount to 100 percent as respondents could give more than one response.

4.2 Travel and waiting times

Figure 65 presents the average time spent travelling to the facility, waiting at the facility and seeing the health worker.[103] The average travel time to facilities was 57 minutes; the highest average travel time in Guadalcanal province (110 minutes), the lowest average travel time was in Central (21 minutes). There was a longer average travel time to the NRH (125 minutes) and hospitals (113 minutes) compared to AHC (41 minutes), RHC (38 minutes) and NAP (44 minutes). Those in the poorest quintile reported the highest average travel time to reach facilities (82 minutes), compared to the wealthiest (20 minutes). This suggests the earlier reported under representation in the poorest quintile may be due to accessibility.

The average wait time to see a health worker was 34 minutes, with the highest wait time in HCC (51 minutes) and the lowest wait time in Temotu (9 minutes). There was also a greater waiting time at the NRH (108 minutes) and hospitals (64 minutes), compared to AHC (27 minutes), RHC (27 minutes) and NAP (17 minutes). There was no significant difference in wait times across wealth quintiles.

The average time spent with a health worker was 12 minutes, with the longest time with a health worker was in Malaita (21 minutes) and the lowest in Makira (5 minutes). The average time spent with a health worker varied from 7 minutes at an AHC to 18 minutes at a RHC. There was no significant difference in time spent with a health worker across wealth quintiles.

Walking was the main mode of transport to the facility (average 72%) in all provinces, facility types and wealth quintiles, except for respondents in HCC who were more like to travel via bus and respondents at the NRH who were more likely to travel via taxi, bus and boat with outboard motor. A greater proportion of those in the poorest quintile reported that they walked to the facility (86%), compared to those in the richest quintile (53%). These results are shown in Figure 66.

[103] The results of the regression analysis show that for travel time and waiting time province, facility type and wealth quintile are significant. None of these factors are significant for time spent with a health worker.

Figure 65: Average travel, waiting and consultation time for patients by province, facility type all facilities

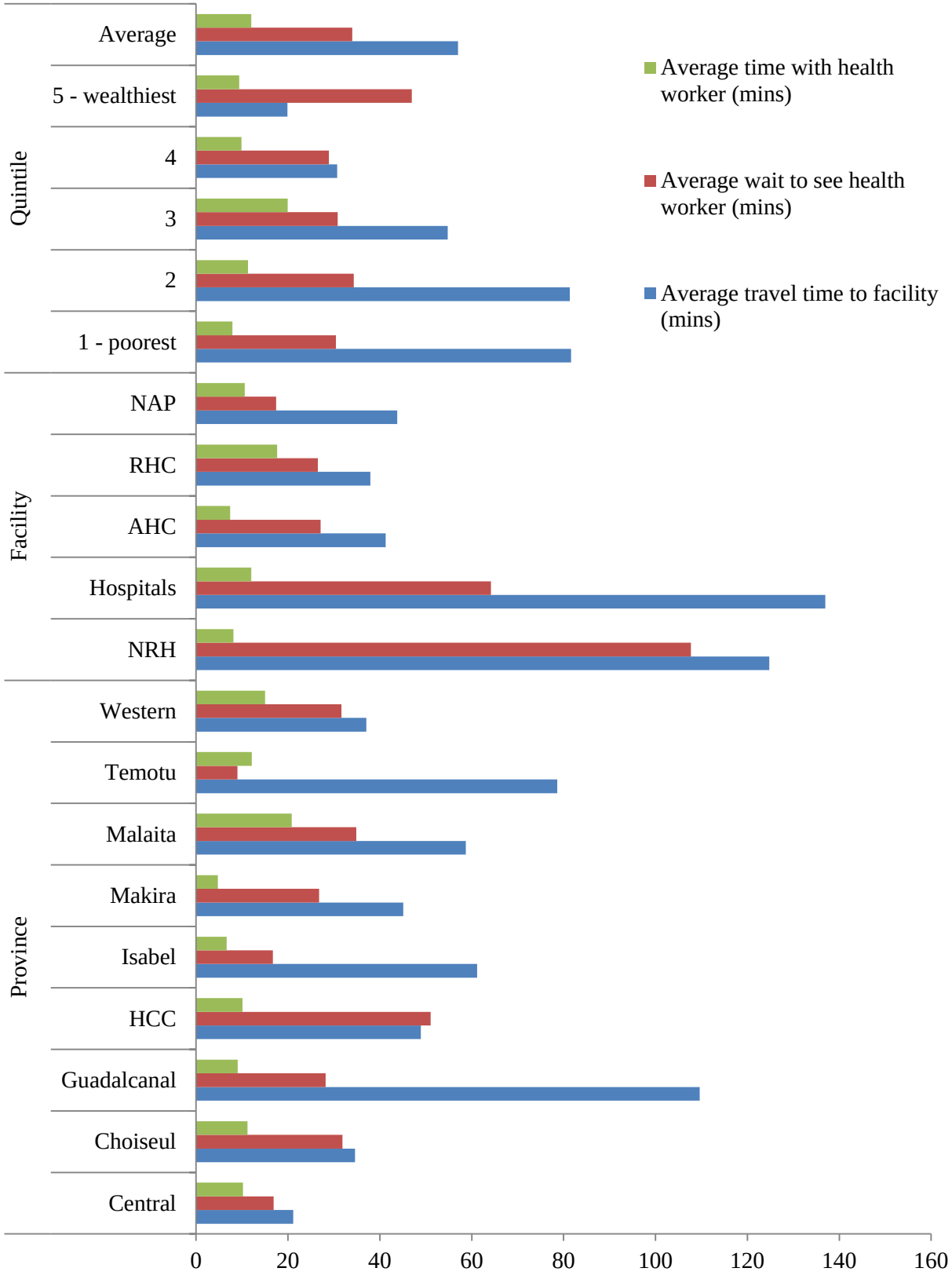
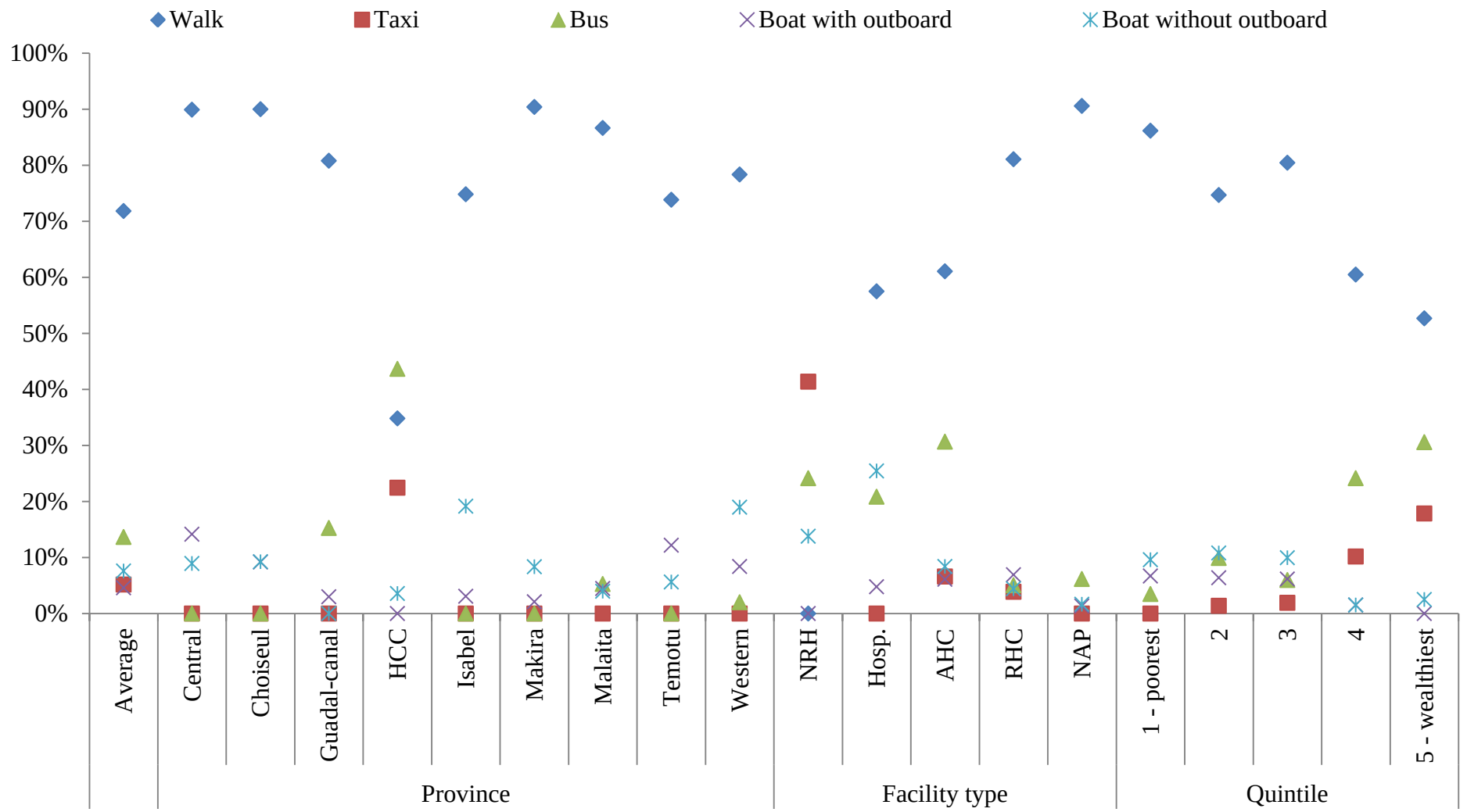


Figure 66: Mode of transport to facility by province, facility type and wealth quintile (%)[104]

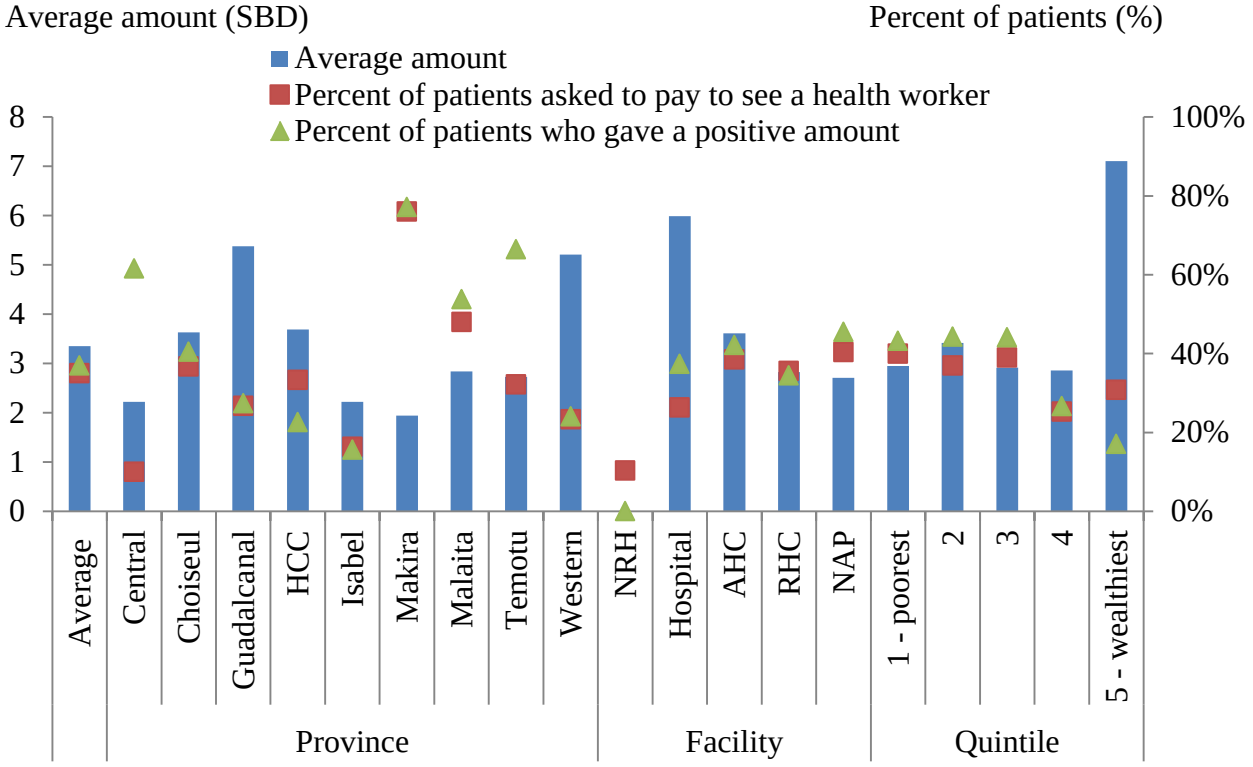


[104] The figures do not amount to 100 percent as respondents could give more than one response

4.3 Patient payments to facilities

Respondents to the PES were asked if they made a financial contribution to see a health worker or to receive medicines: 35% of respondents reported that they were asked to make a financial contribution to see the health worker and 37% reported that they made a contribution.[105] The average contribution made was SBD 3.35 as shown in Figure 67.[106]

Figure 67: Patient contributions to see a health worker by province, facility type and wealth quintile, 2013[107]



The proportion of respondents who were asked to pay varied from 76% in Makira to 10% in Central, and the proportion of respondents who did pay varied from 77% in Makira to 23% in Choiseul. The average contribution varied between provinces from SBD 5.37 in Guadalcanal to SBD 1.94 in Makira.

A higher proportion of respondents at NAP (40%), AHC (38%) and RHC (36%) and were asked to pay, compared with the NRH (10%) and hospitals (26%). Respondents at NAP (46%) and

[105] The *Health Services Act* (1979) permits for the collection of fees at hospitals, but does not currently permit their collection at lower level facilities. See: the *Health Services Act* (1979), sections 4, 8 and 17. Available at: www.paclii.org/sb/legis/consol_act/hsa161/hsa161.html. Section 4 states that "the services so provided shall be free of charge except in-so-far as the Minister, acting in accordance with the provisions of this Act, may make Rules authorising or prescribing charges for such services." Section 8(d) gives the Minister power to issue regulations "for the control of, and the payment of fees for, the use of facilities of public hospitals by private medical and dental practitioners." The subsidiary legislation and regulations provide a schedule for the collection of fees at the NRH and hospitals. All fees that are collected are required to be placed into the consolidated fund under section 17(2).

[106] The results of the regression analysis show that province and facility type are significant for whether respondents were asked to pay, whether respondents did pay and the amount that they paid. Wealth quintile is not significant.

[107] Not all patients who were asked to pay in fact paid, and some who were not asked to pay reported making a payment.

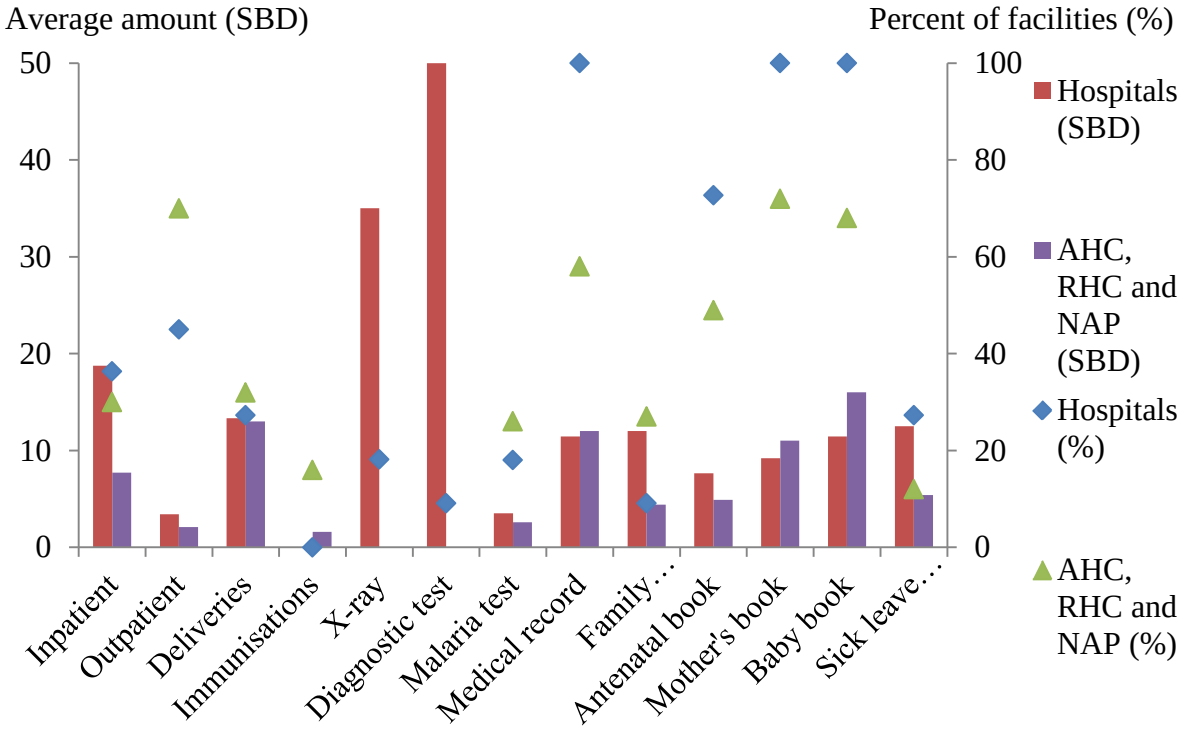
AHC (42%) also more frequently made contributions. The average contribution varied from SBD 5.99 at hospitals to zero at the NRH, where none of the 25 respondents to the PES reported that they made a contribution.[108]

A higher proportion of those in the first, second and third quintiles made a contribution relative to the fourth and fifth quintiles. Respondents in the highest wealth quintile paid more on average (SBD 7.10) than respondents in other quintiles (although this was not statistically significant). Wealth quintile was not significant in the regression analysis for whether respondents were asked to pay, whether respondents did pay and the amount that they paid.

The findings of the PES are consistent with those from the Health Facility Survey (HFS), which recorded standard contributions collected for services and associated exemptions, as well as contributions collected for medical record books. Figure 68 to Figure 70 present the contributions that are requested for services and medical record books as reported by health workers.

Facilities reported collecting contributions for both services and medical record books. Figure 68 shows the proportion of facilities collecting contributions for each service and the average contribution collected.

Figure 68: Proportion of facilities requesting contributions for services and medical record by facility type, 2013



[108] While the respondents to this study have reported no contributions for services at the NRH, it is widely known that the NRH often charges fees for: medical tests (laboratory tests, x-rays and scans); embalming, morgue and death certificates; specialist or dental consultations; dental and medical books, and forms. Furthermore, the MHMS confirmed that private practitioners often use NRH facilities to treat their own private patients, for a fee that is kept by the private practitioner.

Hospitals (55%) and AHC, RHC and NAP (70%) most commonly reported collecting contributions for outpatients. A smaller proportion also collected contributions for inpatients (36% of hospitals and 30% of AHC, RHC and NAP). For the facilities that collect contributions, the average reported contribution for inpatients was SBD 19 at hospitals and SBD 8 at AHC, RHC and NAP, with a lower average for outpatients of SBD 3 at hospitals and SBD 2 at AHC, RHC and NAP. As shown in Figure 69 and Figure 70 the highest contributions for inpatient and outpatient services were at Helena Goldie Hospital[109] – SBD 50 for inpatients and SBD 5 for outpatients (Kirakira also charged SBD 5 for outpatients).

Approximately 27% of hospitals and 32% of AHC, RHC and NAP also charge for deliveries. While the contribution collected for deliveries at hospitals was less than that for inpatients (SBD 13 compared to SBD 19), it was considerably higher at AHC, RHC and NAP (SBD 13 compared to SBD 8).

All hospitals and over 50% of AHC, RHC and NAP collected contributions for medical record books, mother's books, and baby books. The average cost of these books was slightly higher at AHC, RHC and NAP (SBD 12, SBD 11 and SBD 16), compared to hospitals (SBD 11, SBD 9 and SBD 11. Some hospitals (73%) and AHC, RHC and NAP (49%) also charged for antenatal books. A smaller proportion charged for family planning books (9% of hospitals and 27% of AHC, RHC and NAP) and sick leave requests (27% of hospitals and 12% of AHC, RHC and NAP).

Most respondents (86%) said that payments to the health facility had not dissuaded them from visiting a health facility in the past (8% reported that payments to the health facility had dissuaded them from visiting a health facility in the past, and 6% did not know; there was no significant difference by wealth quintile). In the HFS, 45% of AHC, RHC and NAP and 18% of hospitals reported offering exemptions to poor patients, patients not working, the disabled, the elderly, and women, children and infants.

Payments for medication were far less common than general payments to the health facility: 2% were asked to pay for the medication, with an average of payment of SBD 0.95 requested (and a maximum of SBD 10). In addition to cash contributions, 14% of respondents also reported giving gifts of food or crops.

Payments to the health facility were lower than payments to see a kastom (traditional) doctor; 29% of respondents reported visiting a kastom doctor in the last year and 18% of respondents reported making payment to the kastom doctor, with an average of SBD 59 (and a maximum of SBD 300).

[109] The high contributions at HGH are consistent with the statement of income and expenditure for HGH from June to September 2013, in which patient fees accounts for 12% of HGH's income.

Figure 69: Patient contributions for selected services and medical record books by hospitals, 2013

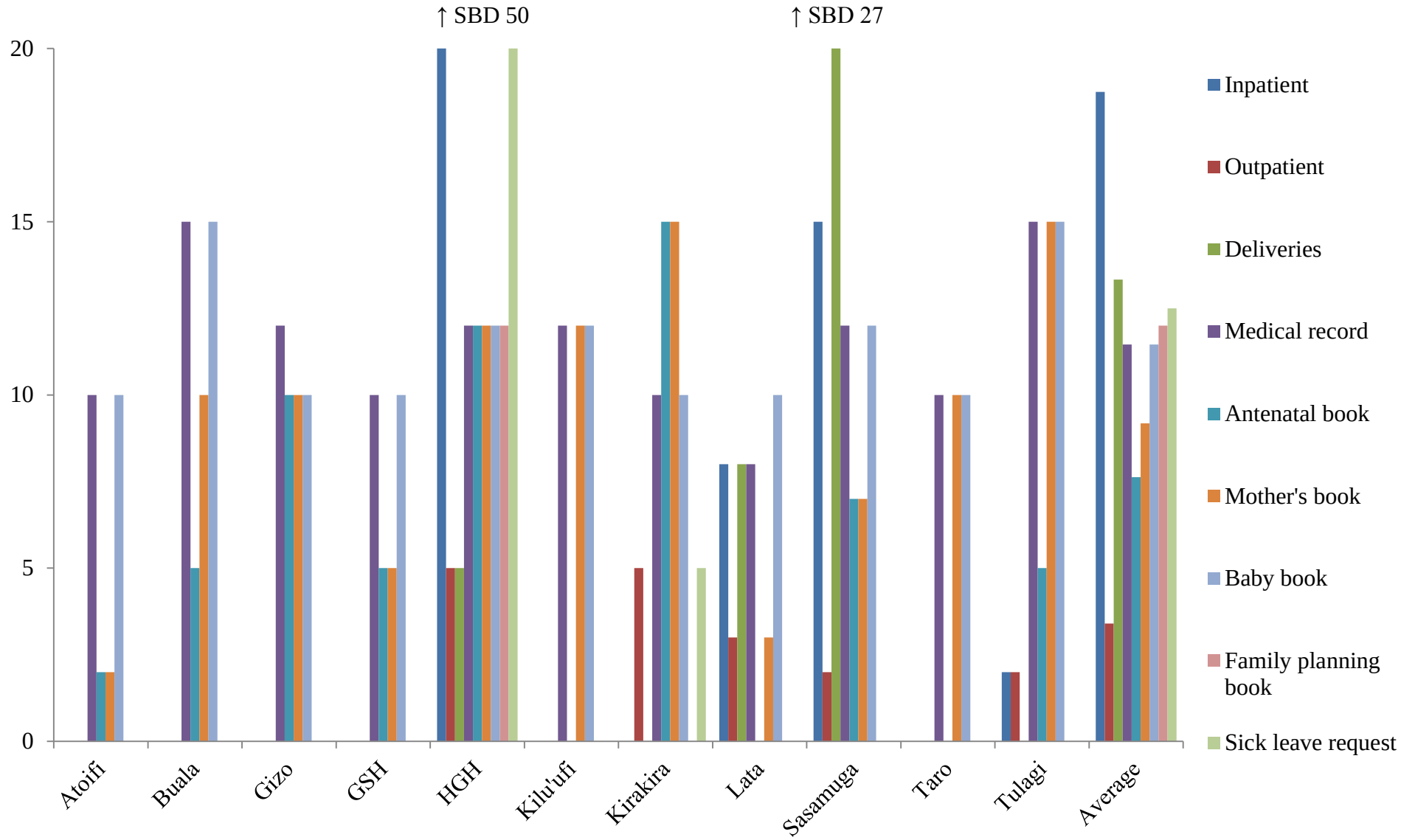
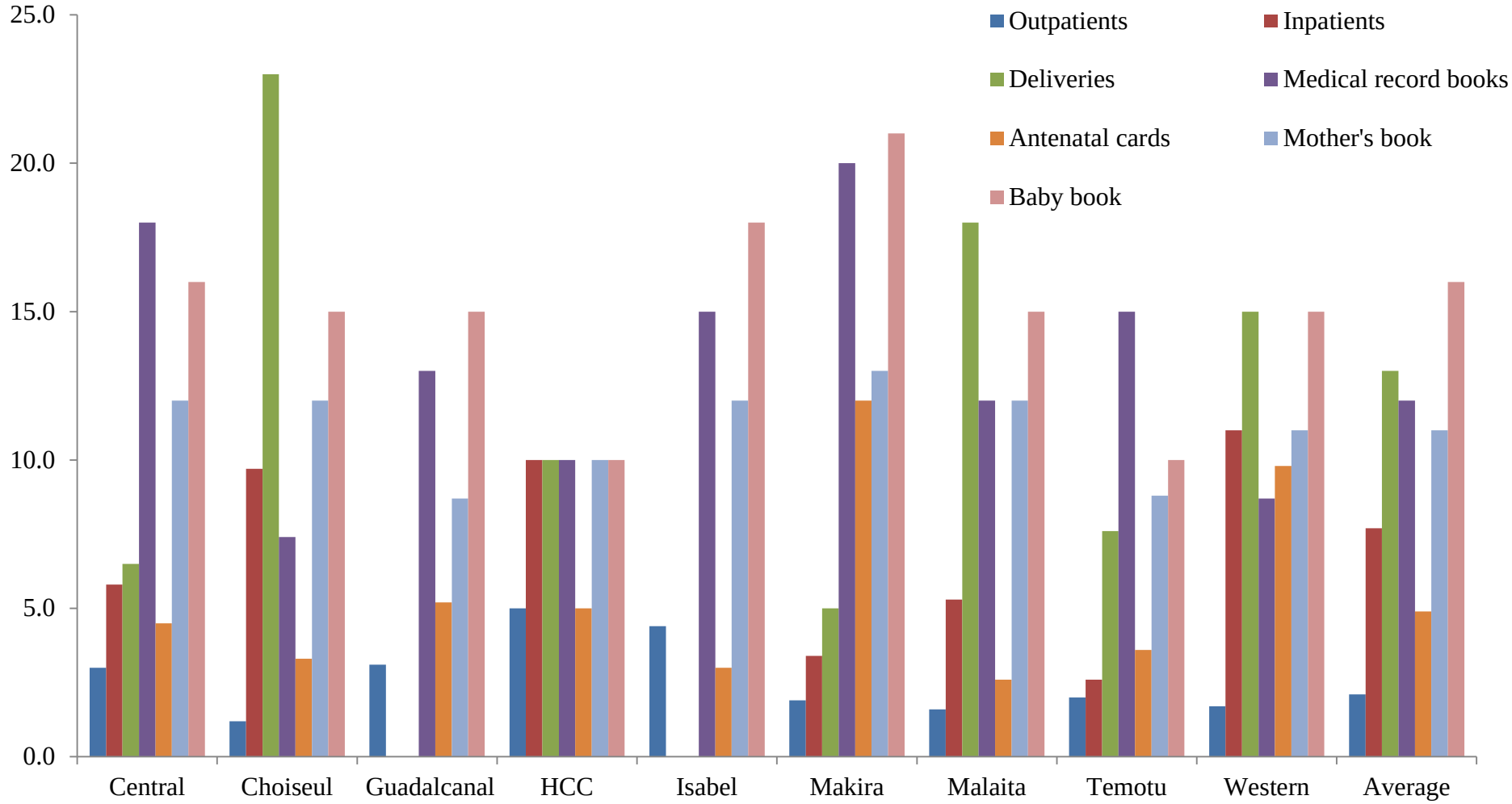


Figure 70: Average patient contributions for selected services and medical record books at AHC, RHC and NAP by province, 2013



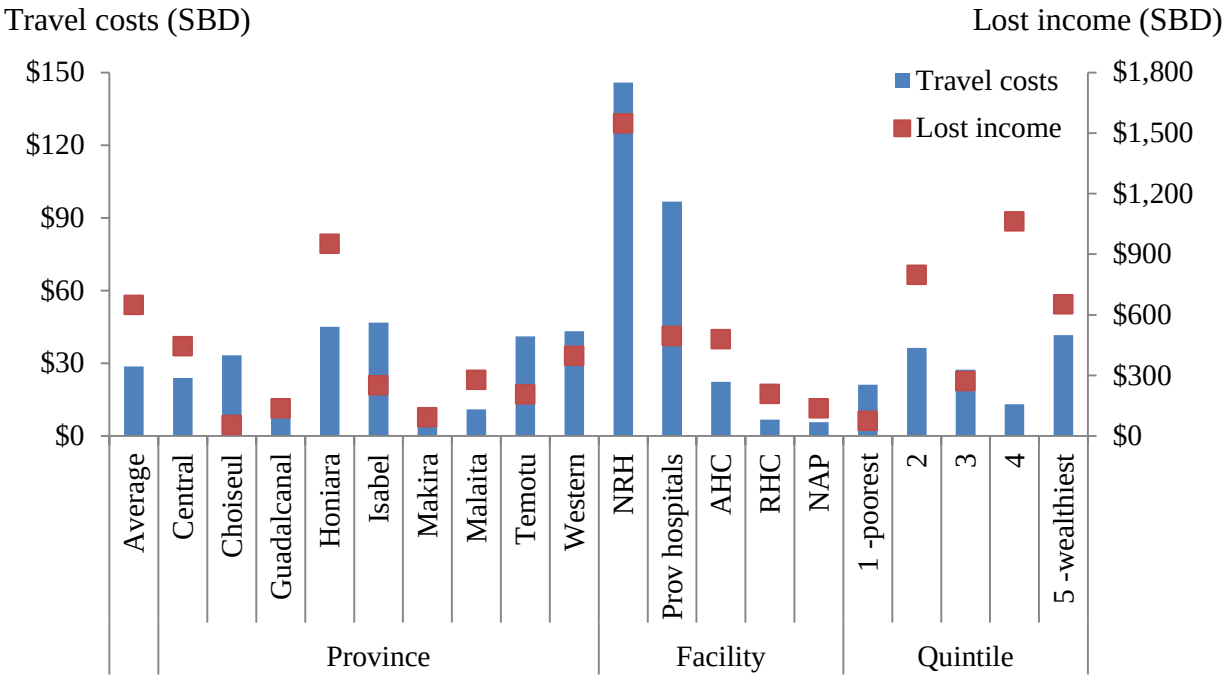
4.4 Direct non-health care and indirect costs

Figure 71 sets out other patient costs, including travel and lost income. The average cost of patient travel was SBD 29. Travel costs were highest in Isabel (SBD 47) and HCC (SBD 45) and lowest in Makira (SBD 4) and Guadalcanal (SBD 10). Respondents paid more on average to travel to the NRH (SBD 146), provincial and church hospitals (SBD 97) than AHC, RHC and NAP. Those in the wealthiest quintile paid more (SBD 42) than other income groups. Most respondents (87%) said that travel costs had not dissuaded them from visiting a health facility in the past (7% reported that travel costs had dissuaded them from visiting a health facility in the past, and 5% did not know).

With respect to lost income, 10%[110] of respondents reported losing income as a result of their health condition, with the average amount of lost income being SBD 649. Lost income was highest in HCC (SBD 950) and lowest in Choiseul (SBD 54). Respondents at the NRH reported losing more income (SBD 1,547) than those at all other facilities; respondents at NAP reported losing SBD 136. Those in the poorest quintile reported losing less (SBD 75) than all other quintiles, and those in the fourth quintile reported losing the most (SBD 1,062).

Finally, with respect to other costs, respondents also reported that they brought water (55%) and food (29%) with them to the facility, or purchased it (25%). Less than 10% of patients bought bed sheets or other items with them to the facility.

Figure 71: Patient travel costs[111] and lost income[112] by province, facility type and wealth quintile, 2013



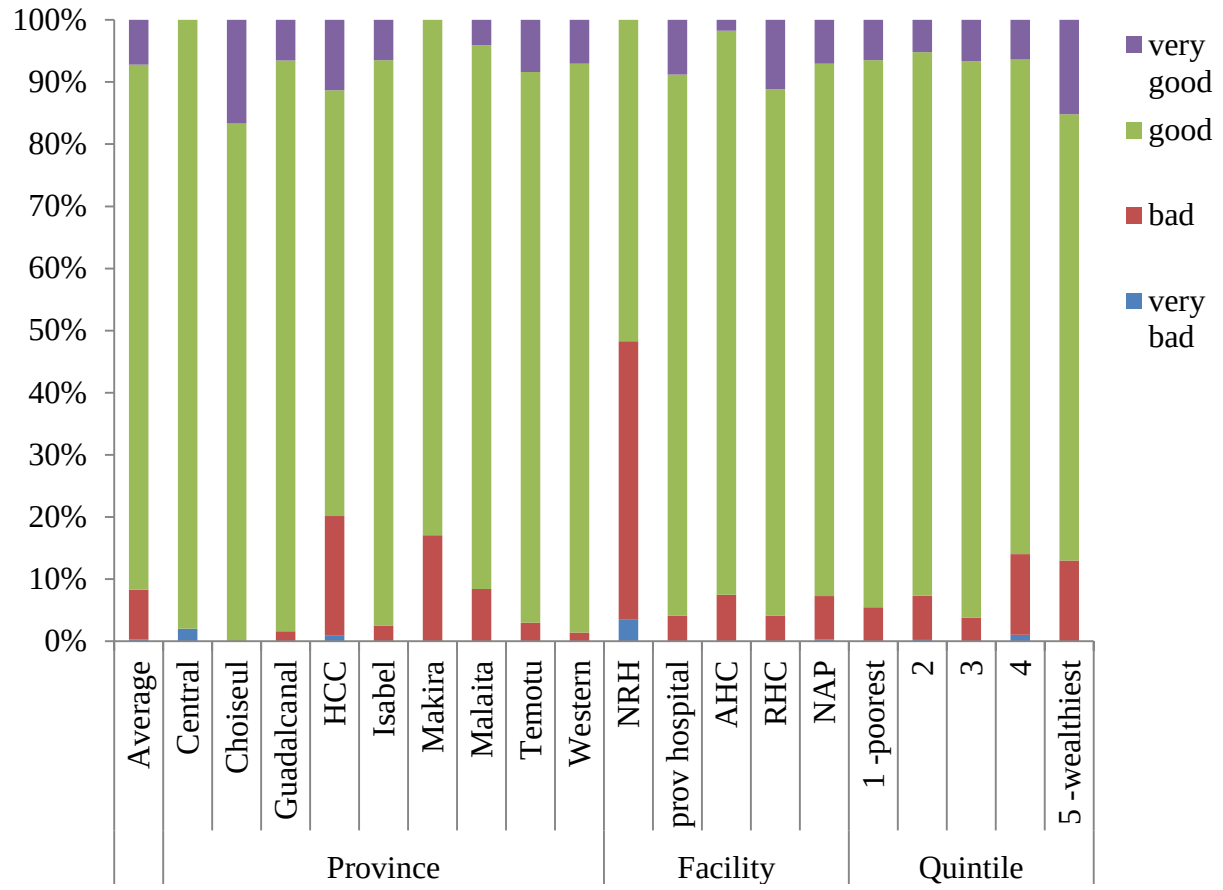
[110] Respondents who reported losing income greater than SBD 500/day and for more than 30 days were removed for this analysis.
[111] Respondents who reported one way travel costs of greater than SBD 1000 (N=6) were removed for this analysis.
[112] Respondents who reported losing income greater than SBD 500/day and for more than 30 days were removed for this analysis.

4.5 Patient satisfaction

As shown in Figure 72, overall 92% of PES respondents rated the service as good or very good (that is across all services, in all facility types in all provinces). The main reasons for a good or very good rating was the availability of medication (71%) and the diagnosis of the condition (61%), followed by the friendliness of the health worker (51%) and the presence of the health worker (26%).[113] The presence of the health worker was a more common reason for satisfaction at the NRH (67%) than the average (26%), and diagnosis by health workers was a more common response from those in the two poorest quintiles (70%) than the average (61%).

The main variation in patient satisfaction was by facility type; 48% of respondents at the NRH ranked the service as bad (45%) or very bad (3%), compared to 4% at hospitals and RHC, and 7% at AHC and NAP. The main reason for dissatisfaction at the NRH and other facilities was the long waiting times (100%), followed by the unfriendliness of the health worker (21%). Reasons for dissatisfaction varied by province: the long wait time was the main reason for dissatisfaction in HCC and Makira (92% and 93%, compared to an average of 78%); the lack of a diagnosis was the main reason in Isabel (100%, compared to the average of 16%); the unavailability of drugs was the main reason in Western (73%, compared to the average of 23%). There was limited variation by wealth quintile.

Figure 72: Patient satisfaction by province, facility type and wealth quintile (%)



[113] Respondents could give more than one response to explain their satisfaction.

5. Key performance and efficiency measures

5.1 Performance measures

Key performance measures are presented in Figure 73 to Figure 78, and in greater detail in Appendix A, Table 32 to 34.

Figure 74 shows the key operating statistics, including the average length of stay (LOS), bed occupancy rate (BOR) and bed turnover rate (inpatients per bed year) for the National Referral Hospital (NRH), hospitals, Area Health Centres (AHC), Rural Health Clinics (RHC) and Nurse Aid Posts (NAP). Figure 73 compares some of these measures to countries in the region.

The average LOS varied from between 2 and 3 days at AHC, RHC and NAP to 6.5 days at hospitals, and 7.3 days at the NRH. There was considerable variation between hospitals, where the average LOS ranged from 3.6 days at Good Samaritan Hospital (GSH) and Tulagi to 10.8 days at Kilu'ufi. As shown in Figure 51, there was also variation between the wards at the NRH, with the average LOS ranging from 102 and 70 days in the rehabilitation and tuberculosis wards respectively, to 2 and 5 days in the birthing and gynaecology wards respectively. For other wards at the NRH, the average LOS varied from 8 to 17 days. As shown in Figure 73, the average LOS at the NRH was higher than in Australia, Fiji, and Papua New Guinea (PNG), but lower than New Zealand.

The average BOR was 32% for hospitals and 80% for the NRH.[114] There was considerable variation in the BOR between hospitals: from 18% at Lata to 56% at GSH. The BOR for the second largest hospital, Gizo (24%), was below average. As shown in Figure 73, the average BOR at the NRH was higher than for hospitals in Fiji (52%).

As shown in Figure 74, there were 86 practicing doctors in Solomon Islands, including 13 at hospitals and 73 at the NRH. This equates to 0.2 practising doctors per 1000 population. This was slightly higher than for PNG, which had 0.1 practising doctors per 1000 population, but lower than Fiji (0.6 practising doctors per 1000 population), New Zealand (2.8 practising doctors per 1000 population) and Australia (3.3 practising doctors per 1000 population), as shown in Figure 73.

Solomon Islands also had a smaller ratio of nurses to the population compared to other countries in the region, except for PNG. As shown in Figure 73, in Solomon Islands there were an estimated 1.7 nurses per 1000 population in 2005,[115] which was higher than the estimated 0.4 nurses per 1000 population in PNG, but lower than Fiji, New Zealand and Australia (2.7, 10.1 and 10.2 practising nurses per 1000 population respectively). Solomon Islands health workforce

[114] The NRH and the MHMS reported the bed occupancy rate as 91.4% for 2012. The discrepancy is likely due to bed count.
[115] The total number of nurses was not calculated in this study. Thus it is not possible to update this figure based on the study findings.

population density (doctors/nurses/midwives per 1,000) is estimated at 2.17 compared with 0.5 for PNG, 2.61 for Fiji and 1.8 for Vanuatu.

A recent costing study in Fiji also estimated the cost per inpatient and outpatient admission at hospitals.[116] The cost of an inpatient admission and outpatient visit at a hospital in Fiji was USD 339 and USD 59 in 2012, compared to USD 559 and USD 13 in Solomon Islands in 2013.

Figure 73: Key operating statistics for countries in the region

Measure	Australia	New Zealand	Fiji	PNG	Solomon Islands
Life expectancy at birth	82 (2012)	81 (2012)	70 (2012)	62 (2012)[117]	68 (2012)
Average LOS	5.8 (2011)	8.6 (2012)	5.0 (2013)	6.0 (2008)	6.5 (2012, hospitals) 7.3 (2012, NRH)
Bed Occupancy Rate			52% (2013)		32% (2012, hospitals) 80% (2012,NRH)
Hospital beds density per 1000 population	3.8 (2009)	2.3 (2011)	2.1 (2009)		1.8 (2012)
Outpatient visit with qualified health worker per person	7.1 (2013)	3.7 (2012)	1.9 (2007)	1.3 (2012)	1.5 (2012)
Practising doctors per 1,000 population	3.3 (2012)	2.8 (2013)	0.6 (2013)	0.1 (2008)	0.2 (2013)
Practising nurses per 1,000 population	10.2 (2012)	10.1 (2012)	2.7 (2011)	0.4 (2008)	1.7 (2009)
Sources	Annual reports	OECD	World Bank	WHO	This study

[116] Fiji Ministry of Health, 'Fiji Health Accounts 2011 – 2012' Fiji, 2013. Copy on file with author.
[117] LOS for PNG is for acute care.

Figure 74: Key operating statistics by facility type

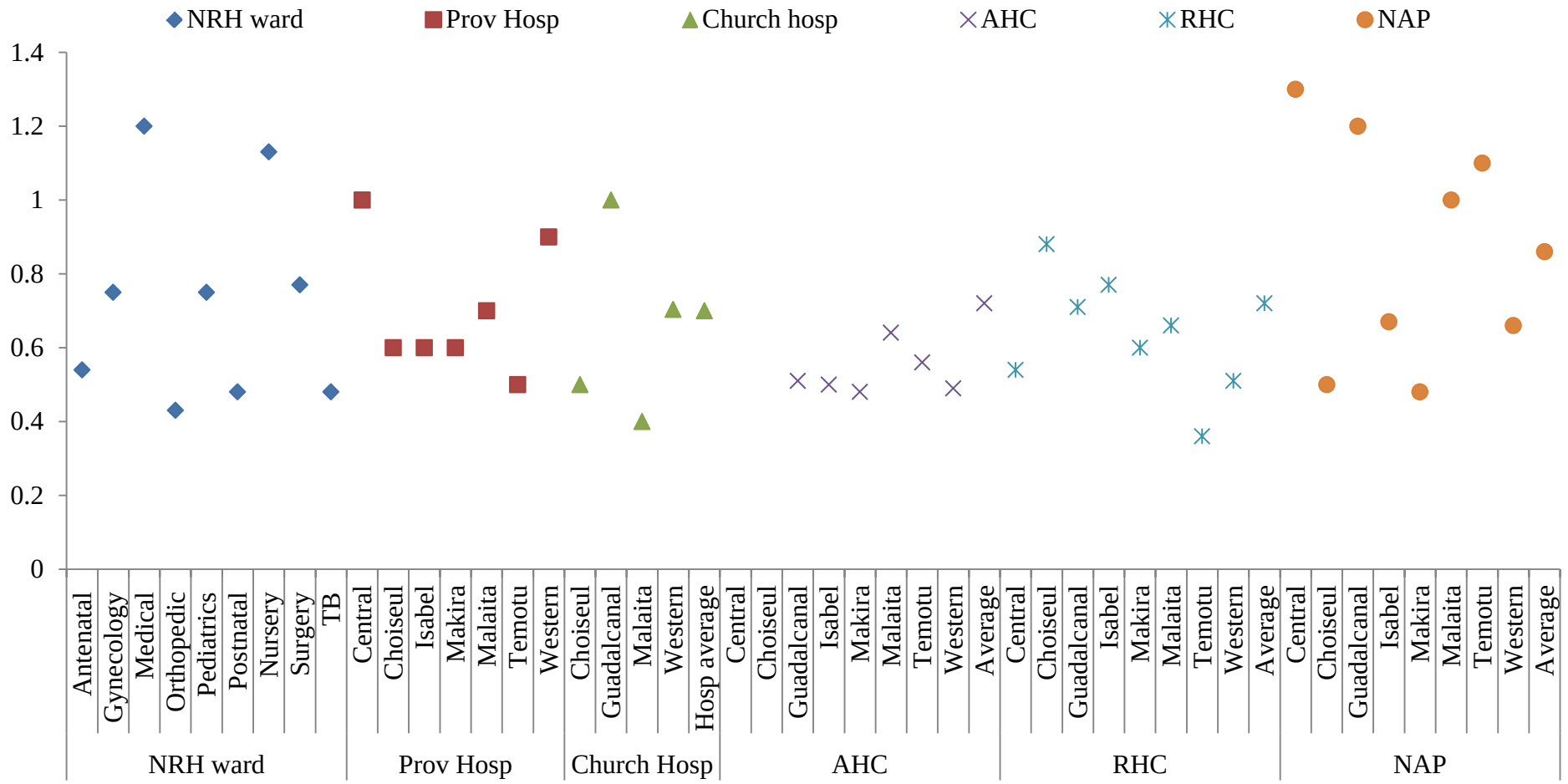
Facility	Inpatient admissions	Outpatients	Inpatient beds	No. Doctors	No. Nurses	No. Nurse Aids	Average LOS	Occupancy rate	Bed Turnover rate	Recurrent Costs
Average NAP	14	1,831	1.9	0	0.1	1.1	2.07	8.6	9.2	$90,447
Average RHC	48	4,970	5.7	0	1.1	1.3	1.99	10	24	$232,528
Average AHC	144	12,078	11.5	0	3.9	2.0	2.99	23	39	$884,536
Average hospital	1,054	14,735	57	1	18	12	6.46	32	20	$5,644,966
Atoifi	*1,240*	*15,595*	*66*	*1*	*20*	*0*	*8.34*	*43*	*19*	*$3,474,057*
Buala	*808*	*6,448*	*44*	*1*	*14*	*5*	*7.66*	*39*	*18*	*$4,353,869*
Gizo	*1,217*	*27,513*	*66*	*3*	*35*	*20*	*4.83*	*24*	*18*	*$13,704,318*
GSH	*1,362*	*28,479*	*29*	*0*	*14*	*10*	*3.56*	*46*	*47*	*$2,719,923*
HGH	*1,150*	*12,626*	*67*	*4*	*9*	*25*	*5.50*	*26*	*17*	*$3,916,857*
Kilu'ufi	*2,800*	*11,569*	*149*	*3*	*48*	*36*	*10.79*	*56*	*19*	*$16,940,608*
Kirakira	*1,241*	*17,805*	*69*	*0*	*22*	*10*	*7.37*	*36*	*18*	*$6,396,944*
Lata	*522*	*14,742*	*69*	*1*	*14*	*10*	*8.76*	*18*	*8*	*$4,213,837*
Sasamuga	*329*	*8,713*	*25*	*0*	*2*	*7*	*5.20*	*19*	*13*	*$889,658*
Taro	*530*	*10,405*	*27*	*0*	*9*	*3*	*5.42*	*29*	*20*	*$3,040,237*
Tulagi	*398*	*8,191*	*21*	*0*	*8*	*4*	*3.60*	*19*	*19*	*$2,444,215*
NRH	12,407	62,985	337	73	236	85	7.33	80.3	27.2	$100,908,694

Figure 75 shows the number of Full Time Equivalent (FTE) clinical staff per bed by facility type and province. There was consistency across the various provinces for both hospitals and AHC, with an average 0.7 beds per clinical FTE and a range from 0.4 to 0.8, for both facility types. There was greater variation across RHC and NAP, which have few beds for inpatients. There was also greater variation across the wards at the NRH, with a variation from 0.43 beds per clinical FTE in the orthopaedic ward, to 1.1 beds per clinical FTE in the nursery.

Figure 76 shows the number of outpatient visits per clinical FTE by province and facility type. This ratio was calculated based on all clinical FTE working at a facility; given the small number of inpatients at AHC, RHC and NAP staff could not be allocated to outpatient and inpatient services. On average, AHC (2,305), RHC (1,735) and NAP (1,297) had higher outpatient visits per clinical FTE than the NRH (125) and hospitals (497). AHC in HCC averaged the highest outpatient visit per clinical FTE of any facility type (6,173) and Kilu'ufi averaged the lowest (98).

Inpatient admission per clinical FTE by province and facility type is shown in Figure 77. This ratio was calculated based on all clinical FTE working at a facility; given the small number of inpatients at AHC, RHC and NAP staff could not be allocated to outpatient and inpatient services. On average AHC (31) had the highest inpatient admissions per clinical FTE than other facilities, although hospitals (27) and the NRH (25) averaged higher than RHC (20) and NAP (11). Church hospitals in Malaita (Atoifi) (48) and Guadalcanal (GSH) (41), as well as AHC in Western (47) and Temotu (41) had higher ratios than other facilities. AHC and RHC in Guadalcanal had a lower ratio than AHC and RHC in all other provinces, which may be due to the fact that they have a lower number of inpatient admissions, as shown in Figure 45. NAP also had a lower ratio than other facility types, which is also likely due to the low number of inpatient admissions.

Figure 75: Full time equivalent clinical staff per bed by province and facility type[118]



[118] Facilities in HCC have been excluded from this analysis as they do not commonly take inpatients.

Figure 76: Annual outpatient visit per full time equivalent staff (all clinical staff) by province and facility type

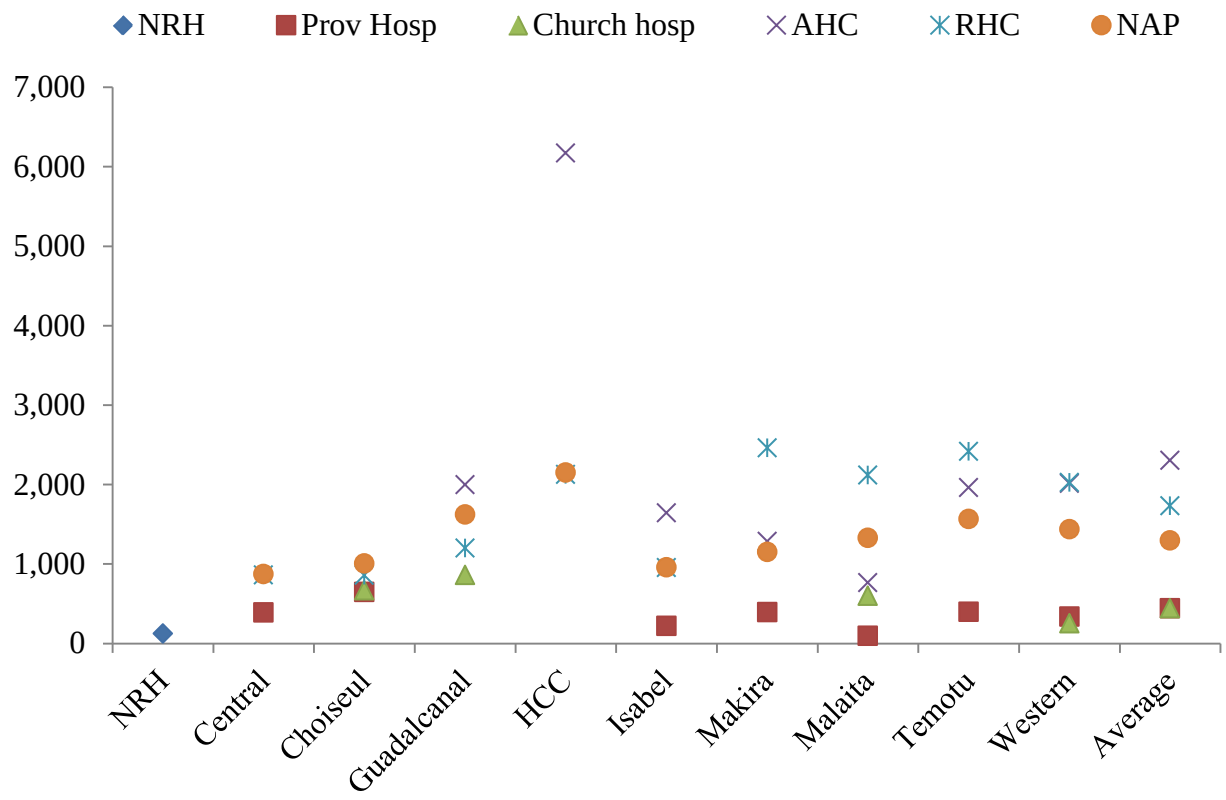


Figure 77: Annual inpatient admission per full time equivalent (all clinical staff) by province and facility type

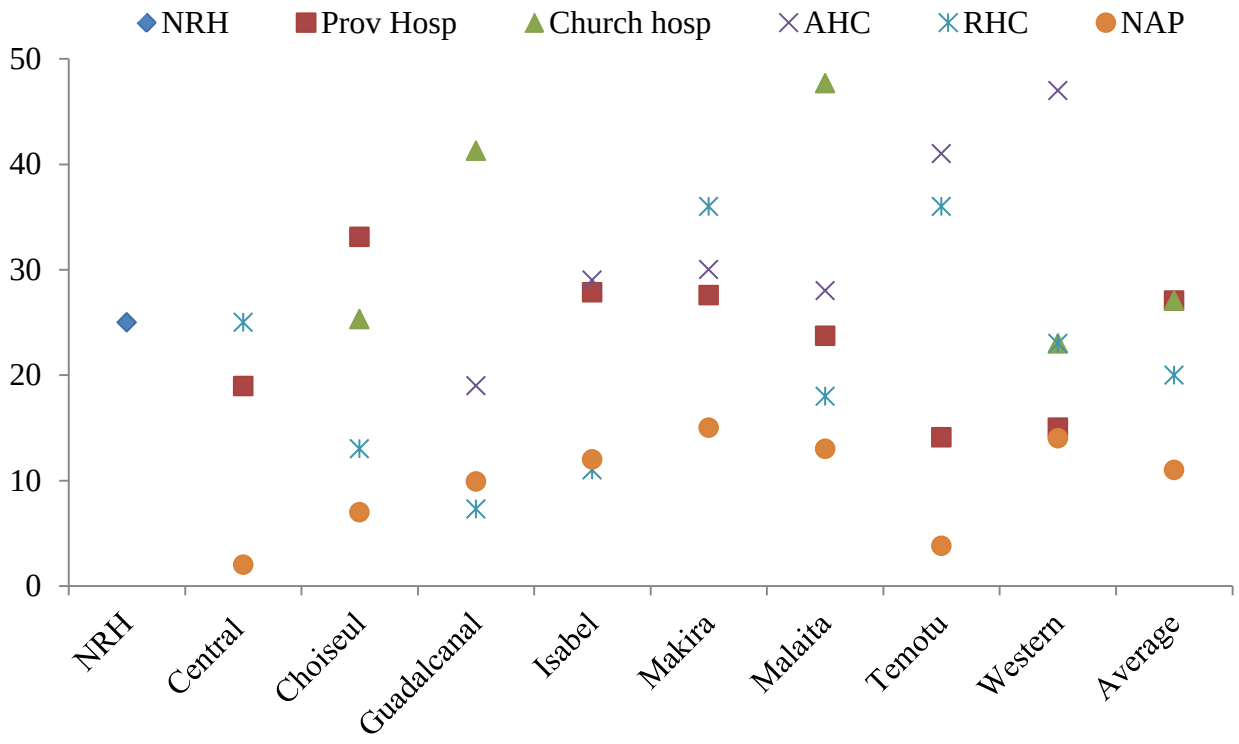


Figure 78 presents an analysis of the labour productivity of various wards and outpatient clinics in the NRH. For inpatients it presents ratios of clinical staff per bed and per occupied bed; for outpatient clinics it presents the daily number of contacts per clinical staff member. The medical ward and nursery had the highest ratio of staff to beds, but the ratio for the nursery declines when adjusting for occupied beds, as the bed occupancy in this ward was greater than one (suggesting that other beds outside the ward are utilised). The number of outpatient contacts per staff was highest in the ear, nose and throat (ENT) clinic and the emergency (general outpatients) department, where they see on average 6 patients a day. Further investigation is required to fully confirm these figures as the human resource information on staff location (ward, clinic) does not always match the rostered numbers.

Figure 78: Input:Output ratios for specific wards/clinical areas in the NRH

Section	Clinical staff per bed[119]	Clinical staff per occupied bed[119]	Outpatient contacts per clinical FTE per day[120]
Inpatient			
Antenatal	0.54	1.56	-
Gynaecology	0.75	1.25	-
Medical	1.2	1.87	-
Orthopaedic	0.43	0.65	-
Paediatrics	0.75	0.78	-
Postnatal	0.48	0.82	-
Nursery	1.13	0.96	-
Surgery	0.77	1.01	-
TB	0.48	0.89	-
Outpatient clinics			
Emergency department	-	-	6.44
Eye	-	-	1.2
ENT	-	-	6.61
Obstetrics and Gynaecology	-	-	2.16
Fracture	-	-	1.32
Diabetic	-	-	1.45

[119] Includes doctors and nurses that work in wards
[120] Includes doctors and nurses that work in outpatient facilities

5.2 Efficiency analysis

The relative efficiency of MHMS facilities was analysed using data envelopment analysis (DEA). The DEA first identified facilities using the lowest level of inputs given their current level of output. These relatively efficient facilities mapped out an "efficiency frontier" reflecting "best managerial practice" at different scales of production, among sampled MHMS facilities.

Relatively efficient facilities operating on the frontier were then compared against other facilities operating at a similar scale of production to calculate measures of technical efficiency (TE). This comparison produced technical efficiency (TE) scores for facilities in the range 0 to 1. A TE score of 1 indicates the facility is operating on the frontier at "best practice" and requires 100% of its current level of inputs to produce its current level of output. Facilities producing the same level of output as a best practice facility, but using higher levels of input are considered (relatively) technically inefficient and receive a score of less than 1. For these facilities, the difference between 1 and their TE score reflects the reduction in inputs that would be required to reach the efficiency frontier and achieve best practice.

Scale efficiency (SE) scores were then calculated by making a further comparison against the facility or facilities with the lowest ratio of inputs to outputs, irrespective of scale. An SE score of 1 suggests that the facility is operating at its efficient scale. This means that, after achieving any gains in TE, it would not be possible to achieve a further reduction in the ratio of inputs to outputs by increasing or decreasing output. For facilities with an SE of less than 1, the difference between 1 and their SE score suggests that a strategic decision to vary the size of the facility might allow the facility to make further reductions in the ratio of inputs to outputs.

Figure 79 to Figure 81 present the average results, summarised by province and facility type, for the DEA. This analysis is explained in the Technical Annex (Section 3.10) and presented in detail in in Appendix A, Table 35. The models use measures of recurrent cost (e.g. expenditure on salaries) and number of beds to capture differences in the amount of inputs that facilities use to produce their observed levels of inpatient admissions and outpatient visits. The advantage of using beds and recurrent costs rather than physical quantities (e.g. number of nurses employed), to capture differences in the amount of inputs that facilities use to produce their observed level of output, is that labour cost provides a more compact proxy for between-hospital differences in skill-mix than would the inclusion of separate quantity measures for each labour category.[121]

Figure 79 shows the results for the main model for AHC, RHC and NAP. Figure 80 shows the results for AHC, RHC and NAP for a more disaggregated model; with staffing costs and cost of drug and other supplies split from other recurrent costs and included separately. Figure 81 shows the results for the main model for hospitals and AHC. The data presented are the TE and SE scores assuming variable returns to scale (VRS).

[121] Note that the interpretation of the DEA results when using labour costs is in dollar terms rather than in terms of input requirements. For example, if a facility has a TE=0.40, production costs would need to be reduced by 60% in order to reach the frontier.

The analysis found a large number of AHC, RHC and NAP are operating a very long way away from the efficiency frontier, and relatively few (15 out of 85 facilities in the sample) are operating on the efficiency frontier in the main model (Figure 79). The number of AHC, RHC and NAP on the efficiency frontier is expected to be greater in the more disaggregated model (Figure 80) and this holds true. The disaggregated model identified the same 15 facilities as being on the efficiency frontier, with an additional 14 facilities also on the frontier, for a total of 29 out of 85 (34%).

Similarly, the analysis found 8 out of 31 facilities (26%) in the hospitals and AHC analysis were operating on the efficiency frontier (Figure 81).

It is important to remember that a facility operating on the efficiency frontier may not necessarily be operating at its efficient scale (rather it is doing as well as it can, given its current scale). The analysis suggests that very few facilities are operating at their efficient scale. In the main model, only 5 of the 85 facilities (6%) were found to be operating at their efficient scale with respect to the production of inpatient and outpatient services. The majority of facilities are found to be operating under increasing returns to scale. This suggests that, even after removing all technical inefficiency, some facilities could further reduce their ratio of inputs to outputs by making a strategic decision to increase the scale of the facility.

A further analysis was conducted to identify the determinants of efficiency and inefficiency.[122] For the lower level facilities, the analysis considered the influence of province, facility type, facility condition, facility size (number of rooms), management (government, co-managed by a private company, or co-managed by a church or non-government organisation), reliance on patient contributions, remoteness (travel time to collect drugs and access to second level medical stores) and production of outreach services (outreach share of total recurrent cost and trips taken from the facility for outreach). Results suggested that province, facility-type, facility size (number of rooms) and participation in outreach activities may be important determinants of TE. For hospitals and AHC, a limited set of facility characteristics were tested due to missing data and the small sample size. Only province was significantly associated with TE scores with facilities in Guadalcanal, and in some specifications Makira, significantly more efficient than facilities in the reference province: Central.

[122] Using Tobit regression.

Figure 79: DEA efficiency analysis – main model for AHC, RHC and NAP

	Main model AHC, RHC and NAP							
	VRS TE				VRS SE			
	AHC	RHC	NAP	Total	AHC	RHC	NAP	Total
Central		0.4	0.5	0.5		1.0	0.6	0.7
Choiseul		0.4	0.8	0.6		0.9	0.9	0.9
Guadal-canal	0.4	0.4	0.5	0.4	1.0	1.0	0.9	0.9
HCC	1.0	0.8	0.7	0.8	0.5	0.7	1.0	0.7
Isabel	0.4	0.4	0.8	0.6	1.0	0.8	0.7	0.8
Makira	0.3	0.9	0.5	0.6	0.9	1.0	0.9	0.9
Malaita	0.5	0.8	0.8	0.8	0.8	0.9	0.7	0.8
Temotu	0.5	0.5	0.7	0.6	1.0	0.9	0.8	0.8
Western	0.6	0.5	0.6	0.6	0.9	0.9	0.8	0.8
Average	0.5	0.6	0.7	0.6	0.9	0.9	0.8	0.8

Figure 80: DEA efficiency analysis – disaggregated model for AHC, RHC and NAP

	Disaggregated model AHC, RHC and NAP							
	VRS TE				VSR SE			
	AHC	RHC	NAP	Total	AHC	RHC	NAP	Total
Central		0.5	0.6	0.6		1.0	0.6	0.7
Choiseul		0.9	1.0	0.9		0.8	0.9	0.8
Guadal-canal	0.5	0.5	0.6	0.6	1.0	0.9	0.9	0.9
HCC	1.0	0.8	0.9	0.9	0.7	0.9	1.0	0.9
Isabel	0.6	0.6	0.9	0.8	1.0	0.8	0.9	0.9
Makira	0.6	1.0	0.5	0.7	1.0	1.0	0.9	1.0
Malaita	0.5	1.0	1.0	1.0	1.0	1.0	0.8	0.9
Temotu	0.8	0.9	0.8	0.8	1.0	1.0	0.8	0.8
Western	0.7	0.7	0.8	0.8	0.9	0.9	0.8	0.8
Average	0.6	0.8	0.8	0.8	0.9	0.9	0.8	0.9

Figure 81: DEA efficiency analysis – main model for hospitals and AHC

	Main model, hospitals & AHC									
	VRS TE					VRS SE				
	Hosp	AHC	RHC	NAP	Total	Hosp	AHC	RHC	NAP	Total
Central	0.3				0.3	0.9				0.9
Choiseul	0.7				0.7	0.9				0.9
Guadal-canal	1.0	0.7			0.8	0.7	0.6			0.6
HCC		1.0			1.0		0.9			0.9
Isabel	0.3	0.6			0.5	0.8	0.6			0.6
Makira	0.4	0.7			0.6	0.7	0.4			0.5
Malaita	0.9	0.4			0.6	0.6	0.8			0.7
Temotu	0.2	0.6			0.4	0.8	0.8			0.8
Western	0.4	0.7			0.6	0.7	0.8			0.7
Average	0.6	0.7			0.7	0.7	0.7			0.7

6. Discussion

6.1 Limitations

This study was the first of its kind in Solomon Islands and, as such, there were numerous lessons learned along the way. The engagement by the Ministry of Health and Medical Services (MHMS) of eight trainee nurses as data collectors was a valuable contribution from the MHMS to the study: the nurses were highly competent; developed into independent data collectors; and appreciated the opportunity to undertake non-clinical work and gain research experience. The use of mobile phones and laptops to administer the survey instruments was also a successful strategy. On the other hand, some key pieces of information were not collected or available and needed to be approximated. These limitations are discussed further below.

a) Information that would have strengthened the analysis

The MHMS collects a wealth of data at facilities, Provincial Health Offices (PHO) and headquarters that were key to calculating the estimates presented in this report. The steps taken by the MHMS (including the MHMS Human Resources, Finance and Health Information System (HIS) teams, the National Referral Hospital (NRH) and the National Medical Stores (NMS)), with the support of development partners, to further strengthen its information systems should receive continued attention.

The estimates presented in this report would have benefitted from the following (some of which the MHMS is currently working towards):

(i) A consolidated list of active facilities used across the MHMS (e.g.: by HIS, NMS, and the PHO);
(ii) Estimates of population catchment per facility;
(iii) A national database of all staff working at each facility;
(iv) An accurate record of the NMS supply chain (i.e.: the specific Second Level Medical Stores (SLMS) that the facility receives its NMS orders from); and
(v) Acquittal of the provincial health service grants by facility or facility type.

The completeness of data in the HIS was also a limitation. Kilu'ufi is the largest hospital and did not systematically report to the HIS in 2012 or 2013, thus data were imputed. The NRH also did not report to the HIS in 2012 or 2013. It had an electronic system for admissions, which was used to estimate the total number of inpatients. There was no electronic system for outpatients at the NRH, so the total number of outpatients was estimated from the registers and booking sheets.

b) Limitations in cross sectional data collection

The data were collected during a single visit to health facilities, except for the NRH. Where there were limitations in the data collected during this visit, follow up queries were made via email, phone and radio to provincial and church hospitals and Area Health Centres (AHC).

There were some limitations in relation to the transport and maintenance costs that could not be addressed through follow up. Transport costs are mostly met by provincial health service grants (and revenue collected through voluntary contributions). As information was not consistently available for all provinces on the cost of transport by facility type, the transport costs were estimated based on nurse recall of the number of trips that they have taken and the cost of those trips. Estimates of maintenance costs were sought from nurses, but it was difficult to determine whether these expenses should be considered recurrent or capital. The costs varied significantly and were difficult to verify. Thus an approximation was used based on the average proportion of provincial health service grants spent on maintenance across all provinces for which data were available.

In addition, the sample only included a small proportion of Nurse Aid Posts (NAP). As explained in the Technical Annex, the desired sample of 25% of NAP in five provinces was not met given that some of the NAP in the sample reported to be Rural Health Clinics (RHC), and there were more NAP in some provinces than originally thought. In total 18% of NAP were included in the study sample (35 out of 190).

c) Limitations in the calculation of service costs

Data used to allocate the recurrent costs to inpatient and outpatient departments was also limited. This was in part due to the original study data collection methods, and in part due to the availability of information.

The original study methods did not include the collection of samples from the registers in the laboratory and imaging departments at hospitals to determine how many tests are performed for inpatients and how many tests are performed for outpatients. Samples were obtained from a number of hospitals after data collection was completed (from those registers that include such information), and an average was used for hospitals that could not be revisited. Any variation in the actual distribution of laboratory and imaging costs between inpatients and outpatients has been assumed to be zero, as averages were used based on a subset of facilities.

The original study methods proposed to allocate staff time between inpatient and outpatient departments using rosters (of which photos were taken). These rosters only distinguished between inpatient and outpatient departments at hospitals, not AHC, Rural Health Clinics (RHC) and NAP, where many staff undertake both inpatient and outpatient duties during their working day. The original study methods did not include questions on how staff allocate their time between inpatient and outpatient departments at AHC, RHC and NAP. Follow up questionnaires were conducted with nurses at 16 out of the 20 AHC in our sample, and the average was applied to RHC and NAP. The use of averages and lack of actual data collected from RHC and NAP means that the allocation of staff time to inpatient and outpatient work are subject to error. This is likely to have introduced further error to the estimates of inpatient and outpatient unit costs. It is unknown if this results in an over (or under) estimate of outpatient (inpatient) costs.

Some data were not available. For example, most registers in the specialist outpatient clinics at the NRH do not record diagnosis or treatment provided. In many facilities and for many types of outpatient visit, only limited data were available on what medicines were dispensed to patients. In some cases, the types of medicine that might have been given were inferred on the basis of the visit type, and in other cases the cost of the medicines were taken as a simple average for all visits. These assumptions serve to under-estimate the actual variation in costs of outpatient treatment by different conditions.

As with all studies of this type, some assumptions are unavoidable. For example, for outpatient visits, it was assumed that the cost of staff time incurred does not vary between patients with different conditions at the same facility, whilst in the inpatient setting, it is assumed that the cost of staff time per bed day is the same for every patient, regardless of their diagnosis or age and gender. These assumptions are reasonable in this type of study, but they have the impact of reducing the variation in unit costs of treating different conditions at each facility.

Another important limitation in the estimation of unit costs by disease stems from the need to sample patient records. In most cases a 5% sample was taken, however, given the often diverse range of patient conditions, this means that in some instances the cost analysis was driven by very small numbers of patients having a particular condition (note however that those conditions with a prevalence of <1% were generally not included in the cost analysis). This can result in large errors in the estimated unit costs of treating that disease or condition, especially if the patients who happened to be sampled were by chance cheaper or more expensive than the average patient. This is likely to be most problematic for conditions like diabetes and hypertension at lower level facilities, where there are very few presentations or admissions, and conditions like the common cold and influenza at hospitals and the NRH.

6.2 Key considerations

Over 80 officials from the MHMS headquarters, PHO, the NRH and development partners attended a two-day workshop from 28-29 October to discuss the findings of the study. As reiterated by the Acting Permanent Secretary, Dr. Tenneth Dalipanda, and other participants at the workshop, the study provides a baseline for further analysis and action. It has produced a wealth of information that the MHMS could use to inform its decisions on how resources could be allocated so that the health system is managed more efficiently and equitably. This includes through:

- The annual operating planning and budget process (and how resources might be reallocated using a mixture of fixed costs and other components to increase the performance orientation within MHMS);
- The setting of priorities as part of the next National Health Strategic Plan 2016-2020 and the accompanying medium term expenditure pressures framework; and
- The further refinement and implementation of the UHC/RDP and related service delivery packages (at early stages of development).

In addition the study has highlighted the need for further policy action and analysis in the following areas:

a) Efficiency

The results of the data envelopment analysis (DEA) suggest that some facilities are operating much more efficiently than others, that is, using their inputs more efficiently to produce output (services). The DEA is a relative measure of efficiency, so will necessarily rank some facilities as more efficient than others. However, there was considerable variation in the extent to which facilities were operating efficiently, with many facilities operating far less efficiently than others according to the DEA results. In order to better understand this variation, the MHMS and partners could undertake further analysis of what facilities are doing well compared to other facilities.

There is also significant variation in recurrent costs within and between provinces, which would benefit from further analysis to better understand these differences.

The report does point to some variations in the cost of key inputs, such as food and energy costs at hospitals, where potential savings could be made.

b) Equity and access

The results of the patient exit survey suggest that Solomon Islands' health system primarily serves the lower middle income groups, that is, the second and third poorest income quintiles. This is a significant achievement for any health system, especially one in a low resource setting.

The results of the patient exit survey also indicated that those in the poorest quintile were underrepresented at facilities. However, it may be that those in the poorest quintile are more likely to live in areas that were not part of the study sample, which led to their underrepresentation in the national estimates. Thus further analysis is required to determine if those in the poorest quintile have greater barriers to accessing health services, which may be due to their lack of geographical access to a facility or their ability to make a financial contribution to the facility. This analysis will be completed once the full results of the 2012/13 Household Income Expenditure Survey are available (which were not available at the time the costing study analysis was undertaken). Additional analysis could also be undertaken using the results of the most recent census, mapping populations against facilities to better understand barriers to geographical access.

Similarly, those in the richest quintile were far more likely to be receiving specialised care from the NRH. This may be due to the fact that those in the richest quintile are more likely to reside in Honiara.

c) Service delivery

Facilities are responsible for providing a range of services both within the facility and in the community. The number of services provided varied by facility type and province. Better understanding why service delivery varies in this way requires estimates of population catchment per facility, which were not available for all facilities. This gap could be filled through analysis of the census and other related data. This will help the MHMS better understand if facilities with lower levels of service provision are underutilised or are serving small remote populations.

Another reason for the reported variation may be definitional. The MHMS, with support from development partners, is in the process of incentivising the delivery of outreach services. Key to measuring changes in performance is greater clarity on the definition of outreach. Outreach was defined in this study in accordance with the national HIS and includes the number of patient contacts on tour for antenatal care, postnatal care and child welfare. Doctors, nurse managers and staff from public health programs also use the term outreach when they visit lower level facilities to provide clinical services and/or conduct supervision. To provide greater clarity, the MHMS could develop clear definitions of outreach in communities, outreach in facilities (which may be referred to as clinical tours), and supervision conducted by area managers and national program staff. Tours and associated contacts should also be reported separately.

d) Patient presentations

Maternal and child health services, followed by infectious diseases, are the main reason for patient presentations at facilities. At the NRH, presentations for all labour and deliveries, diseases in the perinatal period, maternal care related possible delivery problems and pregnancy with abortive outcome, together account for 58% of all inpatient presentations at the NRH, 36% at hospitals and 31% at lower level facilities. Thus, considering the proportion of unintended

and unwanted pregnancies (57% and 25% respectively), significant investment in family planning could reduce the number and severity of these presentations.[123]

Similarly, continued investment in prevention of infectious diseases, including in hygiene, water and sanitation systems, will help reduce the number of inpatient and outpatient presentations resulting from skin and diarrhoea.

As this was a cross sectional data collection, the study did not produce evidence of an increase in presentations due to non-communicable diseases (NCD).[124] While the study did show that the proportion of inpatients with diabetes or hypertension was a small proportion of the total number of admissions, the average cost per admission was relatively high compared to other conditions. Again, investment in prevention and early treatment now is likely to lead to savings in the future.

e) Patient contributions

Both the patient exit survey and the health facility survey found that the collection of small patient contributions for services and medical record books was widespread, including at hospitals, which is permitted by existing legislation, and at AHC, RHC and NAP, which is contrary to existing legislation. There was no evidence that contributions were being placed into consolidated fund at hospitals, as required by the current legislation.

The results of the patient exit survey suggest that the contributions were inequitable in the sense that the poor pay more often and pay more, however further analysis is required to determine if this finding was related to the possibility that the poor are more likely to live in remote areas, where it may be more common to make a contribution to the facility. A small number of respondents reported that contributions had previously dissuaded them from visiting a facility (8%), however the sample may exclude those who were dissuaded from doing so on the day of the study.

The collection of contributions at AHC, RHC and NAP represents a small proportion of the costs of running a facility and thus should be within the fiscal means of the MHMS to resolve by providing substitute funding directly from the budget (and may be cheaper than attempting to administer a formal user fee system). However the collection of contributions provides the only steady stream of cash available to remote facilities that lack access to financial services. Thus, if the MHMS seeks to stop the collection of contributions, it will need to ensure that medical record books are freely available to facilities and that the PHO deliver supplies (fuel, soap, phone credit) to facilities on a regular basis, for example with regular supervision visits.

[123] Kennedy E, Mackesy-Buckley S, Subramaniam S, Demmke A, Latu R, Robertson, A, Tiban K, Tokon A, Luchters S. The case for investing in family planning in the Pacific: costs and benefits of reducing unmet need for contraception in Vanuatu and the Solomon Islands. *Reproductive Health*. 2013;10:30.

[124] This will be examined in the 2015 STEPS, which will include the collection of blood samples to determine the prevalence of diabetes.

Further research on fee collection at the NRH is needed to better understand the collection of these contributions. None of the respondents to the patient exit survey reported that they made a contribution at the NRH, although anecdotal evidence suggests that payments are made to secure better, faster service at the NRH.

f) Role of the NRH

Between 56% and 82% of inpatient admissions at the NRH are self-referrals. It was not possible to estimate where the self-referrals were from in our data. The village, island and province of each patient was recorded in the inpatient sample, but proved inconclusive. Honiara City Council was not recorded as a province for any patient, even for those patients who were referred from clinics in Honiara. This is consistent with convention for those who live in Honiara – they continue to refer to their ancestral village and/or province as their place where they are from (even though they may have lived in Honiara all their life).

The MHMS or NRH staff could conduct a small study on inpatients on where they have resided over the past month and why they did not seek a formal referral to help inform their understanding of who is accessing their services as self-referrals. This will help inform any policy actions that aim to encourage patients to use formal referral pathways, plus provide better evidence to assess whether the allocation of budgetary resources to NRH is appropriate given its patient demand.

g) Information systems

As discussed in Section 6.1, the MHMS has made considerable progress on improving its information systems for human resource, financing and health statistics. Further progress could be made as follows:

(i) A consolidated list of active facilities used across the MHMS (e.g.: by HIS, NMS, and the PHO);
(ii) Estimates of population catchment per facility;
(iii) A national database of all staff working at each facility;
(iv) An accurate record of the NMS supply chain (i.e.: the specific SLMS that the facility receives its NMS orders from); and
(v) Acquittal of the provincial health service grants by facility or facility type.

In addition, the MHMS should encourage all facilities, including Kilu'ufi hospital, to consistently report to the HIS. Using performance measures that are judged by HIS data, is a way to indirectly incentivise reporting to the HIS. Specific attention should continue to be given by the MHMS and development partners to the development of a HIS for inpatients and outpatients at the NRH, and regular reporting to the MHMS.

Progress could also be made within hospitals: for example, a simple Microsoft Excel tool could be developed by the pharmacy department at the NRH to record the supplies provided to the

various wards. Similarly the laboratory department at the NRH could use a tool to record the tests performed by the different teams within the laboratory to consolidate and make consistent the information that is currently available in the various paper registers.[125]

Consideration may also be given to the list of conditions that are recorded on the HIS in the patient registers and the monthly reporting form. Given that ARI is the dominant cause of presentations at AHC, RHC and NAP, and the second highest at provincial and church hospitals, consideration should also be given to distinguishing between ARI with and without pneumonia or suspected pneumonia in the outpatient registers. [126]

h) Costing study data set

The data that were analysed for the purpose of this report represents a small portion of the data that were collected. Additional data were also gathered on the infrastructure and equipment available at facilities in accordance with the standards set out in the UHC/RDP (as it stood in August 2013 when data collection commenced). These data could be used to use to examine the quality of facilities or the cost of meeting the infrastructure and equipment standards set out in the UHC/RDP.

There is also opportunity to further exploit the data that have been analysed for this report. For example, with respect to the inpatient and outpatient samples, additional analysis could be undertaken of various aspects of quality of care, such as the appropriateness of diagnosis and prescription.

The MHMS and development partners should consider incentivising research by MHMS staff using the study data, for example: by establishing a small fund to support research assistants, or providing sabbatical time for undertaking analysis and writing.

[125] These include registers for: Dengue, Chemistry, Overseas tests, Micro: midstream, Micro: aspirates, mouth, throat and sputum, Micro: pus and wound swab, Micro: blood culture, Micro: stool, Micro: genital, Serology, Serology – antenatal care, and Tuberculosis.

[126] The outpatient register uses two categories for ARI: ARI mild, ARI moderate/severe. The HIS monthly report form adds the presence or absence of pneumonia to these categories as follows: “ARI mild (no pneumonia)” and “ARI moderate/severe (pneumonia).”

7. Conclusion

This report adds to the body of information that is available for more evidence-based policy making and priority setting. Like all such surveys, there are methodological limitations in the approach taken; nevertheless, it prompts questions that help get to the heart of equitable and efficient health service performance for all managers to consider.

This is the first study of its kind in Solomon Islands and it has produced a wealth of information that the Ministry of Health and Medical Services (MHMS) could use to inform its decisions on how resources are allocated and used so that the health system is managed more efficiently and equitably. This includes through:

- The annual operational planning and budget process (and how resources might be reallocated using a mixture of fixed costs and other components to increase the performance orientation within MHMS);
- The setting of priorities as part of the next National Health Strategic Plan 2016-2020 and the accompanying medium term expenditure pressures framework; and
- The further refinement and implementation of the Universal Health Coverage/Role Delineation Policy and related service delivery packages.

The full costing study data set contains a much wider set of information for further analysis and use (as note in Section 6.3 above). The MHMS and World Bank will have the cleaned data set in Stata format (including definitions) and copies of all survey instruments available from early 2015. Public use data files in electronic format of the data (including definitions) will also be available from early 2015.

Annex 1: Ministry of Health and Medical Services Divisions

Central Province
Choiseul Province
Guadalcanal Province
Honiara City Council
Isabel Province
Makira Ulawa Province
Malaita Province
Rennel & Bellona
Temotu Province
Western Province
Headquarters and Administration
Policy and Planning
National Nursing Administration
Internal Audit
Eye Division
National Dental Program
National Environmental Health
National Health Promotion
National Health Training & Research
National HIV/STI Program
National Laboratory Program
National Medical Imaging Services
National Mental Health
National Non-Communicable Diseases
National Pharmacy
National Public Health Laboratory
National Reproductive and Child Health
National TB/Leprosy Division
National Vector Borne Disease Control Program
Nursing Council Board
Physiotherapy and Rehabilitation
Social Welfare Development
National Medical Stores
National Referral Hospital