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PNG Health Workforce Crisis:
A Call to Action

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FOREWORD

This report comes at a very opportune time. It demonstrates clearly and systematically that Papua New Guinea faces a health workforce supply crisis. If we do not redress the supply and demand imbalances arising from: (a) the current severely constrained training system for new health workforce cadres; (b) the rapid aging of the existing workforce; and (c) the expanding demand for services over the next 10 to 20 years that arises from the sustained increase of the population; we will not be able to achieve our vision for improved health outcomes for our population articulated in the National Health Plan 2011–2020. In fact, without decisive action to immediately expand the number of nurses being trained, the PNG government financed public health sector may well have fewer nurses in 2020 than we have at present. The picture for other service delivery cadres is similar. This, challenge also emerges at a time when there is evidence the private health sector is expanding significantly and will add to the demand for health staff from our training institutions and also result in increased transfers of the workforce the private sector.

The Health Plan forthrightly argues that our health system requires a "back to basics" approach to reform of our health system to arrest and reverse the nation's deteriorating health indicators. We need to systematically strengthen our primary health care approach and ensure that those at the front line of health service delivery are equipped with the necessary facilities, supplies, equipment and training. We know our health sector workforce delivers services under trying conditions. Improving rural health service delivery fundamentally means that there needs to be an adequate supply of quality health human resources and that they need to be strategically and equitably placed across the country in health facilities that also have access to operational funding and medical supplies. Currently our workforce is inequitably distributed across provinces and districts.

It will take a whole of government approach to achieve appropriate change. We need to find mechanisms to both increase our provincially based workforce and to deploy it according to workload needs. This will require a concerted effort by all stakeholders. We need to reach consensus with training institutions—universities, government and church managed—on how best to expand supply to meet identified needs, including reaching agreement on appropriate curricula. We need to improve the quality of our workforce through the re-establishment of in-service training programs—focussed initially on efforts to reduce our unacceptably high Maternal Mortality Rate.

The Health Plan also acknowledges that it is imperative that we cultivate strong, cooperative, and innovative partnerships to assist us in meeting our health objectives. Nowhere is this more important than with respect to training of our workforce. We are committed to strengthening our extremely important relationship with the Christian Health Services and with the University sector which undertakes most of our new health workforce training.

The report canvasses a range of scenarios for the health workforce and documents the costs of each scenario. The recommended scenario is one which is both affordable given our nation's likely development and fiscal path and is technically appropriate given our health needs. This is a well-timed call to arms. I wish to thank the World Bank for the report.

Mr Pasco Kase
Secretary of Health

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This report was prepared by Mr. Ian Morris, Human Resource Economist for the World Bank under the direction of Ms. Aparnaa Somanathan, Task Team Leader. Mr. Emmanuel Jimenez, Sector Director, Human Development and Mr. Juan Pablo Uribe, Sector Manager, Health, Nutrition and Population of the East Asia Region of the World Bank provided overall management guidance for the report.

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Cover photography by Gregg Maxwell/World Bank.

ABBREVIATIONS AND ACRONYMS

ARI	Acute Respiratory Infections
AusAID	Australian Agency for International Development
BAR	Bougainville Autonomous Region
BoM	Board of Management
CACC	Central Agencies Coordinating Committee
Central	Central Province
CHE	Commission of Higher Education
Chimbu	Chimbu Province
CHS	Church Health Services
CHW	Community Health Workers
CMC	Church Medical Council
CMR	Child Mortality Rate
DHP	District Health Post
DHS	Demographic and Household Survey
DNP&M	Department of National Planning and Monitoring
DoF	Department of Finance
DoT	Department of Treasury
DP	Development Partners
DPM	Department of Personnel Management
DWU	Divine Word University
EHP	Eastern Highlands Province
ENBP	East New Britain Province
ESP	East Sepik Province
GDP	Gross Domestic Product
GoPNG	Government of Papua New Guinea
Gulf	Gulf Province
HC	Health Center
HEO	Health Extension Officer
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
HMTEF	Health Medium-Term Expenditure Framework
HRD	Human Resource Development
HRIS	Health Human Resource Information System
IMF	International Monetary Fund
IMR	Infant Mortality Rate
LIC	Low-Income Country
LLG	Local Level Government
Madang	Madang Province
MBP	Milne Bay Province
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
MHERST	Ministry of Higher Education, Research, Science and Technology
MHS	Minimum Health Standards 2002
MIC	Middle-Income Country
MMR	Maternal Mortality Rate
MoF	Ministry of Finance
MoH	Ministry of Health
Morobe	Morobe Province
MTDP	Medium-Term Development Plan 2011–2015
MTEF	Medium-Term Expenditure Framework 2011–2015 (of Health)
NCD	National Capital District
NC of PNG	Nursing Council of Papua New Guinea
NDoH	National Department of Health
NEFC	National Economic and Fiscal Commission
NGO	Nongovernmental Organization
NHAA	National Health Administration Act
NHB	National Health Board

NHCS	National Headcount Survey
NHEP	National Higher Education Plan
NHP	National Health Plan 2011–2020
NIP	New Ireland Province
NOL	New Organic Law on Provincial and Local Level Government, 1995
OHE	Office of Higher Education
OP	Oro Province
PAU	Pacific Adventist University
PHA	Provincial Health Advisor
PHC	Primary Health Care
PMGH	Port Moresby General Hospital
PNG	Papua New Guinea
PNG DSP	Papua New Guinea Development Strategic Plan 2010–2030
POM	Port Moresby
PSRMU	Public Sector Reform Management Unit
Sandaun	Sandaun Province
SHP	Southern Highlands Province
SoN	School of Nursing
STI	Sexually Transmitted Infection
STR	Student Teacher Ratio
SWAP	Sector Wide Approach
TB	Tuberculosis
TBA	Traditional Birth Attendant
TESAS	Tertiary Education Study Assistance Scheme
TFR	Total Fertility Rate
UoG	University of Goroka
UPNG	University of Papua New Guinea
WB	World Bank
WHO	World Health Organization
WHP	Western Highlands Province
WNB	West New Britain Province
WP	Western Province

EXECUTIVE SUMMARY

Papua New Guinea's health sector is facing a series of major challenges–including an emerging workforce crisis–that must be dealt with if it hopes to deliver better health care. The sector's shortcomings are manifesting themselves in a worrying health picture. Over the past 35 years, there has been little improvement, and evidence from the past decade indicates extremely fragile outcomes. Rates of maternal and infant mortality, and traditional communicable diseases—which together account for about 60 percent of the total disease burden—remain unacceptably high (Box 1). Making matters worse is the emergence of new diseases, including the HIV and AIDS epidemics, and lifestyle-related diseases.

The National Health Plan (NHP) 2011–20 sets out the strategic directions for the development of PNG's health sector over the next decade. It recognizes that these challenges have their roots in:

- structural changes in the sector's governance, including flawed provincial governance and financing arrangements;

Box 1: A Snapshot of Health Outcomes

Preliminary results from the just-completed 2006 Demographic Health Survey reinforce the conclusion of a crisis in health outcomes and the hurdles PNG faces in achieving its national Millennium Development Goals (MDGs):

- The national maternal mortality rate (MMR) is reported to have almost doubled since 2006 to 733 per 100,000 (UNICEF estimates that the average rate for developing countries is 450), with the infant mortality rate (IMR) at 57 per 1,000 live births. Pneumonia and diarrhea, together with underlying malnutrition, are the key causes of post-neonatal death in young children.
- The disease burden among adults is still dominated by infectious and vector-borne diseases, especially tuberculosis and malaria.
- HIV is now well established as a generalized and accelerating heterosexually transmitted epidemic—one of the region's most serious. The World Bank estimated in 2005/6 that HIV prevalence among sexually active adults exceeds 1 percent in rural areas, 2 percent in many urban/enclave areas, and 3 percent in the capital, Port Moresby.
- Life expectancy at birth remains low at 57 years.
- Only 32 percent of the rural population has access to safe water and 42 percent to sanitation. While the situation in urban areas is better—88 percent have access to safe water and 67 percent to sanitation facilities—antedotal evidence indicates that the situation in urban squatter settlements is deteriorating and urban settlements are growing faster than official records indicate.

- poor governance and administrative capacity across the health system, including sound information systems to facilitate decision making; and
- significantly declining real recurrent resources per capita—including for health—since independence in 1975. Recurrent health outlays fell 9.4 percent in real terms from 1996–2004 (the latest year for which there is a full statement of public health expenditures).

Against this backdrop, the National Department of Health (NDoH) has sponsored legislative changes which were recently passed by Parliament that enable provincial governments to establish Provincial Health Authorities (PHA). PHAs are to be responsible for both primary and secondary health care (hospitals) in the province. The NDoH has also initiated a major organizational restructure that will enable it to better provide technical support and guide priority provincial programs rather than implement them; monitor and evaluate overall sector performance; and support efforts to ensure that human resources, logistics support, and infrastructure planning do not remain key constraints to service delivery capacity.

This report was commissioned because NDoH and development partners supporting the health sector increasingly recognize that *the health sector is facing an emerging health sector workforce crisis.* The triggers include: (i) an aging workforce; (ii) limited preservice training capacity to replenish the workforce; (iii) weaknesses in the curriculum of training programs supplying new entrants to the direct service-delivery health workforce; and (iv)an almost total lack of systematic in-service training, especially for rural health. Moreover, data on the health workforce is woefully inadequate for health human resource planning and management purposes.

In response, this report documents for the first time in over a decade the current stock, age, and gender structure of the publicly financed health workforce, along with the capacity of the health-related training institutions. It presents the results of an important 2009 PNG survey of health training institutions, which enable unit costs, staffing, and other aspects of the institutions to be analyzed, together with an assessment of the quality of students and facilities by training school principals. It uses the data gathered to present a set of five alternative demand and supply scenarios for direct service-delivery health staff over the next two decades. It also draws out the supply and demand gap implications of the scenarios.

This exercise is set within the context of important strategic work by the government on health. The NHP 2011–20 lays out the strategic directions for the development of the health sector over the next decade—framed within the Papua New Guinea Vision 2050, the Papua New Guinea Development Strategic Plan 2010–2030 (PNG DSP), the Medium-Term Development Plan 2011–2015 (MTDP), and the NDoH's Medium-Term Expenditure Framework 2011–2015 (MTEF).

The report argues that the government's response needs to deal with: (i) the immediate supply-side crisis (quantity); (ii) the qualitative side, including preservice and in-service training (especially for emergency obstetric care for existing staff); and (iii) incentives to ensure staff are able to be deployed where needed, particularly in rural areas. To that end, its recommendations focus on ameliorating the information problem, improving the training curriculum, tinkering with the composition of the health-delivery staff to boost the number of doctors and nurses, and finding a viable delivery staff scenario to close the supply gap.

One possible path forward is Scenario 5—the recommended scenario—which is not only affordable but also responds to the demand requirements for staff from the health system while leaving space in the recurrent health budget to boost quality. The bottom line is that drastic short- and long-term steps must be taken to remove health human resources as a major long-term constraint on the health sector's capacity to deliver better health services, both public and private, over the next decade and more.

A Profile of the Health Sector

The Supply Side

Given the woefully inadequate data on the size, characteristics, and deployment of the current publicly financed workforce—and the need for better data to form a basis for the new NHP 2010–2020—the Human Resources Division of NDoH undertook a special National Headcount Survey (NHCS) in 2009. The survey shows that the size of the health workforce financed by the public sec-

Table 1: Composition and Growth of the Public Sector Health Workforce 1988–2009

Category	1988	1998	2004	2009	Change 1998–2009 (%)	Change 2004–2009 (%)
Doctors and Dentists	384	316	524	570	80.4	8.8
Health Extension Officers	357	233	575	486	108.6	–15.5
Nurses	2,917	2,920	3,980	3,618	23.9	–9.1
Allied Health	283	372	440	318	–14.5	–27.7
Med Lab. Technical	159	150	254	258	72.0	1.6
Community Health Workers	4,982	3,926	5,358	4,419	12.6	–17.5
Other/Administration	–	2,874	1,224	3,394	18.1	177.3
Total	**9,082**	**10,791**	**12,355**	**13,063**	**21.1**	**5.7**

Source: Data for 1988, 1998 and 2004 as presented in and documented in Chapter 2 of Strategic Directions for Human Development (World Bank, 2007) and 2009 from the National Head Count Survey 2009 (NDoH, 2009).

tor has grown from 10,791 in 1998 to 13,063 in 2009—an overall rise of 21.1 percent in the past 11 years, or a growth of 1.9 percent per annum (Table 1). Since 2004, however, the pace of growth has slowed down markedly. Of this total workforce, direct service-delivery staff with direct service delivery occupations make up 8,844, with 62 percent female and 38 percent male, although the share of males in the rural areas rises to 47 percent. This group—the focus of this report—includes doctors and dentists, nurses, midwives, community health workers (CHWs), and health extension officers (HEOs). To date, the NHP has not indicated that it believes a major adjustment needs to be made in the structure of delivery cadres.

As for *age structure*—vital for many reasons including experience "on the job" and planning for replacement of staff owing to retirement—the survey validates worries about an aging workforce. Key observations include: (i) almost 16 percent of the service delivery workforce of 8,844 in 2009 (1,381) was aged 55 years or more; (ii) a further 37.7 percent (3,338) are currently in the 45–55 year age group and will reach retirement age over the next decade with a further one third (3,033) reaching retirement age in the subsequent decade; and (iii) only 12.3 percent of staff in 2009 (1,090) are less than 35 years of age (Table 2.6).

On the *training* front, the survey shows that over time, two important gaps have emerged: the diffusion of responsibility for training oversight and a continuing serious lack of information on the output of training institutions. While PNG's population has grown, spending on health training has fallen sharply. The question is whether the capacity to train all health cadres has been reduced so much over the past 15 years or more that it is now producing newly qualified staff well below historic attrition rates from the workforce. Hence, without drastic action on the supply side—which will take at least the best part of the next decade with concerted efforts beginning immediately—both short- and long-term human resource supply gaps are to be expected.

The public sector finances the operation of some 2,746 health facilities, of which 94 are urban and 2,652 are rural (Table 2). A striking fact is that in rural areas—which includes 80 percent of PNG's population—most facilities are open aid posts, which offer simple curative and preventive care. Moreover, there is an extremely uneven spread among provinces of not only facilities but also health delivery staff.

The Demand Side

One important indicator of the effective demand for health services is *outpatient visits* per capita per annum. This is an indicator of the overall use of the health system given the state of the health system (funding, staffing, pharmaceuticals, and other medical supplies) and the

Table 2: Total Number of Publicly Financed Health Facilities

Facility Type	Government	Mission	Other	Total
Urban				
Hospitals	21	0	0	21
Urban Clinics	45	14	14	73
Total Urban	**66**	**14**	**14**	**94**
Rural				
Health Center	143	43	6	192
Health Subcenter	162	278	7	447
Rural Hospitals	4	6	2	12
District Hospitals	1	1	0	2
Clinics	1	0	0	1
Open Aid Posts	1,998	0	0	1,998
Total Rural	**2,309**	**328**	**15**	**2,652**
Total Facilities	**2,375**	**342**	**29**	**2,746**

Source: National Head Count Survey (NDoH, 2009).

disease burden of the population. Available data leave little doubt that ambulatory care visits per capita have been decreasing while health outcomes have been deteriating and that this trend, without a reversal, will further hurt health outcomes. The number of outpatient visits per person per annum declined from 1.54 in 1999 to 1.37 in 2008, and outpatient visits per capita per annum in rural areas on average for 2007–8 are only 0.88.

Another demand factor is *resources* with the government estimating that resources for health will rise significantly over the next five years as well as in the longer-term to 2030—in part because of planned LNG projects. For this report's supply-demand scenarios, it is assumed that the health budget will grow at about 5 percent in real terms per annum, about twice the growth in per capita GDP by 2030. The NHP indicates that population will increase at about 2.8 percent per annum over the period 2010 to 2020, then fall to about 2.5 percent over the period 2020 to 2025 and to 2.1 percent between 2025 and 2030. These projections are probably ambitious, however, unless decisive action is taken on the family planning front and on education, particularly of girls.

The reality is that the final effective demand for health workers will depend in no small part on the health system's efforts to increase the quality enhancing items of the nonsalary budget, which needs to rise faster than total expenditure on health and of expenditure on service-delivery staff. This will help ensure that demand for health services—as expressed by outpatient visits per capita per annum, including natal care and immunizations—also increases. Given the demand for services as documented in the 2009 Monash Report, existing staff numbers are some 40 percent over the required numbers—at least in rural areas. There is, therefore, considerable scope to increase rural services with existing staff. On the other hand, existing service demand is well below what should be demanded if the health system were responding to the population's disease burden.

Key Supply Gaps

Armed with this supply and demand information, the report runs five scenarios to draw out the implications for each health cadre and for all service delivery staff, including affordability. The five scenarios vary from no change in existing supply capacity to four alternative scenarios with supply adjusted to meet the postulated demand. These scenarios are summarized in Table 3 below together with the 2009 baseline and then discussed in more detail.

Scenario 1: No change in human resource supply capacity. This scenario highlights the implications of a "Do Nothing" strategy on the supply side from 2010 to 2030—that

Table 3: Summary of the Five Demand Scenarios

Workforce Category	Baseline (2009)	Scenario 1 (No Change in Supply)	Scenario 2 (Aspirational PNGDSP)	Scenario 3 (Maintain 2009 Pop/Staff Ratio)	Scenario 4 (WHO Threshold Service Delivery Ratios)	Scenario 5 (Preservice Training for Service Delivery Staff -Recommended)
		Staff Numbers 2030				
Doctors	379	656	4,184	647	6,231	1,535
Nurses	3,252	2,869	19,526	5,551	8,497	8,012
CHWs	4,398	3,537	18,795	7,507	10,310	8,256
HEOs	411	607	200	702	702	604
Total	**8,440**	**7,669**	**42,705**	**14,407**	**25,739**	**18,406**
	Population to Service Delivery Staff Ratio 2030*					
Doctors	6,637:1	17,277:1	2,707:1	17,512:1	1,818:1	7,380:1
Nurses	17,512:1	3,949:1	580:1	2,041:1	1,333:1	1,414:1
CHWs	2,041:1	3,203:1	603:1	1,509:1	1,099:1	1,372:1
HEOs	1,509:1	18,663:1	56,645:1	16,138:1	16,138:1	18,756:1
Total Staff	**16,148:1**	**1,477:1**	**265:1**	**786:1**	**440:1**	**616:1**
	Staff Costs 2030 (Millions of Kina at 2009 Prices)					
Doctors	34	59	377	58	561	138
Nurses	74	65	443	126	193	182
CHWs	73	59	312	125	171	137
HEOs	11	16	5	19	19	16
Total	**192**	**199**	**1,137**	**328**	**944**	**473**

Costs Kina	Mn 2009	Prices				
Expected Recurrent Budget	513.0	1,460.5	1,460.5	1,460.5	1,460.5	1,460.5
Service Staff Costs as % of Budget	37.3	13.6	77.7	22.4	64.5	32.3
Nurse & CHW Training Costs	5.7	6.5	96.4	17.5	40.5	28.6
Quality-Enhanced Training Costs	8.5	9.7	149.1	26.9	70.3	43.5
Training Costs as % of Recurrent Budget	1.1	0.4	6.6	1.2	2.8	2.0
Quality-Enhanced Training Costs as % of Recurrent Budget	1.6	0.7	10.2	1.8	4.8	3.0

Note: * Population ratios based on high population estimates.

is, there is no change in the current preservice training capacity for doctors, nurses, CHWs and HEOs.

The scenario shows an impending crisis that will result in a fast shrinking service-delivery workforce. The total number of direct service-delivery staff will fall from 8,440 in 2009 to 7,669 in 2030, and the population to staff ratio more than double from 786 to one staff to 16,418 to one staff over the same period. Most significantly, there would be a large decline in CHWs and nurses—the backbone of rural service delivery. Although the number of doctors and HEOs would expand slightly, the population per doctor and HEO would decline. Total staff costs would only increase slightly from K191.3 million now to K198.3 million in 2030, while the share of the health budget allocated to staff would decline sharply from 37.3 percent to 13.6 percent over the period.

Scenario 1 underscores the crisis facing the human resource requirements of PNG's health sector over the next two decades if there is no change in human resource supply capacity. There will be a major staff supply crisis, a major decline in staff relative to the population, and a huge decline in CHWs and nurses, the backbone of rural service delivery.

Scenario 2: Aspirational targets envisioned by PNGDSP 2010–2030. This scenario is driven by the PNGDSP's proposed plan for sharply expanding human resources for health and achieving ambitious health outcome targets. It envisages the total service delivery staff increasing from a base of 8,440 in 2009 to 42,705 by 2030, an increase of over 400 percent. The population to service delivery staff ratio would improve from 786 per staff in 2009 to only 265 per staff by 2030—far below what even the WHO proposes for a country at PNG's epidemiological stage. The plan calls for an increase in:

- doctors from 379 in 2009 to 4,184 by 2030.
- nurses from 3,252 in 2009 to 19,526 in 2030.
- CHWs from 4,398 in 2009 to 18,795 in 2030.

This scenario is not affordable given the expected growth of the economy and the health budget. Specifically, staff remuneration, assuming all staff are financed by government, would increase from K191.3 million in 2009 to K1,135 million in 2030—a real increase of about 500 percent over 21 years (or over 20 percent per year). The share of the health budget allocated to staff would increase from 37.3 percent to 77.7 percent by 2030, an unsustainably high share. The recurrent costs of training nurses and CHWs would increase from K5.7 million in 2009 to K96.4 million by 2030. The real costs of a "quality-enhanced" training package would increase from K8.3 million in 2009 to almost K150 million in 2030. This would represent 8.5 percent of the budget in 2030 for current-level quality training and around 10 percent with the "quality- enhanced" training package.

Scenario 2 demonstrates that the extremely ambitious aspirational targets envisioned by PNGDSP 2010–2030 are not only unaffordable but fail to adequately reflect the likely needed composition of cadres in the future health workforce.

Scenario 3: Maintaining existing population to service-delivery ratios. This scenario is driven by population growth. It assumes that the core direct service-delivery health cadres maintain their current share of the workforce and the current (2009) population-to-staff ratios over the period 2009–30 which would be in keeping with the NHP's thinking that no major adjustment needs to be made in the structure of delivery cadres. The scenario suggests that additional demand for services can be achieved by using the existing staff more efficiently and letting the workforce grow at the rate of population growth.

Under this scenario, the number of doctors would increase from 379 in 2009 to 647 in 2030, sustaining a population to doctor ratio of 17,511 to one. The number of nurses would rise from 3,252 in 2009 to 5,551 in 2030, sustaining a population to nurse ratio of 2,041 to one. The number of CHWs would grow from 4,398 in 2009 to 7,507 in 2030, sustaining a population to CHW ratio of 1,509 to one. The number of HEOs would increase from 411 in 2009 to 702 in 2030, sustaining a population to HEO ratio of 16,148 to one. As for maintaining the population to service-delivery staff ratio of 786 to one, total service delivery staff numbers would need to increase from 8,440 in 2009 to 14,407 in 2030.

This scenario is probably affordable but unlikely to result in the right mix of cadres required for the health workforce. The real remuneration costs would grow from K191.3 million in 2009 to K326.5 million in 2030–

an increase of 2.8 percent per annum (the estimated rate of population increase). This would be more than affordable given the expected recurrent health budget growth of 5 percent per annum in real terms. In this scenario the share of staff costs in the health budget would decline from 37.3 percent in 2009 to 22.4 percent by 2030.

Scenario 3 shows that it is affordable to maintain the existing population to service-delivery ratios but probably would not result in the right mix of cadres required for the health workforce.

Scenario 4: WHO recommended "threshold" service-delivery staff-density targets. This scenario is driven by the WHO "threshold" density of 2.28 per 1,000 population (or population-to-staff ratio of 439 to 1) of doctors, nurses (registered and enrolled), and midwives, below which, according to WHO, coverage of essential interventions—including those necessary to reach the health-related Millennium Development Goals (MDGs)—is not likely. The breakdown would be a doctor density of 0.55 doctors per 1,000 and a nondoctor staff density of 1.73.

This would mean an overall increase in total staff from 8,440 in 2009 to almost 26,000 in 2030—an increase of over 200 percent over 21 years. This is a significant expansion of staff but one that is substantially lower than the almost 43,000 proposed in Scenario 2. Similarly, this scenario projects a population-to-staff ratio by 2030 of 440 to one, a big improvement from the current 786 to one, but not as much as in Scenario 2 (265 to one). By cadre, Scenario 4 projects that:

- The number of doctors would rise from 379 in 2009 to 6,231 by 2030, with the population-to-doctor ratio improving from the current 17,512 to one to 1,818 to one by 2030. The proportion of doctors in the direct service-delivery workforce would rise from 4.5 percent in 2009 to about 25 percent in 2030.
- The number of nurses would increase from 3,252 in 2009 to 8,497 in 2030, with the population-to-nurse ratio improving from 2,041 per nurse in 2009 to 1,333 per nurse in 2030.
- The number of CHWs would grow from 4,398 in 2009 to 10,310 in 2030, with the population-to-CHW ratio improving from 1,509 to one in 2009 to 1,099 by 2030.
- The number of HEOs would grow at the same rate as the population because they represent a small proportion of the total (411 in 2009 to 702 in 2030).

This scenario, however, is not affordable given expected economic growth and the health budget. To begin with, staff remuneration would increase from K191.3 million in 2009 to K942.2 million in 2030—a real 390 percent budgetary increase over 21 years (or about 18 percent per year). As a percentage of the recurrent health budget, staff remuneration would increase from 37.3 percent in 2009 to 64.5 percent by 2030, an unsustainably high share. The recurrent costs of training nurses and CHWs would jump from K5.7 million in 2009 to K40.5 million by 2030. The real costs of a "quality-enhanced" training package would rise from K8.5 million in 2009 to about K70 million in 2030.

Scenario 4 is not affordable, particularly in the outer years, and it recommends a doctor-to-population ratio that is probably not feasible from a supply constraint perspective and is lower than is needed to meet the population's health needs—raising questions about cost-effectiveness.

Scenario 5: A suggested preservice training scenario for direct service-delivery staff. This scenario—the broadly recommended one—envisages a new mix of direct service-delivery staff. It is driven by: (i) the growth in the resource envelope likely to be available for health and service-delivery staff; and (ii) the feasibility and speed with which preservice training can be ramped up to meet the demands of workforce attrition and the needs of a growing population.

Specifically, it calls for a reasonable expansion of the number of doctors (to be targeted for rural facilities) and an expansion of general nursing graduates relative to CHWs. It also assumes that the existing capacity for producing HEOs is sustained given their value as a vital management and supervisory cadre, especially for rural health. Underlying this scenario is a firm suggestion that there needs to be a significant expansion of recurrent (and capital) resources to support: (i) the expansion of pretraining and in-service training; (ii) additional staff for support services; and (iii) more quality-enhancing nonsalary budget expenditures.

In Scenario 5, staff numbers would rise from 8,440 in 2009 to 18,406 in 2030—an increase of 118 percent. This would sustain an improvement in the population to direct service-delivery staff ratio from 786 to one in 2009 to 616 to one in 2030. By cadre the mix would change as follows:

- The number of doctors would rise from 379 in 2009 to 1,535 in 2030. The population-to-doctor ratio would improve from 17,512 per doctor in 2009 to 7,380 per doctor in 2030. By 2030 doctors would represent 8.4 percent of the workforce, up from 4.5 percent in 2009.
- The number of nurses would increase from 3,252 in 2009 to 8,012 by 2030. This will enable the population-to-nurse ratio to improve from around 2,041 to one nurse in 2009 to 1,414 to one by 2030. Nurses would represent 44 percent of the workforce in 2030, up from 38.5 percent in 2009.
- The number of CHWs would grow from 4,398 in 2009 to 8,256 in 2030. The population-to-CHW ratio would improve from around 1,500 to one CHW in 2009 to about 1,372 per CHW in 2030. CHWs would represent about 45 percent of the workforce in 2030, slightly down from 52 percent in 2009.

Scenario 5 is affordable. The cost of employing all staff would increase from K191.3 million in 2009, or about 37 percent of the total health recurrent budget, to K472 million in 2030, or about 32 percent.

Space would be left for training costs and other quality-enhancing efforts to improve health care delivery. The recurrent costs of training nurses and CHWs would increase from K5.7 million in 2009 to almost K29 million by 2030. The real costs of a "quality-enhanced" training package would rise from K8.5 million in 2009 to almost K43.5 million in 2030. This would represent 2 percent of the heath recurrent budget in 2030 for current level quality training of nurses and CHWs and 3 percent with the "quality-enhanced" nurse and CHW training package. The costs of employing this number of doctors in real terms would increase from K34 million in 2009 to K138 million in 2030. The costs of employing nurses would rise in real terms from about K74 million in 2009 to K182 million in 2030 while the costs of employing CHWs would rise from K73 million in 2009 to K137 million by 2030.

Scenario 5 is affordable, responds to the demand requirements for staff from the health system, and leaves space for recurrent health resources to be allocated to a significant expansion of training (preservice and in-service)—while also leaving space for increased allocations to both support staff and quality- enhancing nonsalary budgets.

Recommendations and Options

This report identifies a number of issues that require decisive action by the government. They fall into five groups: (i) information deficits; (ii) training curriculum; (iii) service-delivery cadres; (iv) service-delivery staffing; and (v) the role of development partners.

Information Deficits

Issue: A serious information constraint on the health workforce and its trends completely undermines NDoH capacity to monitor the health workforce.

Recommendation 1. The NDoH should create a management committee with appropriate support from qualified technical NDoH staff to review human resource data requirements for management and planning purposes and to decide how best to rationalize current data system arrangements (within NDoH's control).

Recommendation 2. The NDoH should immediately reestablish—and make operational—the Health Professionals Database(s). This is critical for further insight into the scale and operational trends of the private sector.

Issue: There is highly inadequate information available on the capacity and operations of health-related training institutions.

Recommendation 3. The NDoH and the Office of Higher Education (OHE) should form a joint ad hoc management committee to determine how best to generate the key information required on health training program enrollment policies (including all universities), institution throughputs by program, and costs. This needs to be agreed at a high level (perhaps with an "all of government approach") and involve the mission training facilities (currently mission nurse training is under partial OHE's oversight and CHW training is under NDoH oversight).

Training Curriculum

Issue: A range of critical curriculum issues must be dealt with, including (i) the appropriate level of training on birth complications and emergency obstetric care; (ii) how and whether to monitor and ensure that nurses and CHWs are taught the full agreed curriculum on family planning, STIs, and HIV prevention; (iii) how to boost universities' accountability to NDoH and other major employers to meet nationally set curriculum standards; and (iv) defining in-service training program requirements (including special modules on emergency obstetric care for nurses and CHWs).

Recommendation 4. The NDoH Executive should weigh how to deal with the "all of government" issues that arise because the evolving institutional structures for health worker training have not been kept synchronized. It should do this in consultation with OHE, universities, representatives of other health-related training institutions, and the central government agencies (including the Treasury and its Budgets Division and the Department of National Planning and Monitoring (DNP&M)).

Service-delivery Cadres

Issue: The report suggests: (i) the expansion of the health workforce with modest changes in the composition of the workforce mix by cadres (Scenario 5)—more doctors and nurses relative to CHWs; (ii) further work on nondirect service-delivery staff and postgraduate training requirements; (iii) further consideration of how best to deal (in staff training terms) with the major health problems (including emergency obstetric care); and (iv) a review of hospital needs—especially the role of CHWs in hospitals, given that they were trained for rural areas, and whether a new cadre in hospitals is needed.

Recommendation 5. NDoH management needs to make decisions on the issues raised in this report following extensive consultation with key stakeholders. These include: (i) the immediate steps needed to respond to the impending crisis in direct service-delivery staff (such as expanding general nurse and CHW preservice training); and (ii) which broad scenario discussed in this report (or another arising from further dialogue) should underpin the "emergency response" to human resources for the health sector. As discussed, "no change" on the training supply side is not a feasible option. A specific set of decisions need to be made on: (i) the mix of cadres; (ii) the future of HEOs (and the use of specialty nurses or nurse practitioners); (iii) the relative balance of pre- and in-service training of nurses and CHWs; and (iv) how to deal with emergency obstetric care knowledge in the health workforce.

Service-delivery Staffing

Issue: One important implication of the analyses (in all five scenarios) is that there will be a serious drop in the number of nurses and CHWs over the period of the current NHP and extending into the next NHP period because the attrition rate of the health workforce will exceed the numbers being trained and entering the workforce.

Recommendation 6. NDoH management should annually match supply and demand or build scenarios for human resource development—from the top down and the bottom up. This could be linked to the MTEF process and the process of expanding and redeveloping the health system province by province.

Recommendation 7. The PNG Government should establish a Whole-of-Government Taskforce—comprising at least NDoH, church health agencies, OHE, relevant universities, DNP&M, Budgets Division of Treasury, Economic Policy Division of Treasury, National Department of Education, Prime Minister's Department, and the Department of Personnel Management. The taskforce should immediately review options to:

- develop a costed plan to expand training capacity as agreed that should also explore short–term options to expand supply capacity with training institutions;
- explore options and incentives to encourage existing staff retention through incentives to reduce early retirement and postpone retirement;
- explore options to encourage redeploying staff to rural areas and deploying new graduates to rural areas, particularly those with staff shortages; and
- significantly refurbish existing training facilities.

This taskforce should also be responsible for addressing the set of "Whole-of-Government" implementation

issues that arises because NDoH lacks responsibility for their implementation.

Role of Development Partners

Issue: Development partners have recognized the need for this study and have been concerned for some time about the impending crisis in human resources for health based on the fragmentary evidence that was previously available.

Recommendation 8. This report should be widely discussed and disseminated throughout NDoH, the government, and church agencies. The World Bank could give further presentations to: (i) the National Executive of NDoH; (ii) core related agencies (including DNP&M, Treasury, and OHE); (iii) a special meeting of church agencies; and (iv) development partners accompanied by senior NDoH staff who will be responsible for driving the implementation of the report's recommendations. This could be followed by a one to two day conference to discuss the results, leading to the development of a strategic plan in response to the issues identified in the report.

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1. Introduction

This report documents for the first time in over a decade the current stock of the publicly financed health workforce in PNG and their characteristics and deployment across the country by type of health facility and health cadre. It also documents the capacity of the health-related training institutions and presents the results of an important survey of health training institutions which enable unit costs, staffing and other aspects of the institutions to be analyzed together with a qualitative assessment of the quality of students and of facilities by training school principals. The report presents a set of five demand scenarios and draws out the implications for the health training system and of the health budget for these scenarios.

The report is set within the context of important work done by the government in the recent past on health. The National Department of Health (NDoH) has produced a new National Health Plan 2011–2020 (NHP) which sets out the strategic directions for the development of the health sector over the next decade. The NHP has been framed within: (i) a new, more strategic, 40–50 year framework launched by the Government of Papua New Guinea (GoPNG)–Papua New Guinea Vision 2050 (sponsored by the Department of National Planning and Monitoring (DNP&M) and the subsequent Papua New Guinea Development Strategic Plan 2010–2030 (PNGDSP) which maps out "how to get PNG to where our Papua New Guinea Vision 2050 wants us to be"; (ii) the Medium-Term Development Plan 2011–2015 (MTDP) which sets out the specific inter-sectoral targets to be achieved over the next five years; and (iii) the NDoH's Medium-Term Expenditure Framework 2011–2015 (MTEF).

The NHP recognizes that the emerging crisis in the health human resources area is a critical issue confronting any viable strategy designed to implement the objectives it has set for the health sector. This report helps document the nature of this emerging crisis and makes specific recommendations on the way forward.

1.2. Health System Structural Changes: Emergence of an Almost Unmanagable System

By the time of independence (in 1975), a formal government-funded health system provided basic primary health care in most parts of the country through frontline workers with minimal amounts of training and limited basic drugs. Various Christian missions supplemented government efforts through government-subsidized health services. The system was managed by a centralized health department which managed the whole system, including hospitals, and delegated powers to regional, district, and line staff and facilities. Since independence, however, there have been successive attempts to decentralize the provision of services to provincial and district governments and to allow provinces (and local-level governments) to have enhanced control over health sector resources.

In 1995 the New Organic Law on Provincial and Local Level Government (NOL) devolved primary health care services to provincial level. The provinces are responsible for managing primary health care services (with local-level governments and communities responsible for maintaining health facilities) managed by a provincial health advisor reporting to a provincial administrator as the chief accountability officer for all health staff and primary health services. For budget and personnel management purposes, each province deals directly with the central agencies responsible for budget, as well as personnel

management and planning–independently of the NDoH. The NDoH has retained responsibility for: (i) policy oversight, albeit with very limited capacity for enforcement; (ii) hospitals, which are now managed by autonomous boards able to make budget and human resource decisions including management of their own payrolls independently of the NDoH; (iii) pharmaceutical purchases; and (iv) coordination of most external resources to the health sector, as agreed with the central agencies and individual development partners.

The 19 provinces and 20 hospitals and a largely publicly funded church health system operate in a very diffuse and largely uncoordinated manner. This system accounts for about one-half of all ambulatory care–a not insignificant share of inpatient care days. For the purposes of this study it meant that the workforce is scattered across the 40–50 distinct entities with their own independent payrolls and Human Resource (HR) Management Information Systems (HRMIS) with the consequence that NDoH has no ability to centrally monitor HR trends and effectively fulfill its HR planning and oversight roles.

The health system employed about 13,000 staff in 2009 and its infrastructure primarily comprises 19 provincial hospitals, 73 urban clinics, 192 health centers, and 447 health subcenters. There were about 2,000 health posts–but many more were previously operational. One study showed that at least 300 health posts closed between 1995 and 2000 mainly affecting those in lower-asset quintiles and those living in remote areas. NDoH cannot verify how many aid posts are now operating with any surety. Further, over the past decade or more many staff have retreated from peripheral health facilities and work at more centrally located facilities even though they are formally recorded as working at the more peripheral facilities.

In response to these identified problems, and to redress some of the key issues arising from the NOL, the NDoH has recently initiated legislative and organizational changes. The legislative changes, which have now been passed by parliament,[1] enable provincial governments to establish Provincial Health Authorities (PHA) to be responsible for both primary and secondary health care (hospitals) in the province. These are currently split between national and provincial governments. NDoH has also initiated a major organizational restructure which will enable it to better: (i) provide technical support and guide priority provincial programs rather than implement them; (ii) monitor and evaluate overall sector performance; and (iii) support efforts to ensure human resources, logistics support and infrastructure planning do not continue as key constraints to service-delivery capacity.

1.3. Health Outcomes Remain a Serious Challenge

Health outcomes have stalled over the last quarter century and have even declined in the decade to 2000, with maternal (MMR) and infant mortality rates (IMR) and communicable diseases remaining unacceptably high. The high maternal and infant death rates and communicable diseases dominate the burden of disease–accounting for about 60 percent of the total disease burden. Women are particularly disadvantaged, as evidenced by poor maternal health and lack of access to family planning. By 2000, infant and maternal mortality had declined to 64 per 1,000 live births (72 in 1980) and 370 per 100,000 live births (400 in 1980) respectively. In the Highlands region, however, the MMR had increased to 625 per 100,000 around 2000. Total fertility remained high at 4.6 children per woman (albeit down from 5.4 in 1980) and contraceptive prevalence rates remained low at 26 percent. Preliminary results from the just-completed 2006 Demographic Health Survey reinforce the crisis in health outcomes and the real challenges PNG faces in achieving its national MDG goals. The national MMR is reported to have almost doubled since 2006 to be 733 per 100,000 while there have been modest improvements in the aggregate IMR since 2000 which is reported to have fallen to 57 per 1,000 live births.[2]

Pneumonia and diarrhea, together with underlying malnutrition, are the most important causes

[1] This refers to the Provincial Health Authority Act (2007), which enables streamlining of provincial health services, bringing together the provincial health departments, hospitals and district health services under one management board thus unifying the structure of the previously fragmented public health services at the subnational level. Critically, this legislation enables provinces to decide to opt in to this framework–it is not compulsory. One province, Eastern Highlands, has formally agreed to opt in to this framework. A number of others are seriously considering it.The national government cannot make this compulsory without an "Organic law" or constitutional change to the powers held by the national government.

[2] Disaggregated data by region is not yet available.

of post-neonatal death in young children. The recent DHS reports a slight improvement in neonatal deaths compared to the 1996 DHS results with 29 per 1,000 compared to 32 in 1996 and in post neonatal deaths and improvement from 38 per 1,000 in 2006 to 28 in 2006. Among adults, the disease burden is still dominated by infectious and vector-borne diseases, especially tuberculosis and malaria respectively. This situation is seriously compounded by HIV which is now well established in the form of a generalized and accelerating heterosexually transmitted epidemic–one of the most serious in the region. Bank estimates in 2005/06 indicate HIV prevalence among sexually active adults exceeds 1 percent in rural areas, 2 percent in many urban/enclave areas and 3 percent in the capital, Port Moresby. More recent consensus workshop estimates suggest HIV incidence may have fallen. The World Bank, in cooperation with government and other development partners is undertaking a national HIV Bio-behavioral survey–a crucial step–to better understand the scale and drivers of the epidemic in PNG in parallel with this proposed piece of sector work.

1.4. Government Health Expenditures Substantial But Inefficient and Fragmented

In 2004 public health expenditures represented 11.9 percent of total public expenditures and 3.8 percent of GDP representing a substantial commitment to health. Nevertheless, the poor health status of the population has also been accompanied by a decline in health system performance with decreased coverage and quality of services despite a substantial increase in public spending on the health sector of 35 percent in real terms between 1996 and 2004 (the latest year for which there is a full statement of public expenditures on health).[3]

Over the period 1996 to 2004 there were very significant changes in the composition of health expenditures which have threatened the quality of health expenditures. Recurrent health expenditures declined by 9.4 percent in real terms while development expenditures–mostly donor financed–increased 110 percent. Government expenditures on goods and services fell 27 percent in real terms while expenditures on capital items fell 77 percent. At the same time expenditures on salaries increased 10 percent in real terms. Significantly, at least 300 aid posts were closed between 1995 and 2000, antenatal coverage declined from 80 percent in 1991 to 58 percent in 2004 and there were frequent shortages of basic drugs in most rural and urban health facilities.

1.5. The Emerging Human Resource Crisis: The Reason for the Study

The last few national health conferences and NDoH management have clearly recognized that health human resources are becoming the major long-term constraint on the capacity of the health sector–public and private–to deliver improved health services over the next decade and more. Partial evidence showed the health workforce was aging quickly–particularly those cadres responsible for delivering front-line health services to the rural population and urban poor (Community Health Workers or CHWs, nurses and midwives)—and large swathes of the peripheral health services have collapsed. At the same time, there was concern that the capacity to train all cadres of health staff had also been significantly reduced over the past 15 years or more to the point that it is now producing new qualified staff well below historic attrition rates from the workforce. There was concern that attrition rates could be increasing significantly because of the age of the workforce. Without drastic short- and longer-term action on the supply side–which will take at least the best part of the next decade with concerted efforts beginning immediately—both short- and long-term human resource supply gaps are to be expected. The report shows that these concerns were well founded.

While previous health conferences as long as a decade ago–including the Mount Hagen Health Conference in 2002–recognized that health human resource constraints were looming, other structural challenges facing the health system have also loomed large and received more attention. These include problems with decentralization and establishment of coherent health

[3] The fragmentation of health authorities as noted above also means that there is no central point for consolidation of either government-financed or donor-financed health expenditures. No effort has been made since 2004 by either government or development partners to sustain the efforts of the initial health SWAP team to generate this data.

systems at the provincial level. On the human resource side NDoH also recognized that there were problems with the numbers of people on the various and dispersed health payrolls and that many were not legitimate. Considerable efforts over the past years have been devoted to installing a new payroll system and trying to confirm all health employees on the payroll were legitimate. In 2005 it was estimated that perhaps K20 million could be saved by cleansing the payroll of inappropriate and ghost workers. Significant efforts have been made by NDoH management to complete these reforms.

Efforts to validate the existing stock of qualified health workers actually working within the health system has met with only partial success. The process of validating the age, qualification, experience and other characteristics of the existing health workforce on the payroll system has all but collapsed. This meant that the original plan for the study to use the payroll system was not possible. The base line headcount for staff was established through a special survey undertaken by NDoH for the NHP. This study used this data together with other data sets to estimate the characteristics of the workforce as outlined in Chapter 2 Annex 1.

Thus there was an emerging consensus and recognition of an evolving HR crisis and a belief that: (i) HR–rather than resources–was emerging as a major binding constraint on achieving health outcome objectives; and (ii) relieving the HR crisis needed to become a major theme of both the NHP and the health MTEF.

1.6. Outline of the Report

Chapter 2 documents the size of the publicly financed health workforce for the latest year for which data is available (2009) and trends in the total size of the health workforce since 1988. As background to a discussion of the deployment of publicly financed health staff, the current number and location of health facilities by type and management arrangement is documented. The composition of the total publicly financed health workforce is then analyzed by rural-urban (overwhelmingly hospital) deployment, occupation and whether in service delivery, service-delivery support or administration. Subsequent analysis focuses on the distribution of health staff by province and the provincial equity of provincial staff distribution compared to population. Finally, details are provided on the distribution between hospitals and rural service delivery of the key service-delivery occupations by sex and age group. The chapter concludes with a summary of the numbers and proportions of each service-delivery occupation currently at retirement age and those that will reach retirement age over the next decade.

Chapter 3 outlines the current capacity of the health workforce-related training system in PNG. It particularly focuses on the current size of the training effort for the major service-delivery occupations as outlined in Chapter 2–doctors, HEOs, nurses and midwives and CHWs. It starts with an outline of the current institutional arrangements for the training of the health-related workforce, including the formal responsibilities and configuration of the current health-related training system. The chapter also notes how responsibilities have evolved and significant gaps emerged in the coherence of the training system over the past two decades. In this context it notes the emergence of two important gaps in the current institutional relationships–the diffusion of responsibility for the oversight of the training and a continuing serious lack of information on the need for training institutions outputs. The chapter concludes with a summary documentation of the health-related postgraduate training program enrollments and graduates for 2009.

Chapter 4 reviews in considerable detail the characteristics of two categories of health training institutions–the Schools of Nursing (SoNs) and Community Health Worker Training Schools.[4] These institutions are responsible for supplying the core of the health-delivery system in PNG. To this end Chapter 4 documents and discusses: (i) expenditures of the training schools; (ii) staff-student ratios and the unit costs of students in each of the nurse and CHW training institutions; and (iii) characteristics of nurse and CHW trainers–qualifications and teacher-training qualification, as well as the age, sex and years of experience of the teaching workforce in each of the two types of training schools. Chapter 4 also reports the details of a qualitative and quantitative assessment of

[4] The information reported in this chapter is derived from the Health Training Facilities Survey of 2009. This Survey was conducted jointly with the Secretariat of the Garnaut–Namaliu Review of Higher Education. By and large the universities did not respond to the survey—as a consequence only data on the SoNs and CHW training schools can be reported.

the conditions under which these training schools operate (as reported by principals). This includes the quality of teaching support and teaching processes and the quality of buildings and equipment.

Chapter 5 explores factors which may affect the demand for health service-delivery staff over the coming two decades. It notes that there is an expectation that more resources will be available to health than in the immediate past, however, it is still too early to be sure what the full revenue implications to government of the LNG project and other developments will be. Nevertheless, as discussed in Chapter 5, the report does assume economic growth rates will be positive and significantly above those recorded in the past decade. The NHP projects that the population will increase at about 2.8 percent per annum over the next decade while the PNGDSP expects annual population growth to fall to about 2.5 percent over the period 2020 to 2025 and to 2.1 percent between 2025 and 2030. As discussed in more detail in Chapter 5, this report has used the NHP population projections for the period through 2020 and has subsequently assumed for the period 2020–2030 the population growth rate will begin a modest decline.

The NHP proposes to turn the current decline in outpatient services per capita in rural areas around–following a substantial decline in recent years. This will be achieved by a variety of actions but, strategically, the proportion of the budget available for service-delivery staff will decline while that for nonsalary quality-enhancing expenditures will increase–albeit of an expanding budget in real terms per capita. Chapter 5 summarizes five scenarios–one of which assumes that there is no change in existing supply capacity for direct health service-delivery staff and demonstrates the human resource crisis facing the health sector and four alternative demand scenarios with supply adjusted to meet the postulated demand.

Chapter 6 presents the detailed demand and supply projections for the five scenarios described in Chapter 5 and, within each scenario, the implications for each cadre. In addition to showing the detailed (year-by-year) growth of the direct service-delivery staff (by cadre) implied for each scenario, the detailed tables also show: (i) the expected trend (given the population projections discussed in Chapter 5) in population to staff and staff per 1,000 population ratios; (ii) the expected attrition from the workforce; (iii) the expected outputs from the training schools in the initial years of the NHP (prior to implementing any expansion plans and allowing for new trainees to graduate) as well as how fast graduations from training schools will need to ramp upwards to the employment targets implied by each of the scenarios; (iv) the first year intakes to respective training schools required to ensure–given expected dropout rates for each school–the needed graduates to reach the employment targets for the specific scenario; and (v) the costs in 2009 prices of employing all the graduates. The recurrent costs of training both nurses and CHWs based on unit costs of 2009 and "quality-enhanced" unit costs of training are also shown.

Each set of scenario tables is summarized in a summary table looking at the total service-delivery staff. This includes: (i) staff to be employed; (ii) population to service-delivery staff ratios and total service-delivery staff per 1,000 population ratios; and critically (iii) it shows the direct service-delivery staff salary costs of each scenario, the expected total recurrent budget (as discussed in Chapter 5) and the share of the total service-delivery staff costs of the expected total recurrent budget. Finally, the implications for policy on the expansion of direct service-delivery staff training programs are discussed for each scenario together with the total recurrent costs of training of nurses and CHWs.

Chapter 7 presents the core recommendations of the report. These relate to: (i) future priorities for data system development for health human resources; (ii) institutionalization of the documentation of the existing supply capacity for health human resources; (iii) curriculum issues for core health service-delivery staff (including for emergency obstetric care); (iv) summarizes the core training system expansion recommendations arising from the recommended scenario for the future development of health service-delivery staffing; (v) the establishment of a "Whole-of-Government" Taskforce to manage implementation of the key agreed recommendations from the report; and (vi) an extensive consultation process on the key results of the report in order to establish a national consensus on the way forward.

CHAPTER 2

CHARACTERISTICS OF THE CURRENT HEALTH PUBLIC SECTOR WORKFORCE

2.1. Introduction

This chapter documents the size of the publicly financed health workforce for the latest year for which data is available–2009—and trends in the total size of the health workforce since 1988. As background to a discussion of the deployment of publicly financed health staff, the current number and location of health facilities by type and management arrangement is documented. The composition of the total publicly financed health workforce is then analyzed by the rural-urban deployment, occupation and whether they are in service delivery, service-delivery support or administration. Subsequent analysis focuses on the distribution of health staff by province and the equity of the distribution of provincial staff compared to population. Finally, details are provided on the distribution between hospitals (overwhelmingly urban) and rural service delivery of the key service-delivery occupations by sex and age group. The chapter concludes with a summary of the numbers and proportions of each service-delivery occupation currently at retirement age and those who will reach retirement age over the next decade.

2.2. Size and Deployment of the Health Workforce

Data on the size and characteristics of the publicly financed health workforce are woefully inadequate while data on the workforce in the private sector is almost nonexistent. Nevertheless, there are a number of data systems which purport or aim to provide insights on the size and distribution of the workforce—both public and private. For a range of reasons these are only partial and often duplicative. The problems with the existing data sources are discussed in Annex 2.1 to Chapter 2.

In recognition of this problem the Human Resources Division of NDoH undertook a special National Headcount Survey (NHCS) in 2009 to establish a reasonable estimate of the current size of the publicly financed health workforce in order to form a basis for the new National Health Plan 2010–2020. This is the best single estimate of the total size of the current health workforce employed by government and missions and thus of the health workforce financed by the public budget. This survey collected information on only the major occupations and sex of health staff. Other information on the workforce had to be derived from other, sometimes partial databases. The method by which characteristics of the health workforce, particularly age, have been estimated is discussed in Annex 2.1 to Chapter 2.

In the last quarter of 2009 it is estimated by the NHCS that there were a total of 12,608 health staff employed—although this survey did not cover the staff employed by NDoH in Port Moresby. It is estimated by the Human Resource Information System (HRIS) of the NDoH that there were 455 staff employed by NDoH in 2009. Thus total staff financed by government in late 2009 is estimated at 13,063 (Table 2-1). The overall size of the health workforce financed by the public sector has grown from 10,791 in 1998 to 13,063 in 2009—an overall increase of 21.1 percent in the last 11 years or a growth

Table 2-1: Composition and Growth of the Public Sector Health Workforce 1988–2009

Category	1988	1998	2004	2009	Change 1998–2009 (%)	Change 2004–2009 (%)
Doctors and Dentists	384	316	524	570	80.4	8.8
HEOs	357	233	575	486	108.6	–15.3
Nurses	2,917	2,920	3,980	3,618	23.9	–9.1
Allied Health	283	372	440	318	–14.5	–27.7
Med Lab. Technical	159	150	254	258	72.0	1.6
CHWs	4,982	3,926	5,358	4,419	12.6	–17.5
Other/Administration	–	2,874	1,224	3,394	18.1	177.3
Total	**9,082**	**10,791**	**12,355**	**13,063**	**21.1**	**5.7**

Source: Data for 1988, 1998 and 2004 as presented in and documented in Chapter 2 of Strategic Directions for Human Development (World Bank, 2007) and 2009 from the NHCS 2009 (NDoH, 2009).

of 1.9 percent per annum. During this time the population is estimated to have increased at about 2.8 percent per annum. Between 2004 and 2009, the workforce increased by only 5.7 percent—from 12,355 in 2004 to 13,063 in 2009. This represents an increase of 1.1 percent per annum and is somewhat slower than the estimated rate of population increase and significantly lower than that recorded over the period 1998–2004 of 14.5 percent or about 2.4 percent per annum.

It is interesting to look at the trends in the numbers for specific occupations within the health sector. The number of doctors (and dentists) has increased significantly over the past 11 years (80 percent) and five years (9 percent) respectively. The number of HEOs apparently increased quite fast over the last 11 years (109 percent) but the numbers appear to have declined over the past five years. The number of nurses increased 24 percent over the last 11 years but recorded numbers over the last five years indicate that there has been a 5 percent decrease in numbers. A similar story is apparent for CHWs—over the last 11 years numbers increased by nearly 13 percent and in the last five years declined 17 percent. The data from the NHCS indicate that the numbers allocated to Other/Administration have increased dramatically (177 percent) over the past five years and 18 percent over the past 11 years.

As noted above, and discussed more fully Annex 2.1 to Chapter 2, data on staff in the health sector is far from robust. The data for 2004 sourced from the national payroll has major constraints and probably overestimated the number of nurses by 1,000 and CHWs by 1,700 due mainly to significant ghost workers on the payroll and inadequate payroll cleansing. Nevertheless, the 2004 data does show the staff numbers the health sector was paying for in 2004. It is estimated that the number of doctors was approximately correct.[5] If these numbers are correct then the number of nurses may well have been steady over the period 1988 to 2004 but have increased over 20 percent in the last five years. The picture is similar for CHWs—the numbers will have been steady over the period 1988 to 2009 but have shown some increase over the past five years. Data for Other/Administration in 2004 were also problematic and probably underestimated—thus the apparent increase 2004 to 2009 is probably overestimated.

Health outcomes and the cost effectiveness of those outcomes are strongly influenced by the size, composition and deployment of the health staff. The deployment of staff is strongly influenced by the number and location of facilities. Table 2-2 summarizes the rural-urban location, type of facilities and who manages facilities financed by the public sector in PNG. The public sector finances the operation of some 2,746 health facilities.

The most striking feature of the structure of facilities is the overall importance of Aid Posts—notwithstanding the closure of many over the past 10–15 years

[5] This is discussed extensively in Chapter 2 and Annex 2A of Strategic Directions for Human Development in Papua New Guinea (World Bank, 2007).

Table 2-2: Total Number of Publicly Financed Health Facilities

Facility Type	Government	Mission	Other	Total
Urban				
Hospitals	21	0	0	21
Urban Clinics	45	14	14	73
Total Urban	**66**	**14**	**14**	**94**
Rural				
Health Center	143	43	6	192
Health Subcenter	162	278	7	447
Rural Hospitals	4	6	2	12
District Hospitals	1	1	0	2
Clinics	1	0	0	1
Open Aid Posts	1,998	0	0	1,998
Total Rural	**2,309**	**328**	**15**	**2,652**
Total Facilities	**2,375**	**342**	**29**	**2,746**

Source: National Headcount Survey (NDoH, 2009).

or more. There are almost 2,000 Aid Posts (73 percent of all facilities)—they are government owned and managed and are essentially one-person facilities—which are rural based and offer simple curative and preventive care and support. Staffing in Aid Postaare almost exclusively CHWs and are, notionally at least, supported by either government health centers or health subcenters. Aid Posts are designed to serve small population groups of around 1,000 to 1,500. There are 94 facilities located in urban areas, including 66 owned and managed by government. This includes the 19 provincial hospitals, the Port Moresby General Hospital and one specialist (psychiatric) hospital. The government owns 45 urban clinics while missions run 14 urban clinics.

The core rural health services, which offer a range of services above the basic services provided by Aid Posts, are essentially provided from 639 health centers and health subcenters which comprise 98 percent of health facilities in rural areas—excluding Aid Posts. These facilities are almost evenly split between government and mission management—although it is noteworthy that missions run proportionately smaller health subcenters (86 percent of the total for mission centers and subcenters) than health centers while the split between government health centers and subcenters is 47 percent to 53 percent. Other, includes government owned or private sector-owned facilities whose operating costs are substantially financed by public funding. Mission facilities overall account for over 45 percent of ambulatory care visits and government facilities account for 55 percent of visits (see Annex 2.11; Table 2-1).

The current health workforce, its composition and distribution rural-urban is summarized in Table 2-3. Key observations about the current deployment of staff include:

- Medical officers and HEOs each constitute around 5 percent of the service-delivery workforce, nurses (including midwives) constitute about 40 percent of the workforce and almost 50 percent of the workforce comprises CHWs.
- Overall, 52 percent of staff (6,801) are engaged in urban areas (including NDoH, hospitals and urban clinics) and 48 percent (6,262) are deployed to rural areas.
- Direct service-delivery staff comprise 69 percent (8,954) of total staff and an additional 28 percent are involved in service-delivery support or administration.
- Staff providing technical support for service delivery (allied and ancillary health workers) total 520 (4 percent of the total workforce) or almost 6 percent of the total involved in direct service delivery.
- Administrative support, including provincial health offices, totals 3,134 and accounts for 24 percent of the

Table 2-3: Total Public Sector-Financed Health Employees Urban and Rural (2009)

Staff Category	Urban	Rural	Total	% Urban	% Rural
1. Service Delivery					
Medical Officers	332	51	383	86.7	13.3
HEOs	175	285	460	38.0	62.0
Nursing Officers	1,807	1,472	3,279	55.1	44.9
Midwives	101	192	293	34.5	65.5
CHWs	1,412	3,006	4,418	32.0	68.0
Dentists/Dental Therapists	79	42	121	65.3	34.7
Subtotal Service Delivery *	**3,906**	**5,048**	**8,954**	**43.6**	**56.4**
2. Service Delivery Support					
Medical Laboratory Assistants & Technicians	117	65	182	64.3	35.7
X-Ray Technicians	53	7	60	88.3	11.7
Pharmacists	71	21	92	77.2	22.8
Environmental Health Officers	69	74	143	48.3	51.7
Training Coordinators	33	10	43	76.7	23.3
Subtotal Service Delivery Support	**343**	**177**	**520**	**66.0**	**34.0**
3. Administration					
Administration Support	696	182	878	79.3	20.7
Other Support Staff	419	260	679	61.7	38.3
Cleaners	129	180	309	41.7	58.3
Drivers	121	216	337	35.9	64.1
Casuals	732	199	931	78.6	21.4
Subtotal Administration	**2,097**	**1,037**	**3,134**	**66.9**	**33.1**
4. Nat. Dept of Health HQ					
Medical Officers	62	0	62	100	0
HEOs	26	0	26	100	0
Nursing Officers	41	0	41	100	0
Midwives	5	0	5	100	0
CHWs	1	0	1	100	0
Dental Therapists	4	0	4	100	0
Subtotal NDoH	**139**	**0**	**139**	**100**	**0**
HQ Support Service Occupations					
Med. Lab Assistants & Technicians	13	0	13	100	0
X-Ray Technicians	3	0	3	100	0
Pharmacists	16	0	16	100	0
Environmental Health Officers	24	0	24	100	0
Subtotal HQ Support Service Occupations	**56**	**0**	**56**	**100**	**0**
Other Occupations					
Administration Support	210	0	210	100	0
Other Support Staff	50	0	50	100	0
Subtotal HQ Other Occupations	**260**	**0**	**260**	**100**	**0**
Total NDoH Staff	**455**	**0**	**455**	**100**	**0**
Total Staff	**6,801**	**6,262**	**13,063**	**52.1**	**47.9**

Sources: National Headcount Survey. NDoH staff totals from Human Resource Information System (HRIS), NDoH.
Note: * Service delivery staff in this table includes staff with these occupations working in administration at provincial level.

total workforce. In addition the NDoH headquarters accounts for an additional 455 staff (3.5 percent of the total workforce).

- Only 56 percent of service-delivery staff are deployed in rural areas (5,048) which accounts for well over 80 percent of the population, while 44 percent (3,906) are deployed in urban areas.
- Almost 50 percent of service-delivery staff (4,418) are CHWs who are trained to deliver basic services in rural-based health posts. Almost one-third of CHWs are deployed in urban areas (mainly hospitals).
- Excluding CHWs, there are more service-delivery health staff employed in urban areas (2,494 or 55 percent) than deployed in rural areas (2,042 or 45 percent).
- At an occupational level it is striking that 87 percent of doctors (332) in service delivery are in urban areas and only 13 percent (51) are servicing rural populations. In addition, there are more doctors in the NDoH headquarters (62) in nonservice delivery roles than are serving in all rural areas.
- With respect to nursing officers a majority (1,807 or 55 percent) are deployed in urban areas while 1,472 (45 percent) are deployed in rural areas.
- Midwives, critical to turning around the crisis in maternal mortality, comprise a fraction over 8 percent (293) of the total nursing stock. These numbers are clearly small but it is noteworthy that two-thirds of midwives are deployed in rural areas and there are only five in NDoH headquarters.
- There are 486 HEOs–95 percent (460) of whom are involved in direct service delivery. However, over one-third (175) are deployed in urban areas rather than in rural areas where health centers and health sub-centers that they are meant to manage are located.

Other important dimensions on the distribution of health staff include that by province and population. Staff were historically distributed by province largely on the basis of the history of the development of the health sector—whether financed by government or missions. Just after independence in 1976 provincial governments were established. This froze the recurrent budget in real terms for provincial functions (including rural health). Provinces were made responsible for the creation of new facilities but capital budgets (for maintenance and capital works) were also frozen at the 1976 level in real terms. There were no substantive explicit mechanisms embodied in the organic law on provincial government to equalize the allocation of facilities and/or staffing between provinces.

The considerable inequalities that existed in 1976 have not been systematically addressed since then. A few mechanisms through national government budget funding have attempted to address some of the most egregious anomalies with limited success—mainly because they were never institutionalized including through the National Public Expenditure Plans of the late 1970s and 1980s. The revision to the Organic Law on Provincial and Local level Government of 1996 did not address inequalities in capital stock between provinces. Simultaneously, foreign aid allocations were increasingly project-based and brought off-budget, making it very difficult to address issues as between provinces and between long run recurrent and capital costs. As a consequence, large differences in the distribution of staff (and facilities) remain (Table 2-4).

There are currently 12,292 publicly financed staff delivering health services (excluding administrative staff in provincial headquarters and in the NDoH). The following observations are made on the distribution of this staff as documented (Table 2-4):

- Government accounts for 71 percent of staff (8,732) while missions (including government facilities whose management is taken over by missions and/or private institutions) account for just over one-quarter of staff (3,560).
- The proportion of government staff by province varies very significantly – from a high of 96 percent in Bougainville and 90 percent in the National Capital District (NCD) to a low of 38.4 percent in East Sepik Province and 47.5 percent in Enga province. Conversely, the proportion managed by mission is very important in the many provinces (including the latter) and less important in others. Just over half the provinces, excluding NCD, have a lower proportion of government staff (a higher proportion of mission staff) than the average share.
- There is, on average, one health staff member funded by government for each 561 of the population. However, there are also very significant variations in the population-staff ratio between provinces. Excluding the National Capital District and Central Province which directly serve overlapping populations, the population per staff ratio varies from a low 270:1

in Manus province and 329:1 in New Ireland province to highs of 964:1, 896:1, 890:1 for Morobe, East Sepik and Southern Highlands provinces respectively.

- The final column of Table 2-4 indicates the percentage increase or decrease in staff in each province required to allocate existing staff according to population, i.e., assuming an allocation of staff to achieve 561 people per staff member. Some 55 percent of provinces would need to have a reduction in staff numbers while the other 45 percent would have increased staff. In some cases the increases or reduction would be very significant.
- It is recognized that population is not the only criterion which should determine the allocation of staff because the geography (for example mountainous and maritime provinces; deficits in road and transport infrastructure and its maintenance; and population dispersion) will influence the need for staff to provide accessible services. However, the large variations in population: staff ratios suggest these are not planned variations. Significantly, four provinces (five including NCD) would require a 20 percent or more reduction in staff numbers (Manus 51.9 percent; New Ireland 41.4 percent; Milne Bay 39 percent; and East New Britain 24.0 percent) and five provinces would require an increase in staff of more than 20 percent (Central 100.5 percent; Morobe 71.9 percent; East Sepik 59.6 percent; Southern Highlands 58.7 percent; and Madang 33.6 percent).

This report, while recognizing the importance of looking at the whole health workforce, is primarily looking at the structure and features of the service-delivery component of the workforce. It will, however, make references to the total workforce when detailed breakdowns

Table 2-4: Distribution of Publicly-Financed Health Staff by Province and Population (2009)

Province	Gov't Staff	Non-Gov't Staff	Total Staff	Gov't Staff %	Est. Pop 2009	Pop Per Health Staff	Staff if Average Pop. Per Staff	% Above or (Below) Average
Western	231	176	407	56.8	205,332	505	366	(10.0)
Gulf	178	117	295	60.3	157,498	534	281	(4.6)
Central	109	97	206	52.9	231,795	1,125	413	100.5
NCD	1,530	171	1,701	90.0	320,206	188	570	(66.5)
Milne Bay	529	259	788	67.1	269,779	342	481	(39.0)
Oro	276	45	321	86.0	176,677	550	315	(2.0)
S. Highlands	621	364	985	63.0	876,938	890	1,563	58.7
Enga	288	319	607	47.5	362,033	596	645	6.2
W. Highlands	599	403	1,002	59.8	559,257	558	996	(0.5)
Chimbu	626	92	718	87.2	353,949	493	631	(12.1)
E. Highlands	636	198	834	76.3	505,248	606	901	8.0
Morobe	572	83	655	87.3	631,412	964	1,126	71.9
Madang	589	86	675	87.3	506,323	750	902	33.6
East Sepik	192	308	500	38.4	447,773	896	798	59.6
Sandaun	250	220	470	53.2	238,147	507	425	(9.6)
Manus	168	38	206	81.6	55,628	270	99	(51.9)
New Ireland	246	229	475	51.8	155,775	329	277	(41.4)
E. New Britain	390	212	602	64.8	256,197	426	457	(24.0)
W. New Britain	370	131	501	73.9	251,466	502	448	(10.6)
Bougainville	332	14	346	96.0	196,572	569	350	(1.4)
Total	**8,732**	**3,562**	**12,294**	**71.0**	**6,758,583**	**561**	**n.a.**	**n.a.**

Source: Annex Table 2.1 in Annex 2.11.

of the workforce are available. As noted above, the service-delivery component of the workforce comprises 8,954 or 69 percent of the total public sector workforce.

Table 2-5 presents information on the service-delivery component (direct service-delivery occupations only and excluding service-delivery staff involved in provincial administration) of the health workforce by hospitals/urban and rural areas, occupation and gender. Key observations about the structure of the workforce from these perspectives include:

- The service-delivery staff are less concentrated in urban areas as compared to the total workforce although a still-significant 3,796 (43 percent) of staff are in urban areas. The overwhelming majority are working in hospitals, while 5,048 (57 percent) work in rural areas.
- Almost two-thirds (5,444) of all service-delivery staff are female and 38 percent (3,400) are male. In rural areas, however, males represent 48 percent of the workforce compared to only 27 percent in urban areas and, conversely, females represent 74 percent of the workforce in urban areas/hospitals and 53 percent in rural areas.

There are significant variations in the gender composition and location of the various service-delivery occupations across the public health sector:

Table 2-5: Total Publicly Financed Service-Delivery Staff by Gender and Occupation[1]

Category/Function	Male	Female	Total	Male (%)	Female (%)
Hospitals / Urban[2]					
Medical Officers	246	82	328	75.0	25.0
HEOs	67	59	126	53.2	46.8
Nursing Officers	265	1,515	1,780	14.9	85.1
Midwives	12	80	92	13.0	87.0
CHWs	363	1,029	1,392	26.1	73.9
Dentists/Dental Therapists	49	29	78	62.8	37.2
Subtotal – Hospitals	**1,002**	**2,794**	**3,796**	**26.40**	**73.6**
Rural Health[3]					
Medical Officers	40	11	51	78.4	21.6
HEOs	185	100	285	64.9	35.1
Nursing Officers	468	1,004	1,472	31.8	68.2
Midwives	54	138	192	28.1	71.9
CHWs	1,620	1,386	3,006	53.9	46.1
Dental Therapists	31	11	42	73.8	26.2
Subtotal – Rural Health	**2,398**	**2,650**	**5,048**	**47.5**	**52.5**
Total Service-Delivery Staff					
Medical Officers	286	93	379	75.5	24.5
HEOs	252	159	411	61.3	38.7
Nursing Officers	733	2,519	3,252	22.5	77.5
Midwives	66	218	284	23.2	76.8
CHWs	1,983	2,415	4,398	45.1	54.9
Dental Therapists	80	40	120	66.7	33.3
TOTAL	**3,400**	**5,444**	**8,844**	**38.4**	**61.6**

Source: National Headcount Survey 2009 (NDoH).

Notes: [1] Includes all staff in direct service-delivery provision with these designations.

[2] Includes Urban Clinics but excludes provincial administrative staff and NDoH HQ staff with these occupations.

[3] Includes administrative staff at district and lower levels estimated at about 415 (or almost 7 percent) of the total rural staff of 6,262 (see Table 2-3).

- The vast majority of the 379 doctors in direct service delivery work in hospitals (87 percent) and thus only 51 (13 percent) are deployed in rural areas. About three-quarters of doctors are male and one-quarter female with little difference in the gender composition of the doctor workforce between rural health services and hospitals.
- Two-thirds of HEOs are to be found in rural areas and, surprisingly, 126 (one-third) are working in hospitals—almost two-thirds of HEOs are male, the sex balance in hospitals is 47 percent female and 53 percent male.
- Over half (1,872) of nurses (including midwives) work in hospitals/urban areas while 47 percent (1,664) are deployed in rural services. Midwives (total 284) comprise 3 percent of the service-delivery workforce and 8 percent of the total nurse workforce. Interestingly, two-thirds (192) of midwives are deployed in rural areas—significantly more than for the nursing group as a whole.
- A significant majority of CHWs (68 percent) are deployed in rural service delivery, and yet, as noted above, a significant proportion—almost one-third—are deployed in hospitals/urban areas. The majority of CHWs are female (55 percent) but it is noteworthy that the vast majority of CHWs in hospitals/urban areas (almost three-quarters) are female.
- Dental staff constitute 120 (less than 1.5 percent), of the total service-delivery staff—nearly two-thirds are in hospitals/urban areas and one-third are in rural areas. Two-thirds of dental staff are male while in rural areas this proportion rises to nearly three-quarters.

The age structure of service-delivery staff, including of the principal occupations involved in service delivery is important for many reasons including experience "on-the-job" and, most importantly, for planning for replacement of staff due to retirement. Table 2-6 presents data on the age structure of each occupation involved in direct service delivery by Hospitals/Urban and Rural services. Key observations include:

- Almost 16 percent of the workforce in 2009 (1,381) was aged 55 years or more and thus due to retire shortly—given the age eligibility for formal retirement begins at 55 years of age—with a slightly higher proportion (17 percent) in this age group working in hospitals.
- Significantly, a further 37.7 percent (3,338) are currently in the 45–54 year age group and will reach retirement age over the next decade. A further one-third (3,033) will reach retirement age in the subsequent decade. Thus the need for replacement of staff in service delivery will provide a significant demand for training institutions over the next 20 years.
- Only 12.3 percent of staff in 2009 (1,090) are less than 35 years of age—less than the 16 percent (1,381) aged 55 years or more; confirming the oft-recited statement that the health workforce is aging.

It is important to look at the proportions of each service-delivery occupation by age grouping to better understand the breakdown of the aggregate age structure of the workforce. This is also important for planning training requirements and the potential shortfalls or surpluses in staff given existing supply capacity—see Chapters 3, 5 and 6. Table 2-7 shows the proportion of each service-delivery occupation by hospitals/urban areas and rural service delivery and for the whole workforce. The following key observations can be made by occupational group:

Medical Officers

- Of the total medical officer workforce (including dentists) of 379 just over 10 percent (39) were 55 years or more (that is at, or approaching, retirement age). An additional 36.7 percent (139) are aged 45–54 years of age and will thus reach retirement age over the next decade.
- Over 40 percent of medical officers (158) are aged 35–44 years of age.
- Only 11.3 percent of the medical officers (43) are aged 25–34 years of age-only marginally more than the cohort currently at retirement age.
- A much higher proportion of medical officers working in rural service delivery are in the older age groupings compared to the average for all medical officers—almost 14 percent of rural medical officers are at retirement age and a further 60 percent (31) can expect to retire over the next decade.

Health Extension Officers

- Of the total number of HEOs in direct service delivery (411), 12.7 percent (52) are aged 55 years or more and thus have reached or are approach-

Table 2-6: Total Publicly Financed Service-Delivery Staff by Occupation and Age Group (2009)[1]

Category/Function	<24	25–34	35–44	45–54	55–64	65+	Total
Hospitals/Urban[2]							
Medical Officers	0	40	148	108	27	5	328
HEOs	2	34	54	29	7	0	126
Nursing Officers	5	215	646	588	310	15	1,780
Midwives	0	1	18	38	34	1	92
CHWs	0	100	479	585	216	12	1,392
Dental/Dental Therapists	0	8	27	24	17	1	78
Subtotal Hospitals	**7**	**398**	**1,372**	**1,372**	**611**	**34**	**3,796**
Percent Total Hospitals	**0.2**	**10.5**	**36.1**	**36.1**	**16.1**	**0.9**	**100**[4]
Rural Health[3]							
Medical Officers	0	3	10	31	7	0	51
HEOs	1	22	115	101	40	5	285
Nursing Officers	13	256	476	518	202	7	1,472
Midwives	0	10	55	85	40	2	192
CHWs	13	366	996	1,207	341	83	3,006
Dental Therapists	0	1	9	24	7	2	42
Subtotal Rural Health	**27**	**658**	**1,661**	**1,966**	**637**	**99**	**5,048**
% Total Rural Health	**0.5**	**13.0**	**32.9**	**39.0**	**12.6**	**2.0**	**100**
Total Service-Delivery Staff							
Medical Officers	0	43	158	139	34	5	379
HEOs	3	56	169	130	47	5	411
Nursing Officers	18	471	1,122	1,106	512	22	3,252
Midwives	0	11	73	123	74	3	284
CHWs	13	466	1,475	1,792	557	95	4,398
Dental Therapists	0	9	36	48	24	3	120
TOTAL	**34**[2]	**1,056**	**3,033**	**3,338**	**1,248**	**133**	**8,844**
Percent of Total	**0.4**	**11.9**	**34.3**	**37.7**	**14.1**	**1.5**	**100**

Source: National Headcount Survey 2009 (NDoH).

Notes: [1] Includes all staff in direct service-delivery provision with these designations.

[2] Includes Urban Clinics, excludes provincial administrative staff and NDoH HQ staff with these occupations.

[3] Includes direct service-delivery staff working as administrative staff at district and lower levels (relatively small).

[4] Errors due to rounding arising from estimation proess see Annex 2.

ing retirement age. Another 31.7 percent (130) are aged 45–54 years and can be expected to retire over the next decade.

- Another 41.2 percent (169) are aged 35–44 years of age.
- Less than 15 percent of HEOs (59) are aged less than 35 years—indicating the numbers in this younger cohort working in service delivery are significantly less than for the subsequent two 10 years age cohorts.
- It is interesting to note that a higher proportion of the younger cohorts of HEOs are working in hospitals/urban areas.

Nursing Officers

- Of the total number of nursing officers (excluding midwives) of 3,252, over 16 percent (534) working in direct service delivery are aged 55 years or older

and almost one-third more (1,106) are aged 45–54 years of age and are thus scheduled to retire over the next decade.

- Another 35 percent (1,122) are aged 35–44 years of age.
- Some 15 percent of nurses (489) are aged less than 35 years—about the same proportion of the workforce scheduled to retire imminently.
- Nursing officers, on average, are younger in rural areas, particularly among the younger age group of 25–34 years.

Midwives

- Midwives constitute an important health service occupation and are presented in this analysis as a separate occupation—albeit one that requires a nursing qualification prior to training as a midwife. There are 284 midwives in service delivery of whom 77 (over 27 percent) are aged 55 years or more and can be expected to retire shortly. Significantly, 38 percent of midwives working in hospitals are of retirement age compared to about 22 percent in rural areas.

Table 2-7: Total Publicly Financed Service-Delivery Staff by Occupation and Age Group (2009) (%)

Category/Function	<24	25–34	35–44	45–54	55–64	65+	Total
Hospitals/Urban							
Medical Officers	0	12.2	45.1	32.9	8.2	1.5	100
HEOs	1.6	27.0	42.9	23.0	5.6	0	100
Nursing Officers	0.3	12.1	36.3	33.0	17.4	0.8	100
Midwives	0	1.1	19.6	41.3	36.9	1.1	100
CHWs	0	7.2	34.4	42.0	15.5	0.9	100
Dentists/Dental Therapists	0	10.4	35.1	31.2	22.1	1.3	100
Subtotal Hospitals	**0.2**	**10.5**	**36.1**	**36.1**	**16.1**	**0.9**	**100**
Rural Health							
Medical Officers	0	5.9	19.6	60.8	13.7	0	100
HEOs	0.4	7.7	40.4	35.4	14.0	1.8	100
Nursing Officers	0.9	17.4	32.3	35.2	13.7	0.5	100
Midwives	0	5.2	28.7	44.3	20.8	1.0	100
CHWs	0.4	12.2	33.1	40.2	11.3	2.8	100
Dental Therapists	0	2.4	20.9	55.8	16.3	4.6	100
Subtotal Rural Health	**0.5**	**13.0**	**32.9**	**39.0**	**12.6**	**2.0**	**100**
Total Service Delivery Staff							
Medical Officers	0	11.3	41.7	36.7	9.0	1.3	100
HEOs	0.7	13.7	41.2	31.7	11.5	1.2	100
Nursing Officers	0.5	14.5	34.5	34.0	15.7	0.7	100
Midwives	0	3.9	25.7	43.3	26.1	1.1	100
CHWs	0.3	10.6	33.5	40.8	12.7	2.2	100
Dental Therapists	0	7.5	30.0	40.0	20.0	2.5	100
TOTAL (Percent)	**0.4**	**11.9**	**34.3**	**37.7**	**14.1**	**1.5**	**100**
TOTAL (Numbers)	**34**	**1,056**	**3,033**	**3,338**	**1,248**	**133**	**8,844**

Source: Calculated from Table 2-6.
Note: Errors due to rounding.

- Another 43 percent of midwives (123) are aged 45–54 years and can be expected to retire over the next decade.
- Only 3.9 percent of midwives (11) are aged below 35 years.

Community Health Workers

- CHWs constitute about 50 percent of the total service workforce of 4,398 with 15 percent (652) aged 55 years or older and due for retirement.
- An additional 41 percent of CHWs (1,792) are aged 45–54 years and due to reach retirement age over the next decade. A slightly higher proportion of CHWs working in hospitals are aged over 55 years than in rural service delivery.
- Another one-third of CHWs (1,475) are aged 35–44 years of age and will begin to reach formal retirement age in another decade.
- Around 11 percent (479) of CHWs are aged less than 35 years—a proportion lower than that for the cohorts aged 55 years or more.

Dental Therapists

- Dental therapists and technicians total 120—the majority in hospitals. The proportion aged 55 years or more is almost one-quarter (27) and an additional 40 percent (48) are aged 45–54 years of age. Thus almost two-thirds of dental staff are expected to retire over the next decade.
- Only 7.5 percent of this occupational group (nine) are aged less than 35 years.

ANNEX 2.1

NOTES ON DATA SOURCES AND DATA CONSTRAINTS

Introduction

The NDoH), the government more generally, and the Churches Health Council have a number of databases which contain important information on health sector employees. Many of these systems duplicate information contained in other systems and in other cases the same information is collected but different codes are used. These data systems include: (i) the Government Payroll System (Department of Finance); (ii) the Churches Health Council Payroll; (iii) the Health Care Practitioner's Professional Registration System (within NDoH); (iv) Health Human Resource Management System (within NDoH); (v) the NHCS 2009 (within NDoH); and (vi) the Health Management Information System (within NDoH). All these systems have significant constraints and data gaps which have degraded over recent years. Even the NHCS 2009 conducted by the NDoH to give a basis for total health-related employees in the publicly financed health sector for the NHP has a number of constraints as discussed below. Nevertheless, this is the single best count of the publicly financed health workforce and forms the basis of the estimates of total health workforce, location, type of facility, occupation and sex used throughout this report and in the NHP. As described below the data from the Health Human Resource Management System ((iv) above) was used to estimate the age structure of the workforce—data which is key to the overall theme of this report.

Comments on the Current Status of the Key Human Resource Information Systems

This section makes comments on the type of information within each information system (as outlined above) and includes information on characteristics of the health workforce, its quality, and ease of access to the information.

(i) **Government Payroll System**. Over the best part of the last decade the government payroll system has been transited to the "Concept System" and management of the payroll has been increasingly delegated to departments and provinces. This is important for the health workforce employed by government as all provincial health staff are, in fact, provincial government employees. As part of the overall reforms of the health sector, hospitals (while national) are now managed by their own boards and are largely and increasingly responsible for management of their payrolls. Thus there are, in effect, over 40 separate subpayrolls for the government health sector which have very little central quality control. As a consequence of both the significant decentralization of payroll management and an inadequate central quality control of information on the payroll for employees, the data kept on the payroll—particularly that relating to the characteristics of the employees (sex, age, qualifications, training, and location)—has deteriorated significantly. This data source

(used quite successfully for analysis of the characteristics of the government health workforce over the last three decades through 2004), therefore, proved to be wholly inadequate for this study. It will take a very significant effort to rectify this situation. At the outset of this study it had been assumed the payroll would be the principal source of information for the characteristics of the government health workforce.

(ii) **Churches Health Council Payrolls**. These payrolls are operated by the Churches Health Council and/or their members to pay the publicly financed health workforce employed in mission/church health facilities. This would have been the source of information for the mission sector had the government payroll been a viable source of information for health human resource planning. These payrolls should be part of any review of data sources for health human resource planning as recommended in Chapter 7 of this report. The NDoH should insist on a uniform and consistent supply of information on the mission health workforce as part of its "conditionalities" for public financing of the mission health workforce.

(iii) **Health Care Practitioner's Professional Registration System.** This is a critical potential source of information on the professional health workforce working in PNG (doctors, nurses, dentists and pharmacists). It is, in fact, the only current potential source of consistent information on health professionals working in the private sector. Under current legislation, all the listed health professionals—government, mission and private sector—are required to register annually and pay an annual fee for the privilege. Without this registration these professionals are not able to practice as a health professional. According to the NDoH most health professionals comply with this requirement. The registration form collects key information on many other characteristics of the professional, including where they work, age, sex, and highest level of training. The database to record this data is, however, in a state of disrepair and has wholly inadequate systems in place to ensure the data is managed with integrity. This would not take long to repair with adequate systems and training support. It is recommended in Chapter 7 that this situation is rectified as a matter of urgency. It is particularly important that NDoH has a sound understanding of what is happening in the private health sector—particularly at this stage of PNG's development with strong private sector development, including anecdotal evidence that the private health sector is growing significantly as incomes rise and many employers in rural and rural enclave areas recognize the importance of ensuring good health care for their employees and their families and more generally the wider communities within which the enclaves operate.

(iv) **Health Human Resource Management System.** This system operates within the Human Resources Division of the NDoH and collects detailed information on the publicly financed health workforce. It duplicates much of the data which should be available from the Government (and Church) Payroll Systems. The data is, however, inadequately managed and the systems are degrading. NDoH's capacity to continue to collect this information has been significantly degraded. Nevertheless, the data for 2009 (probably the last year for which data will be usable without major quality improvements to the systems) was found to be useful. As discussed below, it was used to generate information on the age of the workforce by location, occupation and sex. Getting the information from this system required significant technical manipulation of the data sources as each province and hospital (over 40 in total) was recorded on individual spreadsheets, often using nonstandard codes requiring considerable data manipulation to generate a consistent data set able to be analyzed on a national basis. It was also evident that the database held information on fewer individuals working in the publicly financed health sector compared to that recorded in the NHCS. Nevertheless, the information collected seemed to be of high quality—notwithstanding the lower recorded totals compared to the NHCS.

(v) **NHCS (2009).** This is unambiguously the best single recent database on the characteristics of the publicly financed health workforce and its totals. As discussed, it was undertaken as a one-off survey because the other systems have significant systemic problems and are inadequate for most human resource management and planning uses. Unfortunately, it did not collect information on the age of the workforce—hence the manipulation of the data from the Health Human Resource Management System as described below for

this report. Notwithstanding the overall soundness of this survey, it was not perfect and it took considerable effort. If the existing systems were rationalized, as recommended in Chapter 7, the key information should be available on a continuous basis and a national survey of this kind should not be needed.

(vi) **Health Management Information System.** This system is the core management information system of NDoH and collects all the information on service delivery, and some chacteristics of health facilities and staff. The system collects information from the ground (facility) up. It was not designed to be a human resource management system yet does collect important information on health staff. A key question is should/could it be adapted or expanded to cover key strategic information as collected for the NHCS (expanded to include age). This would mean that the type of analysis undertaken in this report could be done on a regular/annual basis alongside the MTEF—as recommended in Chapter 7. It would not, of course, be useful for some other important health human resource purposes—so this suggestion is not a substitute for deciding what other system(s) will be needed for overall health human resource planning. Another key issue is that this critical system is not user friendly and in its current form is very difficult and time consuming to integrate. It does not have many standard output report defined. These are technical issues that can be resolved with adequate computer systems support and should be a matter of priority.

(vii) **Overall Conclusion on Current Status of Health Human Resource Systems.** The overwhelming conclusion is that there is considerable scope to rationalize the human resource information systems within the NDoH. This report recommends that NDoH systematically reviews its health human resource requirements, being careful not to put too many demands on the system(s). It is probably much better to have smaller, less complicated, but robust systems meeting defined strategic information requirements. Our understanding of the current state of the existing systems and the needs of NDoH lead us to tentatively conclude that: (i) the payroll systems should be fixed as a matter of both short- and longer-term priority (including ensuring that the church system payroll can generate the required data); (ii) that the Health Care Practitioner's Professional Registration System be redeveloped as a matter of immediate priority so that strategic information on the scale of the private sector can be generated and then subsequently monitored over time; (iii) that the feasibility of modifying the Health Management Information System (to include the data outlined above) and making the system much more user friendly to use is explored; and (iv) that serious consideration be given to stopping the Health Human Resource Management System on the basis that this system is largely duplicating information contained in the above referenced systems which the NDoH human resource management needs. It is also clear that computer systems resourcing and the technical skills and capacity required to enable them to operate efficiently and effectively is largely missing from the NDoH.

Methodology Used to Estimate the Health Workforce and its Key Characteristics

As discussed, the core of the information derived from the NHCS forms the basis of the information we have on the stock of the publicly financed health workforce and its characteristics. The database was adjusted (for each province and the 20 hospitals) where there was missing information (in each case missing information was quite small—less than 5 percent in the vast majority of cases) in the following manner. For each province and hospital it was assumed that a proportion of the known data would apply to the unknown data—that is the data was scaled up in the same proportion as the known characteristics so that the totals were equal to the headcount.

As discussed, the headcount survey did not generate information on age—an important characteristic of the health workforce. To this end it was assumed that the age distribution by province/hospital and occupation of NHCS (as adjusted) would be the same as that recorded in the Health Human Resource Management System database for 2009. There did not seem to be any major systematic bias in the missing data (for instance the distribution by occupation, sex and province was generally consistent between the two data sources). The data was also broadly consistent with published reports of the health workforce

from around 2000 adjusted for time given changes in supply. Nevertheless, the mission believes the data reported in this report is relatively robust—there is probably some difference between the characteristics of the workforce reported and those actually in place. This simply means that it is important to improve the databases and the consequent information base for this type of analysis. The report recommends, in Chapter 7, that the estimates of the health workforce stock be done annually and monitored carefully to determine if the trends predicted in this report actually eventuate. It also recommends that the projections are done annually as part of, or in conjunction with, the annual MTEF updates and that the projections are gradually built up from provincial exercises which are planned to start under the proposed Asian Development Bank Project in 2012.

ANNEX 2.2

Annex Table 2.1: Publicly Financed Health Staff by Province and Function

Province / Function	Government	Mission	Joint (Government & Mission)	Other	Total
Western					
Admin (Urban only)	5	0	0	0	5
Urban Services	173	7	0	0	180
Rural Services	58	164	0	5	227
Subtotal Western	**236**	**171**	**0**	**5**	**412**
Gulf					
Admin (Urban only)	0	0	0	0	0
Urban Services	119	0	0	0	119
Rural Services	59	117	0	0	176
Subtotal Gulf	**178**	**117**	**0**	**0**	**295**
Central					
Admin (Urban only)	29	0	0	0	29
Urban Services	4	0	0	0	4
Rural Services	105	95	0	2	202
Subtotal Central	**138**	**95**	**0**	**2**	**235**
National Capital					
Admin (inc. NDoH HQ)	455	0	0	0	455
Urban Services	1,530	51	0	120	1,701
Rural Services	0	0	0	0	0
Sub-Total NCD	**1,985**	**51**	**0**	**120**	**2,156**
Milne Bay					
Admin (Urban only)	21	0	0	0	21
Urban Services	312	0	0	0	312
Rural Services	217	259	0	0	476
Subtotal Milne Bay	**550**	**259**	**0**	**0**	**809**
Oro					
Admin (Urban only)	10	0	0	0	10
Urban Services	163	0	0	0	163
Rural Services	113	45	0	0	158
Subtotal Oro	**286**	**45**	**0**	**0**	**331**
Southern Highlands					
Admin (Urban only)	32	0	0	0	32

(*continued on next page*)

Annex Table 2.1: Publicly Financed Health Staff by Province and Function (*continued*)

Province / Function	Government	Mission	Joint (Government & Mission)	Other	Total
Urban Services	238	13	0	0	251
Rural Services	383	254	97	0	734
Subtotal SHP	**653**	**267**	**97**	**0**	**1,017**
Enga					
Admin (Urban only)	23	0	0	0	23
Urban Services	163	25	0	0	188
Rural Services	125	203	0	91	419
Subtotal Enga	**311**	**228**	**0**	**91**	**630**
Western Highlands					
Admin (Urban only)	0	0	0	0	0
Urban Services	422	19	0	0	441
Rural Services	177	384	0	0	561
Subtotal WHP	**599**	**403**	**0**	**0**	**1,002**
Chimbu					
Admin (Urban only)	29	0	0	0	29
Urban Services	148	0	0	0	148
Rural Services	478	92	0	0	570
Subtotal Chimbu	**655**	**92**	**0**	**0**	**747**
Eastern Highlands					
Admin (Urban only)	30	0	0	0	30
Urban Services	413	12	0	0	425
Rural Services	223	186	0	0	409
Subtotal EHP	**666**	**198**	**0**	**0**	**864**
Morobe					
Admin (Urban only)	10	0	0	0	10
Urban Services	454	0	0	0	454
Rural Services	118	83	0	0	201
Subtotal Morobe	**582**	**83**	**0**	**0**	**665**
Madang					
Admin (Urban only)	0	0	0	0	0
Urban Services	281	0	0	0	281
Rural Services	308	86	0	0	394
Subtotal Madang	**589**	**86**	**0**	**0**	**675**
East Sepik					
Admin (Urban only)	23	0	0	0	23
Urban Services	175	45	0	0	220
Rural Services	17	232	0	31	280
Subtotal East Sepic	**215**	**277**	**0**	**31**	**523**

(*continued on next page*)

Annex Table 2.1: Publicly Financed Health Staff by Province and Function (*continued*)

Province / Function	Government	Mission	Joint (Government & Mission)	Other	Total
Sandaun					
Admin (Urban only)	0	0	0	0	0
Urban Services	189	0	0	0	189
Rural Services	61	220	0	0	281
Subtotal Sandaun	**250**	**220**	**0**	**0**	**470**
Manus					
Admin (Urban only)	21	0	0	0	21
Urban Services	113	0	0	0	113
Rural Services	55	33	0	5	93
Subtotal Manus	**189**	**33**	**0**	**5**	**227**
New Ireland					
Admin (Urban only)	21	0	0	0	21
Urban Services	129	0	0	77	206
Rural Services	117	150	0	0	267
Subtotal Island	**267**	**150**	**0**	**77**	**494**
East New Britain					
Admin (Urban only)	17	0	0	0	17
Urban Services	202	0	0	0	202
Rural Services	188	206	0	6	400
Subtotal ENB	**407**	**206**	**0**	**6**	**619**
West New Britain					
Admin (Urban only)	18	0	0	0	18
Urban Services	246	0	0	0	246
Rural Services	124	131	0	0	255
Subtotal WNB	**388**	**131**	**0**	**0**	**519**
Bougainville					
Admin (Urban only)	27	0	0	0	27
Urban Services	187	0	0	0	187
Rural Services	145	14	0	0	159
Subtotal Bougainville	**359**	**14**	**0**	**0**	**373**
TOTAL					
Admin (Urban only)	771	0	0	0	771
Urban Services	5,661	172	0	197	6,030
Rural Services	3,071	2,954	97	140	6,262
TOTAL STAFFING	**9,503**	**3,126**	**97**	**337**	**13,063**

Notes: (1) Rural base does not include aid post staff. (2) Admin Urban (Provincial Health Office's + NDoH), Urban (Hospitals + Urban Clinics), Rural (DHO's + RH's + HC's + SC's + Training Institutions).

CHAPTER 3

HEALTH WORKFORCE TRAINING CAPACITY AND ISSUES

3.1. Introduction

This chapter outlines the current capacity of the health workforce-related training system in PNG. It particularly focuses on the current training effort for the major service-delivery occupations as outlined in Chapter 2—doctors, HEOs, nurses and midwives, and CHWs. It starts with an outline of the current institutional arrangements for the training of the health-related workforce, including the formal responsibilities and configuration of the current health-related training system. The chapter also notes how responsibilities have evolved and significant gaps emerged in the coherence of the training system over the past two decades. In this context it notes the emergence of two important gaps in the current institutional relationships—the diffusion of responsibility for the oversight of the training and a continuing serious lack of information on the needs for the outputs of training institutions. The chapter concludes with a summary documentation of the health-related postgraduate training program enrollments and graduates for 2009.

3.2. A Brief Discussion of the Historic Context of the National Health Workforce Training System

Historically, the NDoH had a major and direct role in the provision of health-related training through a network of HEO, nurse and CHW training institutions which it both managed and financed through its budget. This capacity, particularly for nurse and CHW training, was strongly supported by a network of mission-managed training institutions which also received direct public subsidies. In this situation, the NDoH had direct decision-making authority over numbers entering the vast majority of training institutions and it determined the curriculum—albeit in collaboration with the church/mission partners. There was a national consensus on both the major causes, and nature, of both the burden of disease in PNG and on the roles and functions of the network of different health facilities and their staffing.

Major decisions were made by government in 1999 which have had a lasting influence on the structure of postsecondary education and training in PNG—including for health-related training programs. First, within the context of a major fiscal adjustment (which required a 10 percent or more reduction in much of the civil service), a number of government nursing schools were closed and the last of the government CHW training schools were also closed. Another important government policy decision involved making the Office of Higher Education (OHE) (under the oversight of a relatively new Commission of Higher Education—CHE) responsible for the vast majority of postsecondary education institutions—particularly those requiring or aspiring to require grade 12 as a prerequisite for entry to the institution. This included all health-related training (HEO and nursing education) but excepted CHW training which formally required grade 10 entry requirements. Part of this reform process included a policy decision in 1996 that existing training institutions (including the largely single program-based

schools of nursing and the College of Allied Health in Madang) either affiliate or amalgamate with a university.[6] It also required them to plan to upgrade their programs to a degree level over time—an issued discussed in more detail in Chapter 6.

Under this arrangement, responsibility for the financing of government scholarships for students to enter degree and diploma programs for all sectors, including health, was centralized in the OHE. This effectively meant that the OHE set student numbers for courses, except at the margin where some institutions began accepting private students and a number of aid agencies began directly funding some students. In the absence of national or sectoral human resource plans or evidence-based mechanisms to determine student numbers it was supply-side capacity to train students which was the primary determinant of how many were trained. While there has been much discussion of human resource planning needs, the last National Human Resource Assessment was undertaken in 1987–88 and the OHE still does not have a systematic evidence-based process to determine priorities for training or university programs or for scholarships financed by the public budget.

As the major employer of health-related staff and the regulator of the health system, the NDoH has primary responsibility for planning health human resource needs and communicating these needs to both the OHE and to individual training institutions. It also has a role in advocating with the Department of Treasury (Treasury) and the DNP&M for these institutions to be adequately resourced. The budget division of Treasury is responsible for recurrent budget finances (and final advice to Cabinet on proposals for the expansion of the health workforce proposed by provinces and NDoH), while the DNP&M is formally responsible for development expenditures including development assistance. The NDoH also engages with all other stakeholders—including Development Partners (DPs)—s appropriate and also has a key role in ensuring that training is of adequate quality and relevance. These issues are taken up in more detail in Chapter 5.

Another important context for this discussion is that PNG, between 1993 and 2009, has seen real recurrent expenditures by government decline by almost one-third while the population has grown by 65 percent over the same period. Since independence in 1975, real per capita government expenditure has declined over 45 percent. There are very few functioning countries, if any, that have been able to deal with this level of resource decline and remain basically functional. Education and training institutions, including health-related training institutions, have not been exempt from this fundamental resource-scarce picture.

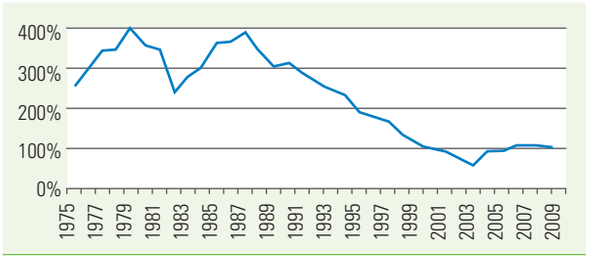
The data for nursing colleges illustrate this situation with real recurrent expenditure currently about 50 percent of what it was in the mid-1980s. On a real per capita basis, recurrent budgets are around 25 percent of what they were in the 1980s (Figure 3.1). In any discussion of quality issues and the review of the current state of health-related training, these stylized facts need to be kept in mind—in fact, in many senses, it is remarkable that the institutions have been able to maintain any semblance of professionalism. It is a credit to current management that many of the institutions survive at all. It is fortuitous, as discussed in Chapter 5, that the resource picture facing PNG is less constrained than over the past decade or more and that there is scope, assuming appropriate priorities, to redress some of the past resource constraints. Annex 3.1 (Figures 3A.1 and 3A.2) presents data on government budgets and recurrent budget data for nursing colleges since independence in 1975.[7]

Since 1999, the structure of the postsecondary education and training system and the health-related subcomponent of the education and training system have evolved in significant ways. The University of Papua New Guinea (UPNG) is responsible for medical (doctor) training and other allied health training. The two nongovernment universities emerged about this time: the Divine Word University (DWU) in Madang and the Pacific Adventist Uni-

[6] At independence in 1976 PNG had two universities—the University of Papua New Guinea, with its main campus in Port Moresby, and the University of Technology in Lae—both publicly owned and funded. Another publicly financed but privately administered university is the Divine Word University which was established in Madang. A private university—the Pacific Adventist University outside Port Moresby—was also established in the 1990s. The government established the Goroka campus of the University of Papua New Guinea with a primary focus on secondary teacher education. It also established the University of Natural Resources and Environment using the Vudal agricultural training college infrastructure as its base. Each university is established under its own national legislation.

[7] This discussion draws heavily on background work and papers undertaken for the PNG Universities Review 2010.

Figure 3-1: Real Per Capita Expenditure on Nursing Colleges as Percentage of 2009 Expenditure



Source: PNG Universities Review 2010.

versity (PAU) outside Port Moresby—both of which also began teaching health-related subjects. The government (NDoH) owned College of Allied Health Sciences which was responsible for HEO training merged with the DWU and consequently became responsible for HEO training. Under the reconfigured government university system the University of Goroka (UoG) began teaching nurse-related undergraduate and postbasic qualifications training programs. The "old" Schools of Nursing (SoN) have essentially maintained their existing single course/program structure—although some have begun the process of affiliating with a university. Similarly, the CHW training programs have continued as single program institutions—albeit all managed by mission authorities.

One recent expert report suggests that: "In general the nongovernment universities appear to be more effectively led and governed, and have a sense of strategy and vision as well as vibrancy that is lacking in the public universities. They have smaller councils and these appear to be more strategically focused. They are also more focused on both external benchmarking and quality assurance. The public universities appear to be laboring under enormous pressures related to funding reductions—the NHEP III (draft National Higher Education Plan III) concludes that there has been a 51 percent real funding reduction between 1983 and 2003), a loss of direction, and a lack of policy certainty that are causing severe difficulties which must have an impact on their quality. There is a lack of capital and equipment maintenance and renewal and inadequate funding for new capital works and general capital infrastructure to support teaching and research" (ACER and Masora Consulting 2010).

This picture, while focused more specifically on the more narrow university sector, also applies to the whole of the health-related training system. This will be discussed in more detail in Chapter 4 as it relates to nurse and CHW training institutions. It is, however, an important context for a discussion of the current capacity of the health-related training system. Too often, specific issues with either specific schools or cadres are discussion without adequate reference to the institutional context within which individual institutions operate. Aspects of the current institutional arrangements are dysfunctional, which makes it all but impossible for individual institutions or actors within the system to undertake reform in the interests of rational nationally focused outcomes. A more rational approach will require a "whole-of-government" approach. This will be taken up in more detail in Chapter 7.

3.3. A Brief Description of the Health-Related Training System Institutions and Programs

The health-related training institutions (including universities) as they are currently configured include the following:

3.3.1 Universities

3.3.1.1 *Government Institutions*

University of Papua New Guinea.

Course offerings include:

- *Postgraduate degree programs (Masters) in* emergency medicine, obstetrics and gynecology, surgery, medical sciences, and public health.
- *Postgraduate diplomas* in anesthesiology, child health, obstetrics and gynecology and ortorhinolaryaryngology.
- *Undergraduate medical programs (Bachelors)* in: medicine and surgery, pharmacy, dental surgery and oral health.
- *Undergraduate allied health programs (Bachelors)* in medical imaging science and medical laboratory science.
- *Undergraduate clinical nursing (Bachelors)* in midwifery and pediatrics, mental health and acute care.
- *Undergraduate nursing (Bachelors)* in community health and nursing administration and nursing administration and education.

- *Diploma programs in allied health* including anesthetic science, community health, and medical laboratory technology.

University of Goroka.

Course offerings include:

- *Undergraduate nursing (Bachelors)* in maternal and child health.
- *Diploma programs* in health teaching and health education (post-SoN qualifications).

3.3.1.2 *Nongovernment Institutions*

Divine Word University. DWU is publicly financed but privately managed. The health-related courses offered include:

- *Undergraduate programs (Bachelors)* in rural health extension, environmental health, physiotherapy and health management.
- *Diploma programs* in eye care and accident and emergency medicine.
- *The Health Extension Officer training program.*

Pacific Adventist University.

- *Postgraduate program in public health* planned.
- *Undergraduate program (Bachelors) i*n general nursing with a midwifery program planned.

3.3.2 Schools of Nursing

There are seven SoNs which run a diploma of general nursing, a three-year course with a common curriculum. They are single-course institutions, the majority (five) operated by missions. The Madang School of Nursing also runs a bachelors degree in midwifery. The diploma qualification is the basic course for nursing in Papua New Guinea and is also a general qualification for entry, with some experience, to postgraduate nursing courses run by the universities. In general, schools of nursing have, or are in the process of, affiliating with a university.

3.3.2.1 *Government-Owned Schools of Nursing*

Government-owned institutions include: (i) the Highlands Regional College of Nursing in the Eastern Highlands Province; and (ii) Mendi in the Southern Highlands Province which re-opened in 2010 after 10 years closure.

3.3.2.2 *Mission-Owned Schools of Nursing*

Mission-owned and managed SoNs include: (i) St Barnabas (Milne Bay Province); (ii) Lae (Morobe Province); (iii) St Mary's Vunapope (East New Britain Province); (iv) Lutheran (Madang Province); and (v) Nazarene (Western Highlands Province).

3.3.3 Community Health Worker Training Schools (All Mission Owned)

There are 12 CHW training schools—all mission owned. They run a common curriculum and produce graduates with a Certificate in Community Health Work. The CHW training schools are: (i) Kapuna (Gulf Province); (ii) Raihu (West Sepik Province); (iii) Rumginae (Western Province); (iv) Lemakot (New Ireland Province); (v) Salamo (Milne Bay Province); (vi) St Gerard's (Central Province); (vii) Tinsley (Western Highlands Province); (viii) St Margaret's (Oro Province); (ix) Braun (Morobe Province); (x) Kumin (Southern Highlands Province); (xi) Onamuga (Eastern Highlands Province); and (xii) Gaubin (Madang Province).

3.4. Preservice Enrollments and Outputs of Health Training Institutions

Systematic data on enrollments by institution and program are not centrally held and, as a consequence, information is fragmented. The data in this section comes from a variety of sources, including a special survey of health-training institutions carried out for this report and which is discussed in more detail in Chapter 4. The universities, by and large, did not respond to this survey and special efforts were made to visit and phone institutions to generate the information contained in this report. Data has also been cross checked for consistency with other data held by the Human Resources Division of NDoH wherever possible.

The current capacity—enrollments and graduates—of the health-related education and training institutions and programs are summarized in Table 3-1. Table 3A.1 in Annex 3.2 presents detailed information on pre- and postgraduate training program enrollments and graduates related to the health sector for 2009.

Table 3-1: Summary of Key Preservice Training Enrollments and Graduates (2009)

Institution Programs	Male	Female	Total	Length (Yrs)	Graduates 2009
University Degrees					
Medical[1]	–	–	192	6	49
Dental (Surgery)[1]	–	–	–	6	16
Dental (Oral Health)[1]	–	–	–	4	2
Pharmacy[1]	–	–	74	5	25
Med. Lab Science[1]	–	–	51	4	20
Med. Imaging Science[1]	–	–	36	4	18
Nursing General	25	66	91	4	20[2]
Health Extension Officers	–	–	–	3	46
Environmental Health	46	55	101	3	18
Physiotherapy	21	40	61	3	19
Health Management	62	40	102	3	17
Diplomas					
General Nursing	–	–	479	3	135
Community Medicine	–	–	–	3	30
Certificates					
CHWs	–	–	449	2	149

Source: Health Training Institution Survey 2009 and data supplied by the various universities.
Note: [1] One year science at UPNG main campus and other years of study at medical school campus. [2] Estimated.

Key features of the supply situation summarized in Table 3-1 include:

Graduates with Degrees

- There are less than 50 medical doctors currently graduating annually—about 2.5 per province per year. As one point of reference there are currently only 383 doctors in service delivery and there are 62 in the headquarters of NDoH in largely administrative positions.
- Half as many pharmacists are graduating (25) as there are doctors (49). This compares to the existing stock in service delivery of 92.
- There were 16 graduates in dental surgery and two in oral health.
- There were 20 medical laboratory and 18 medical imaging graduates. This compares to an estimated 240 currently in direct service delivery.
- There were 46 rural health extension graduates (HEOs)—almost as many as there are doctors, compared to 460 currently employed in service delivery.
- There are fewer than 20 graduates per year in each of health management, physiotherapy, and environmental health.

Diploma and Certificate Level Graduates

- There were currently 165 diploma-level nursing graduates. This represents just 5 percent of the current stock of 3,279 nurses in service delivery.
- There were 149 graduates with certificates as CHWs—equivalent to just 3.4 percent of those in service delivery (4,418).

Annex 3.2 Table 3A.1 presents key information on the current training capacity of all the above referenced health-related training institutions/programs.

3.4.1 Medical, Health Extension Officer, Nursing and Community Health Worker Training Programs

3.4.1.1 *Medical Training*

Admission to the medical faculty at UPNG requires students to satisfactorily complete the first year of the general science program at the main campus. Admission to university requires superior grades in the national

Grade 12 examinations. A very significant proportion of students getting into university are believed to be sourced from a very few high schools (essentially the five old International Education Agency—now elite, private fee-based—schools based in Port Moresby and a couple of other urban areas and the four "old" National High Schools which used to be the only government-funded schools providing a Grade 12 education and entry to university programs). This means that provinces without an elite school (the majority) will have very limited numbers of their students represented in the intakes. The extent to which trained doctors prefer to go back and practice in their own province may be one big factor constraining regional equity in the supply of doctors.

There is considerable concern about the quality of education currently provided, in large part driven by the decline in real funding levels. This is reinforced by the ACER and Massaro review (2010). It noted that there have been no internal or external reviews of medical courses since 2000. The same report also cites a Country Profile of the PNG qualification system by Australian Education International (2010) which suggests bachelor degrees in PNG are the equivalent of associate degrees in other universities. It is not clear that this general conclusion should be applied to the PNG Medical School whose graduates are being accepted in Australia and/or as entry to postgraduate medical programs. Nevertheless, even if the medical school is an island of excellence in an otherwise fragile institution, there is a need to ensure student graduate quality in a transparent manner. To this end, the aforementioned report's recommendation that: "an effective quality assurance system must be implemented to complement the existing accreditation system" and that "this should provide for regular internal quality assurance and periodical quality assurance based on international peer review…" is appropriate.

3.4.1.2 *Health Extension Officer Training*

HEOs are now trained by DWU following the amalgamation of the the College of Allied Health Sciences with DWU. Entry to the program at DWU is based on Grade 12 results. It is important to determine to what extent all provinces/regions are represented in the student intakes for the reasons discussed above for medical graduates.

There has been considerable ambivalence in some quarters about the role and function of HEOs within the PNG health system of the future. Historically, HEOs were typically in charge of health centers, and to some extent health subcenters, and were responsible for supervising nurses and CHWs within their span of control. This was justified on the basis that PNG had a rural health service which was a "nondoctor" based model. HEOs were, to a significant extent, an alternative to doctor supervision in the absence of an adequate supply of doctors in rural areas. Over time, the entry requirements and qualifications of both nurses and CHWs have been increased.

Many in the nursing profession and others argue that, with the advent of degree programs for nurses and a range of postbasic nurse certificate and postgraduate programs for nurses, there is no longer a justification for HEOs. This is an issue which will be taken up in Chapter 5 when discussing demand issues. It is clear, however, as is evident from the documentation of doctors numbers, age structure and the proportion currently working in rural areas and the current supply situation that, even with a decision to immediately ramp up doctor training, the rural health system will operate without doctors as a primary service provider for at least another 15 to 20 years.

Enrollments in, and graduates of, the HEO program have generally declined over the past 15 years. Since 2004, graduate numbers have averaged 46 with a 3.5 percent dropout rate over the course—fairly low by many tertiary course standards in PNG and internationally. In 2009 there were, as discussed, 46 graduates.

HEO Curriculum Issues

Some critics within the health sector not only argue that the role of HEOs, at least as originally envisaged, has changed significantly over the past decade but also argue that the current HEO curriculum does not prepare graduates adequately with adequate competence, skills or confidence in either health-facility management or as rural clinical officers. Most particularly, they are not prepared to deal adequately with emergency obstetric care—a key rationale for their existence in the absence of doctors. Over the last part of the 1990s there have been at least two HEO curriculum reviews conducted by DWU and one requested by the NDoH curriculum review committee. The reviews done by the DWU have not, apparently, been made public or acted upon and the other by the NDoH has not been

acted upon. Perhaps there is a clear need to first generate a national consensus on what the role of an HEO should be—if an HEO is required at all. Without such a consensus on a core aspect of the rural health service-delivery strategy it is hard to see how agreement can be reached on an appropriate HEO training curriculum. Clearly, this requires a "whole-of-sector" approach to rebuild a consensus on the future of this—historically at least—very important cadre. This issue is taken up again in Chapter 5 (on human resource demand issues) and in Chapter 7.

3.4.1.3 *Preservice Nurse Training by Institution and Program*

The intake to nurse training has fluctuated over the period 2003 to 2008 from a low in 2003 of 114 to a high of 407 in 2005 but, in overall terms, has declined steadily since 1998. Since 2003, the average number of clinical nurse graduates has been 78.[8] According to data from the Training Institution Survey as shown in Table 3-2, there were 479 students enrolled in the Diploma of Nursing in 2009, with 386 (81 percent) enrolled in mission-owned facilities and 93 (19 percent) enrolled in government facilities. Over 70 percent of students are female. For the year 2010 there were 45 students enrolled in the newly reopened Mendi School and approximately 30 expected graduates in 2012 from the first intake.

In 2009 there were an estimated 135 graduates. The average graduating class is less than 30. The average enrollment in all SoNs is only 80 students—with one having only 52 students. Thus the training institutions under discussion are very small.

Entry requirements to general nursing programs are generally a Grade 12 completion with good grades in mathematics and the sciences. Most institutions specify that students must be 18 years of age.

8 Submission on Education and Training to the Human Resource Forum from NDoH, June 2008.

Table 3-2: Nurse Preservice Training Enrollments and Graduates (2009)

Institution Ownership	Male	Female	Total	Length (Yrs)	Graduates 2009
1. University Degrees[1]					
University of PNG–NCD	–	–	–	–	(–)
Pacific Adventist–NCD	25	66	91	4	(–)
University of Goroka–E. Highlands	–	–	–	–	(–)
Divine Word University–Madang	–	–	–	–	(–)
Subtotal Degree	**25**	**66**	**91**		**(–)**
2. Diplomas					
General Schools of Nursing					
2a. Mission					
St Barnabas–Milne Bay	14	38	52	3	13
Lae–Morobe	8	50	58	3	30
St Mary's–East New Britain	–	90	90	3	26
Lutheran–Madang	50	58	108	3	42
Nazarene–W. Highlands	35	43	78	3	24
Subtotal Mission	**107**	**279**	**386**		**135**
2b. Government					
Mendi–S. Highlands	–	–	–	3	Closed
Highlands Regional–E. Highlands	27	66	93	3	0
Subtotal Government	**27**	**66**	**93**		**0**
TOTAL	**159**	**411**	**570**		**135**

Source: Health Training Institution Survey 2009 and data supplied by the various universities.
Note: [1] Only PAU offers any preservice nurse training programs. UPNG, UOG, and DWU do not offer such programs.

SoN In-service Training

From the responses of the Health Institution Training Survey of 2009, it would seem that there is little in the way of systematic in-service training programs conducted. Vunapope indicated that they undertook infant and young child feeding and counseling training, preceptor training, and accident and emergency training—all organized by the NDoH. Nazarene organized monthly in-service for clinicians and academic staff. Mendi indicated they planned preservice preceptor workshops, accident and emergency and nutrition workshops.

General Nurse Curriculum Issues

There is a core national curriculum for the general diploma in nursing which is used as the basis for all programs in all the SoNS. Basic training programs only contain training for care of normal pregnancy and do not prepare the graduates to handle abnormalities and obstetric emergencies. The extent to which this is true needs to be rectified. For the current and foreseeable future, nurses will remain a mainstay of the health service-delivery strategy and in many rural areas are the primary or only health cadre—other than much lower level trained CHWs—available in health centers and health subcenters which serve a very significant share of the population—including pregnant mothers. This suggests careful consideration should be given to skills that are included in the base curriculum of nurse training programs. One option must be to consider a review of the curriculum to ensure that adequate reproductive health content and skills are included.

There has been some discussion within the health sector about the possibility of introducing a field-based postbasic nurse diploma in (more) advanced midwifery skills than can be incorporated in the basic nurse program of six months. It is not clear how this relates to the current 12 month graduate diploma in midwifery. Perhaps it could be a first module—it requires more thought. However, the notion of a form of in-service training and/or a postdiploma graduate program designed to enhance reproductive and child health programs for rural areas is, we believe, appropriate if it is carefully thought through and developed appropriately—initially perhaps through a pilot program. It will not be costless, however the costs of a high IMR and MMR are also unacceptable if such an approach could be demonstrated as effective. It is noted that the national Health Human Resources Conference of October 2008 recommended that the NDoH establish such a program.

3.4.1.4 *Community Health Worker Training by Institution*

Enrollments in, and graduations from, the CHW training programs in the twelve mission-run CHW training schools in the recent past have been in the order of 450–470 and 210–215 respectively. The data for 2009 are reported in Table 3-3. In 2009 there were 209 graduates from the 12 institutions—meaning that the average graduating class is only 17 with actual graduating classes varying between 0 and 36. More than half of all enrollments are female (55 percent). While complete datasets are not available for graduates by gender, it is not evident that dropout rates among enrollees by gender are significantly different—indicating that enrollments are a reasonable proxy for graduates.

Generally, the minimum entry requirement is for a Grade 10 pass with upper passes or credits in English, mathematics, science and social science. Students are generally expected to be in the age range 18–22 years and be of good character. Some specify a period of at least two years in the community prior to entry to the program. Entry requirements for the CHW training program, as specified by principals of schools in the Health Facility Training Institutions Survey 2009, are presented in Appendix Table 3.1.3 in Volume 2. In more recent years an increasing proportion of students entering the various institutions have a Grade 12 education.

While the increased number of students graduating from Grade 12 throughout the country may provide an opportunity to reconsider the entry requirements to CHW training, there are a number of factors which need to be taken into account before such a decision. These include: (i) an increased level of general education on entry to CHW training programs would almost certainly require adjustments to be made to the curriculum; (ii) principals of the schools have indicated some dissatisfaction with Grade 12 graduates as not settling down to the curriculum and/or that Grade 12 students have expectations of the programs that are not realistic; and (iii) if a decision is made that there should be a wide geographic selection of students entering training programs on the grounds this is an important method to encourage graduates to serve in remote areas, it is necessary to ensure

there is an adequate supply of qualified graduates from all areas of the country. Grade 12 graduates are currently distributed very inequitably across the country and many areas are extremely unlikely to have an adequate supply of Grade 12 graduates. These issues are taken up in more detail in Chapter 7.

At present the mission training institutions do not operate in all provinces—seven provinces and the NCD do not have a CHW training institution. Nevertheless the training institutions are widely disbursed across the country in a very decentralized manner, certainly compared to all other training systems in the country. Thus, they are well placed to meet the staff needs of a decentralized delivery system at least within the provinces in which they operate. The church CHW training institutions were, at least initially, primarily established to meet the needs of their own church health service. Over time, government institutions were closed and their role has evolved somewhat. Clearly, the institutions cater for more than their own needs, including other provinces but it is not clear that all needs are currently being met. Chapter 7 will discuss the options open to expand training in the future given the anticipated demand—including options to expand existing facilities and options to increase the number of institutions through the establishment of new government training institutions.

CHW In-service Training

It would seem that there are few systematic in-service training programs being conducted. Vunapope indicated that they undertook infant and young child feeding and counseling training, preceptor training, and accident and emergency training—all organized by the NDoH. Nazarene organized monthly in-service for clinicians and academic staff, while Mendi indicated that they planned preservice preceptor workshops, accident and emergency and nutrition workshops.

CHW Curriculum Issues

The CHW training curricula is a national competency-based program, however, the program only contains training for care of normal pregnancy and delivery care and does not prepare the graduates to handle pregnancy abnormalities and any obstetric emergencies. The program is also limited in the depth of training allocated to family planning and STI (sexually transmitted infection) prevention. While international evidence supports the notion that there should be strict limits on the scope

Table 3-3: Community Health Worker Training Enrollments and Graduates (2009)

Institution (All Mission Owned)	Male	Female	Total	Graduates 2009
St Margaret's (Oro)	20	29	49	16
Salamo (Milne Bay)[1]	18	26	44	20
Tinsley (Western Highlands)	11	8	19	19
Braun (Morobe)[1, 2]	11	14	25	12
Raihu (West Sepik)	22	34	56	23
St Gerard's - Veifa' (Central)[1]	21	23	44	22
Onamuga (Eastern Highlands)[1, 3]	9	11	20	10
Kapuna (Gulf)[1]	18	16	34	12
Gaubin (Madang)	29	25	54	26
Rumginae (Western)[3]	16	14	30	0
Kumin (Southern Highlands)	5	15	20	13
Lemakot (New Ireland)	24	30	54	36
TOTAL	**204**	**245**	**449**	**209**
Percentage	**45.5**	**54.5**	**100**	**–**

Source: Health Training Institution Survey 2009.
Notes: [1] Estimated graduates.
[2] Enrollments by sex unknown: assumes proportions the same as for all other institutions.
[3] No intake in 2008. No graduates in 2009.

and function of this level of staff, it nevertheless remains clear that currently and for the foreseeable future CHWs will be a mainstay of the health service-delivery strategy and in many rural areas are the only health staff available for a significant share of the population—including pregnant mothers. This suggests careful consideration should be given to skills that are included in the base curricula of CHWs. One option to consider is a review of the CHW curriculum to ensure that adequate reproductive health content and skills are included. This review should be carefully nuanced with the possible increased supply of Grade 12 students entering CHW training programs—albeit balanced with the issues discussed above relating to Grade 12 entrants and the need to adequately supply remote areas with core health staff.

There has been considerable discussion within the health sector about the possibility of introducing a post-basic CHW diploma in (more) advanced midwifery skills (as discussed above for nurses). This notion is appropriate if it is carefully thought through and developed appropriately—initially perhaps through a pilot program. Options discussed have typically envisaged a six month course. It might be appropriate to have a shorter program for more CHWs—there has been virtually no in-service training/refresher programs for CHWs. These are probably highly desirable—particularly as a priority for those CHWs with at least five years before retirement and who are working in the remoter areas of the country. It will not be cost-free but the costs of a high IMR and MMR are also unacceptable if such an approach could be demonstrated as effective. It is, after all, a fact that most midwifery care—at least in rural areas—is currently provided by either CHWs or a general nurse. The National Health Human Resources Conference of October 2008 recommended that the NDoH establish such a postgraduate diploma program.

All CHW training is undertaken by church agencies that make a critical contribution to health service delivery—albeit with the vast majority of funding coming from the public budget. There is considerable concern in many quarters of the health sector that not all aspects of the national curricula for CHWs (or for that matter a range of basic package protocols in health facilities) are taught adequately. It is often felt that some church agencies do not teach family planning at all and many propagate very moralistic ideas and attitudes towards reproductive health issues—for example HIV and STI prevention and adolescent health. This is often also used as another reason why government needs to re-establish its own CHW training schools. It is important that there is a national curricula and that training schools are subject to quality-assurance programs. The state of quality-assurance programs—or the almost complete absence of systematic quality-assurance programs—is discussed in more detail in Chapter 4 and options and the case for new government CHW training schools is discussed in more detail in Chapter 5.

3.5. Postgraduate Training Programs

The University of Papua New Guinea Medical School and other universities also provide a wide array of postgraduate programs in a wide range of specialties. These courses and programs make an important contribution to the human resource needs of the health system—particularly for specialty doctors and nurses, including midwives. Table 3-4 summarizes the data collected for this report. While not complete, it does provide some indication of the scale and diversity of programs offered. The data for this table is based on Appendix 3.1 in Volume 2.

3.5.1 Nurse Midwifery Programs

By and large this report, by design, is focused on the core "basic or entry level" service-delivery staff—doctors, HEOS, nurses, and CHWs because of a crisis in supply. These staff categories, particularly nurses and midwives, form the backbone of rural health services. The emerging supply constraints of these staff are in danger of ensuring the service-delivery structure is weakened even further compared to its existing parlous state—as discussed throughout the NHP. The only postgraduate program that is a particular focus in this report is that for midwives because of their crucial potential role in enabling a clear, more immediate and decisive response to the appallingly high maternal mortality rates and unacceptably high neonatal and infant mortality rates currently prevailing in the country—particularly throughout the highlands region.

At present doctors is the only category of staff which has significant training in abnormal and emergency obstetric care as part of its core curriculum. Neither the general nurse training program nor the CHW training program covers abnormal and/or emergency obstetric

Table 3-4: Postgraduate Training Program Graduates (2009)

Institution / Program	Male	Female	Total	Length (Yrs)	Graduates 2009
University Degrees					
Master of Medicine (Emerg. Med.)	2	0	2	–	2
Master of Medicine (Obs & Gynecology)	0	2	2	–	2
Master of Medicine (Surgery)	4	0	4	–	4
Master of Medical Sciences	2	0	2	–	2
Masters in Public Health	1	0	1	1	1
Bachelor of Clinical Nursing	–	–	–	1	49
Bachelor of Nursing	–	–	–	1	30
Maternal Child Health	–	–	–	1	–
Diplomas					
Anesthetics	–	–	–	1	1
Obstetrics & Gynecology	–	–	–	–	3
Eye Care	–	–	–	1	1
Accident & Emergency	–	–	–	1	1
Health Teaching	–	–	(–	1	–
Health Education	–	–	–	1	–
Certificates					
Any	–	–	–	–	–
TOTAL	**9**	**2**	**11**	**n.a.**	**96**

Source: Mission data collection and Health Training Institution Survey 2009.

care. HEO training on other than normal deliveries is also perfunctory. As currently configured, midwifery training takes place at university level as a postgraduate program with students entering the program after completion of a general diploma in nursing from one of the SoNs and generally following some work experience. Current capacity for the training of midwives is about 90 from the current four university postgraduate programs.

No new midwives have, however, been formally registered since 2000 because the curricula that have been introduced by the various universities that are responsible for training midwives since 2001 have never been approved or certified by the Nursing Council of PNG (NC of PNG). The key issues are apparently that none of the curricula fulfill the statutory requirements in terms of clinical skills training. Further, the curriculum is also very theoretical and contains insufficient training time in the clinical area, and often includes insufficient supervised clinical placements during training.

The NDoH responded in 2006 by initiating a program of curriculum development with external assistance. Initially an external review of the midwifery training and deployment was undertaken by the end of 2007. This report confirmed that none of the current midwifery programs were adequate and meeting the professional registration requirements for skilled clinical midwives. A recommendation was made that a new national curriculum be developed and implemented. NDoH subsequently attempted to collaboratively develop a structure and basis for a national midwifery program by supporting staff of the four midwifery training programs, facilitated by the international expert who had conducted the initial review.

The universities have subsequently been developing a national curriculum, however, this process seems to have bogged down. In large part this is because of a perceived conflict between the "rights" of each university to determine curriculum and the "right" of the NC of PNG and of the NDoH to drive the curricula—notwithstanding

they are the major employer of graduates. One school of thought in the universities seems to be that NDoH does not have a right to make any input to curriculum development. Another thread of discussion, perhaps even inertia, seems to be that there is resistance to reforming the theoretical unregisterable curricula. It is hoped by the time this report is distributed that this impasse will have been overcome.

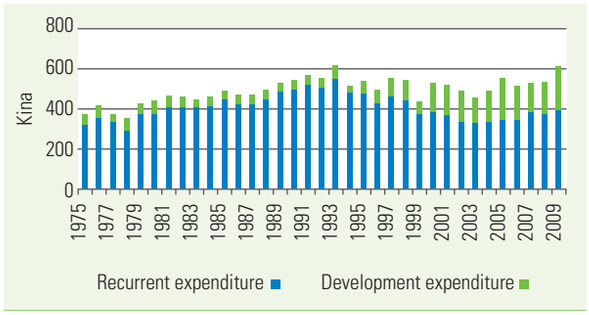
It is the view of this report that NDoH should not hesitate to decisively push the universities to produce appropriate midwives—ones who meet the needs of the national service delivery strategy. A system that does not allow midwives to be registered by the NC of PNG is not fair to individual graduates who, in good faith, enter programs expecting to be registered. More importantly, it is a waste of national resources and the extent to which this constrains service delivery and reduced IMRs and MMRs is unethical. The NDoH should put a strong case to the OHE and government more generally, that student sponsorships for new intakes to universities not cooperating on the revised national curriculum for midwives should be withdrawn forthwith.

3.6. A Note on Subsequent Chapters of the Report

Chapter 4 looks in some detail at the unit costs of student training, school revenues, operational processes and issues, including quality issues of the teaching process, organizational issues, and the ability of students to find jobs at graduation. It also reviews aspects of current training facility assets and infrastructure quality and condition. This chapter forms a background to Chapters 5 and 6 which discuss options and costs to enhance the supply of health human resources to meet needs. It also reports the full details of the Health Training Facility Survey of 2009. Those wishing to just review the demand for health human resources and then look at the estimated imbalances in supply and demand for the core service-delivery cadres can proceed directly to Chapters 5 and 6.

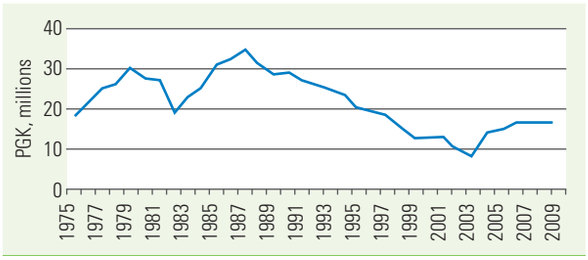
ANNEX 3.1

Figure 3A.1: Real Per Capita Recurrent and Development Expenditure (1975–2009)



Source: PNG Universities Review 2010.

Figure 3A.2: Real Recurrent Expenditure on Nursing Colleges (1975–2009)



Source: PNG Universities Review 2010.

ANNEX 3.2

Table 3A.1: Health Training Institutions, Programs, Enrollments and Graduates (2009)

Program Name	Graduates 2009			Enrollments 2009		
	Males	Females	Total	Males	Females	Total
A. UNIVERSITIES						
1. University of Papua New Guinea (UPNG)						
Postgraduate Programs						
Master of Medicine (Emergency Medicine)	2	0	2	–	–	–
Master of Medicine (Obstetrics & Gynecology)	0	2	2	–	–	–
Master of Medicine (Surgery)	4	0	4	–	–	–
Master of Medical Sciences	2	0	2	–	–	–
Masters in Public Health	1	0	1	–	–	–
Postgrad. Dip. Anesthesiology	1	0	1	–	–	–
Postgrad. Dip. Child Health	5	0	5	–	–	–
Postgrad. Dip. Obstetrics & Gynecology	1	2	3	–	–	–
Postgrad. Dip. Ortorhinolaryngology	1	0	1	–	–	–
Undergraduate Medical Programs (Allied Health)						
Bachelor of Medicine & Surgery	39	10	49	–	–	192
Bachelor of Pharmacy	8	17	25	–	–	74
Bachelor of Dental Surgery *	6	10	16	–	–	–
Bachelor of Oral Health *	2	0	2	–	–	–
Undergraduate Programs (Allied Health)						
Bachelor of Medical Imaging Science	10	8	18	–	–	36
Bachelor of Medical Laboratory Science	10	10	20	–	–	51
Bachelor of Clinical Nursing (Postgrad Nursing Diploma. Program) **						
Bachelor of Clinical Nursing (Midwifery) ***	–	–	–	–	–	–
Bachelor of Clinical Nursing (Pediatric) ***	–	–	–	–	–	–
Bachelor of Clinical Nursing (Midwifery & Pediatrics)	16	33	15	–	–	–
Bachelor of Clinical Nursing (Mental Health)			9	–	–	–
Bachelor of Clinical Nursing (Acute Care)			25	–	–	–
Bachelor of Nursing (Postgrad. Program) **						
Bachelor of Nursing (Community Health & Nursing Admin)	9	21	11	–	–	–
Bachelor of Nursing (Nursing Administration) ***			–	–	–	–
Bachelor of Nursing (Nursing Education) ***			–	–	–	–
Bachelor of Nursing (Nursing Admin & Education)			19	–	–	–

(*continued on next page*)

Table 3A.1: Health Training Institutions, Programs, Enrollments and Graduates (2009) (*continued*)

Program Name	Graduates 2009			Enrollments 2009		
	Males	Females	Total	Males	Females	Total
Diploma Programs (Allied Health)						
Diploma in Anaesthetic Science	11	10	21	–	–	–
Diploma in Community Health	13	17	30	–	–	–
Diploma In Medical Laboratory Technology	6	0	6	–	–	–
2. Pacific Adventist University (PAU)						
Master Public Health (Postgrad. Program)	Program not commenced					
Bachelor of Midwifery (Postgrad. Program)	–	–	–	–	–	–
Bachelor of General Nursing	–	–	–	–	–	91
3. Divine Word University (DWU)						
Diploma in Eye Care	1	6	7	1	5	6
Diploma in Accident & Emergency Medicine	1	0	1	0	0	0
Bachelor of Rural Health Extension	22	24	46	104	141	245
Bachelor of Environmental Health	8	10	18	46	55	101
Bachelor of Physiotheraphy	4	15	19	21	40	61
Bachelor of Health Management	12	5	17	62	40	102
4. University of Goroka (UOG)						
Bachelor of Maternal Child Health (Postgrad. Program)	–	–	–	–	–	–
Diploma in Health Teaching	–	–	–	–	–	–
Diploma in Health Education	–	–	–	–	–	–
B. SCHOOLS OF NURSING						
1. St Barnabas (MBP)						
Diploma in General Nursing	–	–	13	–	–	52
2. Lae (Morobe Province)						
Diploma in General Nursing	–	–	30	–	–	58
3. St Mary's Vunapope (ENBP)						
Diploma in General Nursing	–	26	26	–	90	90
4. Lutheran (Madang Province)						
Bachelor of Midwifery	–	–	–	–	–	–
Diploma in General Nursing	–	–	42	50	58	108
5. Highlands Regional (EHP)						
Diploma in General Nursing	–	–	–	27	66	93
6. Mendi (SHP)						
Diploma in General Nursing	Closed					
7. Nazarene (WHP)						
Diploma in General Nursing	8	16	24	–	–	78
C. CHW TRAINING SCHOOLS						
1. Kapuna (Gulf Province)						
Certificate in Community Health Work	–	–	–	–	–	34

(*continued on next page*)

Table 3A.1: Health Training Institutions, Programs, Enrollments and Graduates (2009) (*continued*)

Program Name	Graduates 2009			Enrollments 2009		
	Males	Females	Total	Males	Females	Total
2. Raihu (Sandaun Province)						
Certificate in Community Health Work	–	–	23	–	–	56
3. Rumginae (Western Province)						
Certificate in Community Health Work	–	–	16	–	–	30
4. Lemakot (NIP)						
Certificate in Community Health Work	–	–	36	24	30	54
5 Salamo (MBP)						
Certificate in Community Health Work	–	–	–	18	26	44
6. St Gerards (Central Province)						
Certificate in Community Health Work	–	–	–	21	23	44
7. Tinsley (WHP)						
Certificate in Community Health Work	–	–	19	11	8	19
8. St Margarets (Oro Province)						
Certificate in Community Health Work	–	–	16	20	29	49
9. Braun (Morobe Province)						
Certificate in Community Health Work	–	–	–	–	–	25
10. Kumin (SHP)						
Certificate in Community Health Work	5	8	13	5	15	20
11. Onamuga (EHP)						
Certificate in Community Health Work	–	–	–	–	–	20
12. Gaubin (Madang Province)						
Certificate in Community Health Work	–	–	26	29	25	54

Source: National Health Training Institution Survey 2009.
Notes: * Bachelor of Dentistry is divided into Oral Health and Dental Surgery.
** Nursing programs have been categorized into two (Clinical Nursing and Nursing) in the graduates register at UPNG.
*** These programs were merged in 2005.

CHAPTER 4

CHARACTERISTICS OF SCHOOLS OF NURSING AND CHW TRAINING INSTITUTIONS

4.1. Introduction

This chapter reviews in considerable detail the characteristics of two categories of health training institutions—the Schools of Nursing and Community Health Worker Training Schools. The information reported in this chapter is derived from the Health Training Facilities Survey of 2009 which, as discussed, was the primary source of data on enrollments and graduates from the health training system reported in Chapter 2.[9] Nevertheless, these institutions are responsible for supplying the core of the health delivery system in PNG as discussed in Chapter 2 and subsequently in Chapters 5 and 6. To this end Chapter 4 documents and discusses: (i) expenditures of the training schools; (ii) staff-student ratios and the unit costs of students in each of the nurse and CHW training institutions; (iii) characteristics of nurse and CHW trainers—qualifications and teacher training qualification, age and sex and years of experience of the teaching force in each of the two types of training schools. Section 4.5 reports the details of a qualitative and quantitative assessment of the conditions under which these training schools operate (as reported by principals)–including quality of teaching support and teaching processes and the quality of buildings and equipment.

The data in this chapter has never been documented systematically before—including cost and expenditure data and, in particular, the assessment of the teaching process and the quality of the buildings. In this regard the Training Facilities Survey of 2009 is the first real attempt to draw a wide range of data together. As previously noted, it was also collected as background information for the Garnaut-Namaliu Review of Papua New Guinea Universities.[10]

4.2. Nurse and CHW Training Institution Expenditures 1995–2009

This section documents and discusses the total recurrent costs, average recurrent costs and the break-up of recurrent operating costs of Schools for Nursing and CHW Schools in turn.

4.2.1 Schools of Nursing

The Schools of Nursing are relatively small institutions. The recurrent budgets for each of the seven SoNs are presented in Table 4-1 for the period 2005–2009. The total recurrent cost of operating all SoNs has increased from K2.8 million in 2005 to K3.7 million in 2009 in nominal

9 The Health Training Institutions Review of 2009 was conducted jointly with the Secretariat of the Papua New Guinea Universities Review 2010 (forthcoming). By and large the Universities did not respond to the survey—as a consequence only data on the SoNs and CHW Training Schools can be reported.

10 There are considerable additional detailed data for individual training institutions derived from the survey available within the Human Resources and Policy Division of the National Department of Health.

Table 4-1: Recurrent Expenditures of All Schools of Nursing 2005–2009 (Kina)

School	2005	2006	2007	2008	2009
St Barnabas	479,239	506,098	592,598	615,690	646,658
St Mary's	225,000	234,000	449,000	484,000	633,000
Lutheran	1,040,467	1,066,883	1,115,258	909,885	840,155
Nazarene	482,131	495,492	529,604	558,572	580,653
Lae	214,473	247,020	236,187	237,333	271,423
Highlands Regional	379,081	477,125	445,982	458,178	511,897
Mendi	n.a.	n.a.	n.a.	n.a.	236,951
Total Expenditures	**2,820,391**	**3,026,618**	**3,368,629**	**3,263,658**	**3,720,737**
Average Expenditures/SoN	**470,050**	**504,369**	**561,438**	**543,943**	**531,534**

Source: Health Training Institution Survey 2009.

terms. In real terms budgets will have fallen significantly. The average size of recurrent expenditures of SoNs in 2009 was less than K532,000.

The composition of nursing school salary expenditures is instructive (Tables 4-2 and 4-3). Salary costs of nursing schools are estimated to have remained at around K1.2 million over the period 2005 to 2009 and have declined as a proportion of total recurrent costs from 44 percent in 2005 to 32 percent in 2009.[11] Teaching costs have been estimated at about the same level as salaries—about K1.3 million in 2008 and 2009 while operational costs have increased somewhat from K0.6 million in 2005 to K1.2 million in 2009. Thus teaching costs, including student boarding costs, have represented just over one-third of school operating budgets—student boarding costs being the largest cost in this category and representing about one-quarter of a typical school's operating cost budget. Student travel (to pay students to get from home to the school and return for holidays) and allowances for books account for a further 5 percent of total operating costs—expenses usually paid together with boarding costs by the scholarship system from the public budget.

Teaching aids and related material only constitute 2 percent of total operating costs with the costs of computing and the internet constituting about 1 percent of total costs although this reached 2 percent in 2009. Significantly, no resources have been expended on school libraries. All in all teaching quality-enhancing expenditures constitute only 5 percent—perhaps 6 percent if allowances for student books are included in this estimate. Libraries, as also noted below in Section 4.5, are not accorded a priority for quality-enhancing school expenditures. The details of individual school budgets are presented in Appendix Tables 4.1.1 to 4.1.7.

The break-up of school operational costs is also instructive with administrative operational costs remaining at a fairly modest level of 5 percent of the total. Maintenance has received an increasing share of the operating budget—rising from 6 percent in 2005 to 9 percent in 2009. At face value this could be perceived as a good and sound trend. However, much of the qualitative data reported in Section 4.5 indicates that both buildings and plant and equipment are, by-and-large, in a parlous state. The rising maintenance budgets no doubt reflect the crisis many schools are facing keeping their operations continuing. Vehicle and plant costs represent about 3 percent of school operating budgets—while power, water, and telephone accounted for an additional 5 percent of expenditures in 2009.

4.2.2 CHW Training Schools

The CHW training schools are very small institutions—typically situated in mission compounds or other mission-owned and managed health facilities. The reported recurrent operating budgets for each of the 12 schools are presented in Table 4-4 for the period 2005–2009. The total

[11] The quality of data for 2009 is estimated to be more robust than other years. As a consequence this trend in the proportion of wages in total expenditure is probably quite accurate (see Appendix 4.4 for how these estimates were constructed).

Table 4-2: Total Expenditures on All SoNs by Expenditure Categories 2005–2009 (Kina)

Expenditures	2005	2006	2007	2008	2009
Salaries	**1,252,990**	**1,221,181**	**1,259,170**	**998,547**	**1,190,958**
Teaching Costs					
Teaching Aids and Material	82,347	93,593	95,904	96,000	78,667
Student Boarding/Lodging	674,176	785,869	919,607	970,531	855,965
Student Travel and Books	141,089	181,386	174,067	178,955	204,138
IT (Computing and Internet)	20,712	18,412	19,202	33,552	79,346
Library	12,762	13,333	13,333	12,093	14,629
Other	20,000	9,333	29,333	78.017	66,680
Subtotal Teaching Costs	**951,086**	**1,101,926**	**1,251,446**	**1,369,148**	**1,299,425**
Operational Costs					
Administration Costs	126,000	131,917	182,288	184,984	188,718
Maintenance	181,143	227,457	219,600	269,935	353,184
Vehicle and Plant Costs	77,192	85,016	102,725	97,911	106,186
Power	98,867	120,360	105,533	105,533	98,133
Water	26,421	29,100	24,667	34,667	28,667
Telephone	30,911	31,144	25,333	28,000	23,333
Other	75,780	78,517	197,867	174,933	432,133
Subtotal Operational Costs	**616,314**	**703,511**	**858,013**	**895,963**	**1,230,354**
Total Expenditures	**2,820,390**	**3,026,618**	**3,368,629**	**3,263,658**	**3,720,737**

Source: Health Training Institution Survey 2009.

Table 4-3: Total Expenditures on All SoNs by Expenditure Categories 2005–2009 (%)

Expenditures	2005	2006	2007	2008	2009
Salaries	**44**	**40**	**37**	**31**	**32**
Teaching Costs					
Teaching Aids and Material	3	3	3	3	2
Student Boarding/Lodging	24	26	27	30	23
Student Travel and Books	5	6	5	5	5
IT (Computing and Internet)	1	1	1	1	2
Library	0	0	0	0	0
Other	1	0	1	2	2
Subtotal Teaching Costs	**34**	**36**	**37**	**41**	**34**
Operational Costs					
Administration Costs	4	4	5	6	5
Maintenance	6	8	7	8	9
Vehicle and Plant Costs	3	3	3	3	3
Power	4	4	3	3	3
Water	1	1	1	1	1
Telephone	1	1	1	1	1
Other	3	3	6	6	12
Subtotal Operational Costs	**22**	**24**	**26**	**28**	**34**
Total Expenditures	**100**	**100**	**100**	**100**	**100**

Source: Calculated from Table 4-2.

recurrent costs of all institutions indicate there was a significant increase in expenditures between 2005 and 2006 from K1.6 million to K2.6 million but that since 2006 expenditures have been fairly constant at around K2.2 to 2.5 million per annum in nominal terms. In real terms they will have declined significantly. The average cost of running a CHW school has increased in nominal terms from K135,000 in 2005 to K214,000 in 2009 with a few schools spending around one-half of the average expenditure per school.

The composition of CHW school budgets provides an important insight into the current cost structure of teaching community health workers (Tables 4-5 and 4-6). Salary costs in nominal terms have fluctuated between K351,000 in 2005 to K475,000 in 2007 and down to K395,000 in 2009—a substantial decline since 2006 in real terms.

As a proportion of total recurrent costs, salaries have declined from 22 percent in 2005 to 15 percent in 2009—having been around 20 percent in 2007 and 2009. Teaching costs over the period 2005–2009 have declined from 47 percent in 2005 to 34 percent in 2009. The main cost under this heading is student boarding which showed a declining proportion over this period from 30 percent in 2005 to 16 percent in 2009. Nevertheless, it continues to constitute a substantial proportion of total costs. Student travel (for home leave) and books account for an additional 4–5 percent of total expenditures.

Teaching aids and associated materials are reported at about 9 percent in 2009—substantially higher than for nurse schools—and have been generally increasing as a proportion of total operating costs. Internet connections account for 1 percent or less over the period—as reflected in Section 4.5 below—and many CHW schools do not have any access to the internet. As with nursing schools, no expenditures are reported for libraries—clearly libraries are either nonexistent or in a very parlous state which is not a good situation for a good teaching environment. Overall direct teaching quality-enhancing expenditures constitute about 10 percent of total operating expenditures—an amount that could and should, at face value, be higher.

Operational costs for CHW schools are reported at about one-half of total recurrent expenditures. In 2005–2007 maintenance accounted for a very high proportion of overall expenditures and in 2007–2009 the unspecified "other" has increased significantly—particularly in 2009. As discussed under the section on nurse schools, the high levels of maintenance expenditure probably constitute an effort to deal with a buildup of past neglect of maintenance—see also Section 4.5 below. Vehicle and plant

Table 4-4: Total Recurrent Costs CHW Schools 2005–2009 (Kina)

CHW School	2005	2006	2007	2008	2009
St Margaret's	176,669	102,170	153,660	144,279	184,756
Salamo	57,433	91,000	129,184	195,110	194,993
Tinsley	156,344	297,891	193,562	189,655	107,153
Braun	159,994	301,541	197,212	210,822	244,470
Raihu	142,253	153,410	171,965	162,765	539,502
St Gerard's	174,240	315,787	211,458	225,068	258,716
Onamuga	141,900	283,447	179,118	192,728	226,376
Kapuna	111,004	176,710	154,967	206,352	137,953
Gaubin	110,907	124,174	128,012	144,881	188,693
Rumginae	127,011	130,276	159,997	171,757	238,845
Kumin	103,428	403,472	396,640	109,488	129,418
Lemakot	165,503	233,564	135,207	338,065	119,255
Total Expenditure All Schools	**1,626,686**	**2,613,443**	**2,210,983**	**2,290,969**	**2,570,131**
Average Expend/School	**135,557**	**217,786**	**184,248**	**190,914**	**214,177**

Source: Health Training Institution Survey 2009.

Table 4-5: Total Expenditures of All CHW Schools by Expenditure Categories 2005–2009 (Kina)

Expenditures	2005	2006	2007	2008	2009
Salaries	**350,647**	**516,803**	**475,293**	**450,315**	**394,694**
Teaching Costs					
Teaching Aids and Material	113,156	108,469	126,765	149,435	237,799
Student Boarding/Lodging	490,868	370,030	383,548	437,135	403,954
Student Travel and Books	76,961	123,068	81,804	116,733	95,105
IT (Computing and Internet)	8,400	13,200	6,000	11,750	13,800
Library	5,000	5,000	2,250	4,000	5,000
Other	68,860	80,504	91,971	119,668	125,222
Subtotal Teaching Costs	**763,245**	**700,271**	**692,338**	**838,721**	**880,880**
Operational Costs					
Administration Costs	59,377	99,367	115,344	119,110	139,600
Maintenance	190,328	808,491	432,582	123,850	123,978
Vehicle and Plant Costs	116,244	124,588	103,701	243,465	141,276
Power	83,304	80,162	101,815	170,843	99,252
Water	7,838	14,430	28,145	32,761	50,521
Telephone	34,300	39,562	33,734	38,570	29,651
Other	21,403	229,769	228,031	273,334	710,279
Subtotal Operational Costs	**512,794**	**1,396,369**	**1,043,352**	**1,001,933**	**1,294,557**
Total Expenditures	**1,626,686**	**2,613,443**	**2,210,983**	**2,290,969**	**2,570,131**

Source: Health Training Institution Survey 2009.

Table 4-6: Total Expenditures of All CHW Schools by Expenditure Categories 2005–2009 (Percent)

Expenditures	2005	2006	2007	2008	2009
Salaries	**22**	**20**	**21**	**20**	**15**
Teaching Costs					
Teaching Aids and Material	7	4	6	7	9
Student Boarding/Lodging	30	14	17	19	16
Student Travel and Books	5	5	4	5	4
IT (Computing and Internet)	1	0	0	1	1
Library	0	0	0	0	0
Other	4	3	4	5	5
Subtotal Teaching Costs	**47**	**26**	**31**	**37**	**35**
Operational Costs					
Administration Costs	4	4	5	5	5
Maintenance	12	31	20	5	5
Vehicle and Plant Costs	7	5	5	11	5
Power	5	3	5	7	4
Water	0	0	1	1	2
Telephone	2	1	2	2	1
Other	1	9	10	12	28
Subtotal Operational Costs	**31**	**53**	**48**	**43**	**50**
Total Expenditures	**100**	**100**	**100**	**100**	**100**

Source: Calculated from Table 4-5.

costs and power costs constitute an important share of total operational costs—generally between 9 and 12 percent of total expenditures over the period 2005–2009.

4.3. Unit Costs of Nurse Schools and CHW Training Institutions

Unit costs are measured by the schools' total recurrent expenditure divided by student enrollments (the latter is drawn from those reported in Chapter 3). The information for nursing schools (Table 4-7) reports some interesting observations. Average unit costs for all nurse training schools was K7,479 in 2007. In nominal terms unit costs have increased by about K1,000 over the years 2007–2009, however, there is a significant differences between the unit costs of mission and the government-managed school. The average unit costs for mission schools in 2009 was K7,874 while that for government schools was K5,504 in 2009. The average unit costs of students in mission schools have been about K2,400 per student more expensive (about 43 percent more expensive) than the government school.

Table 4-7: Recurrent Unit Costs per Student for Schools of Nursing 2006–2009 (Kina)

School/Costs	2006	2007	2008	2009
St Barnabas				
Total Recurrent Costs	506,098	592,598	615,690	646,658
Enrollments (EFTS)*	51	51	57	52
Unit Cost	**9,923**	**11,619**	**10,802**	**12,436**
St Mary's				
Total Recurrent Costs	234,000	449,000	484,000	633,000
Enrollments (EFTS)*	59	84	89	90
Unit Cost	**3,966**	**5,345**	**5,438**	**7,033**
Lutheran				
Total Recurrent Costs	1,066,883	1,115,258	909,885	840,155
Enrollments (EFTS)*	168	133	120	108
Unit Cost	**6,350**	**8,385**	**7,582**	**7,779**
Nazarene				
Total Recurrent Costs	495,492	529,604	558,572	580,653
Enrollments (EFTS)*	83	78	77	78
Unit Cost	**5,970**	**6,790**	**7,254**	**7,444**
Lae				
Total Recurrent Costs	247,020	236,187	237,333	271,423
Enrollments (EFTS)*	(–)	48	60	58
Unit Cost	**(–)**	**4,920**	**3,956**	**4,680**
Highlands Regional				
Total Recurrent Costs	477,125	445,982	458,178	511,897
Enrollments (EFTS)*	(–)	88	91	93
Unit Cost	**(–)**	**5,068**	**5,035**	**5,504**
Average Unit Costs – All	**(–)**	**7,021**	**6,677**	**7,479**
Average Unit Costs – Church	**6,552**	**7,411**	**7,006**	**7,874**
Average Unit Costs – Government	**(–)**	**5,068**	**5,035**	**5,504**

Source: Health Training Institution Survey 2009.
Notes: Effective Full-Time Equivalent Student Enrollments. Excludes Mendi because it had only partial enrollments in 2009 and was not operational in previous years.

These are significant differences—assuming all enrolled students graduate and that the nurse course is three years. The average cost of a graduate from a government school would be about K16,500 while that from a mission school would be about K7,000 more expensive at K23,600 per graduate. While one needs to be careful how to interpret these results—there could, for example, be variations in quality of student outcomes and/or drop-

Table 4-8: Average Recurrent Unit Costs CHW Schools 2006–2009 (Kina)

School	2006	2007	2008	2009
St Margaret's Total Recurrent Costs	102,170	153,660	144,279	184,756
Enrollments (EFTS)*	19	20	20	49
Unit Cost	**5,377**	**7,683**	**7,214**	**3,771**
Salamo Total Recurrent Costs	91,000	129,184	195,110	194,993
Enrollments (EFTS)*	34	37	41	44
Unit Cost	**2,676**	**3,491**	**4,759**	**4,432**
Tinsley Total Recurrent Costs	297,891	193,562	189,655	107,153
Enrollments (EFTS)*	(–)	(–)	49	19
Unit Cost	**(–)**	**(–)**	**3,871**	**5,640**
Braun Total Recurrent Costs	301,541	197,212	210,822	244,470
Enrollments (EFTS)*	22	(–)	25	25
Unit Cost	**13,706**	**(–)**	**8,433**	**9,779**
Raihu Total Recurrent Costs	153,410	171,965	162,765	539,502
Enrollments (EFTS)*	47	42	19	56
Unit Cost	**3,264**	**4,094**	**8,567**	**9,634**
St Gerard's Total Recurrent Costs	315,787	211,458	225,068	258,716
Enrollments (EFTS)*	30	30	30	44
Unit Cost	**10,526**	**7,049**	**7,502**	**5,880**
Onamuga Total Recurrent Costs	283,447	179,118	192,728	226,376
Enrollments (EFTS)*	25	25	25	20
Unit Cost	**11,338**	**7,165**	**7,709**	**11,319**
Kapuna Total Recurrent Costs	176,710	154,967	206,352	137,953
Enrollments (EFTS)*	(-)	15	n.a.	34
Unit Cost	**(-)**	**10,331**	**n.a.**	**4,057**
Gaubin Total Recurrent Costs	124,174	128,012	144,881	188,693
Enrollments (EFTS)*	51	49	54	54
Unit Cost	**2,435**	**2,612**	**2,683**	**3,494**
Rumginae Total Recurrent Costs	130,276	159,997	171,757	238,845
Enrollments (EFTS)*	30	19	15	30
Unit Cost	**4,343**	**8,421**	**11,450**	**7,962**
Kumin Total Recurrent Costs	403,472	396,640	109,488	129,418
Enrollments (EFTS)*	38	40	13	20
Unit Cost	**10,618**	**9,916**	**8,422**	**6,471**
Lemakot Total Recurrent Costs	233,564	135,207	338,065	119,255
Enrollments (EFTS)*	59	69	62	54
Unit Cost	**3,959**	**1,960**	**5,453**	**2,208**
Average Unit Costs – All**	**6,824**	**6,272**	**6,915**	**6,221**

Source: Health Training Institution Survey 2009.
Note: *Effective Full-Time Equivalent Student Enrollments. ** Based on schools for which we have data.

out and graduation rates may vary—the numbers do suggest government authorities produce nurse graduates at lower unit costs.

The unit costs of CHW schools—all of which are managed by mission authorities—are presented in Table 4-8. The average unit costs are estimated at around K6,500 in nominal price terms over the period 2006–2009 with unit costs in 2009 being the lowest recorded over this period at K6,221. Given that a CHW course is two years and assuming dropouts are not significant (and available evidence suggests they are not significant) the average cost of producing a CHW graduate is about K12,450. It is noteworthy that there is a fair degree of variation in the unit costs between the various CHW schools. In 2009 the range varied between K2,208 for Lemakot to K11,319 for Onamuga—quite an extreme variation. Nevertheless, the majority of schools are within a range of K3,800–K8,000.

4.4. Staffing Numbers and Other Characteristics of Nurse and CHW Training Schools

Important factors which affect the cost structures of schools but also—and perhaps more importantly—the quality of the teaching experience for students and the quality of outcomes from the schools are the numbers of teachers and their educational, training and work experience. This section reports on teacher numbers by school; their sex and age; their formal education qualifications; teaching qualifications; and years of experience in a professional capacity since beginning work. Nurse schools are discussed, followed in turn by CHW training

4.4.1 Nursing Schools

The network of seven nursing schools in PNG is a relatively small system with a total teaching staff of only 58 (Table 4-9). The average school has only eight teaching staff. Still, within the context of PNG, the teaching staff of nurse schools are well trained and have significant experience which is not easy to replicate—and will not be easy to expand without decisive policy interventions should a decision be taken to expand the nurse training system (see Chapter 7). At present there are 36 females (about two-thirds of the total) teaching in nursing schools and 22 males (one-third). One school—St Mary's—has an all-female staff while the newly established government-managed school in Mendi has a 70 percent complement of male staff. This is probably because of the difficult living conditions in Mendi and the Southern Highlands.

The age structure of nursing school teaching staff is important because there is a need to balance experience and to ensure that enough replacement teachers can be found when individual teachers reach retirement age. The age structure of the overall health workforce is aging very quickly. About 16 percent (nine teachers) will be well past retirement age in the next decade (that is they are 55 years of age or older) and that another 26 percent (15 teachers) are aged 45–54 years and will thus

Table 4-9: Total Full-Time Nursing School Teaching Staff by Sex (2009)

Nursing School	Female	Male	Total	Percent Female	Percent Male
St Barnabas (Milne Bay)	4	4	8	50	50
St Mary's (East New Britain)	9	0	9	100	0
Lutheran (Madang)	5	4	9	56	44
Nazarene(Western Highlands)	7	3	10	70	30
Lae (Morobe)	3	3	6	50	50
Highlands Regional (Eastern Highlands)	6	3	9	67	33
Mendi (Southern Highlands)	2	5	7	29	71
All Schools Total	**36**	**22**	**58**	**62**	**38**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

Table 4-10: Total Full-Time Nursing School Teaching Staff by Age (2009) by Age Group 200

Nursing School	<35 Years	35–44 Years	45–54 Years	55–64 Years	65 + Years
St Barnabas (Milne Bay)	1	3	4	0	0
St Mary's (East New Britain)	2	3	3	1	0
Lutheran (Madang)	1	6	2	0	0
Nazarene(Western Highlands)	2	8	0	0	0
Lae (Morobe)	1	3	1	3	0
Highlands Regional (Eastern Highlands)	0	1	2	3	1
Mendi (Southern Highlands)	0	3	3	1	0
All Schools Total	**7**	**27**	**15**	**8**	**1**
All Schools (%)	**12**	**46**	**26**	**14**	**2**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

become eligible for retirement in 10–15 years. Almost 60 percent (34 teachers) are less than 45 years—these teachers will become the core experienced staff over the next decade and as efforts are made to expand the nurse training system.

The profile of the formal education qualifications of the six reporting nurse-training institutions is presented in Table 4-11. It is noteworthy that over 50 percent of nurse trainers (27) have a Bachelors degree and that almost a further 40 percent (20) have a Masters degree. Only 8 percent have a diploma (4). This indicates that nurse trainers are quite well qualified. In fact, three of the six colleges do not have any trainers with less than a Bachelors degree and no school has more than 25 percent of its staff with only a diploma.

The quality of teaching in schools, including nursing schools, is very likely to be enhanced by teaching staff having a teaching qualification as well as a professional qualification. The data in Table 4-12 presents this information for nurse training colleges. This shows that about one-third (20 staff) do not have a teaching qualification while 60 percent (35 staff) have a Diploma in Education. A further 5 percent (3 staff) have a Bachelors of Education degree.

Another important dimension of teaching staff as a part proxy for quality of teaching is the experience of staff teaching. The data in Table 4-13 indicates that qualified staff (with a teaching qualification) have twice the work experience of unqualified teaching staff—16 years compared with eight years. This holds

Table 4-11: Education Qualifications of Full-Time SoN Teaching Staff (2009) (Percent)

School of Nursing *	Certificate	Diploma	Bachelors	Masters	PhD	Total Percent	Total No.
St Barnabas	0	25	25	50	0	100	8
St Mary's	0	0	89	11	0	100	9
Lutheran	0	0	44	56	0	100	9
Nazarene	0	0	30	70	0	100	10
Lae	0	17	50	33	0	100	6
Highlands Regional	0	11	78	11	0	100	9
All Schools Total	**0**	**4**	**27**	**20**	**0**	**100**	**51**
All Schools %	**0**	**8**	**53**	**39**	**0**	**100**	**51**

Source: Health Training Institution Survey 2009.
Note: * Data for Mendi not available. **Part-time staff not included.

Table 4-12: Teaching Qualifications of Full-Time Nursing School Teaching Staff (2009) (Percent)

School of Nursing	Nil	Certificate	Diploma	Bachelors	Masters	Total %	Total No.
St Barnabas	37.5	–	62.5	–	–	100	8
St Mary's	44.4	–	44.4	11.1	–	100	9
Lutheran	22.2	–	77.8	–	–	100	9
Nazarene	80	–	20	–	–	100	10
Lae	33.3	–	66.7	–	–	100	6
Highlands Regional	11.1	–	77.8	11.1	–	100	9
Mendi	–	–	85.7	14.3	–	100	7
All Schools %	**34.5**	**0.0**	**60.3**	**5.2**	**0.0**	**100**	**58**
All Schools No.	**20**	**0**	**35**	**3**	**0**	**100**	**58**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

more or less true for all schools. The apparent reason for this is that staff teaching in nursing schools for longer periods have been rewarded in the past with access to scholarships to gain a teaching qualification—an issue taken up in Chapter 7.

4.4.2 CHW Training Schools

The total teaching staff of all CHW training schools is presented in Table 4-14. Each of these schools is quite small—with there being an average of five teaching staff per school. One school has only three teaching staff and five schools have six staff.

In total there are 60 teaching staff—about the same number of teachers as there are in all seven nursing schools. Some 60 percent of the teaching staff is female and 40 percent male. There is often a significant difference in the gender distribution of staff between individual schools—with Lemakot in New Ireland Province being 100 percent female and Gaubin in Madang Province being only 25 percent female.

The age structure of the teaching force is important—both in terms of ensuring there is adequate experience within the institution and to form the basis of future planning of teaching staff as they retire or reach retirement age. The age structure of the overall health workforce—particularly of CHWs is aging very quickly. The age structure of the teaching workforce is younger than for the nurse teaching workforce or for CHWs in the workforce (Table 4-15). Some 70 percent of the workforce is less than 44 years—so if there is no rapid turnover of CHW school teaching staff the core of the teaching staff will not reach retirement for 15 or more years. Only 12 percent of the teaching workforce is more than 45 years and thus due for retirement by the end of the next decade. The age of some six staff (10 percent) are not known.

The formal education qualifications of the staff teaching in the CHW training institutions are presented in Table 4-16. Some 14 of the teaching staff (23 percent) have a Certificate level education qualification while 36

Table 4-13: Average Years of Experience of Full-Time Nursing School Teaching Staff (2009)

School of Nursing	Qualified Teaching Staff[1]	Unqualified Teaching Staff[1]	Total Staff
St Barnabas	16	13	8
St Mary's	14	5	9
Lutheran	12	8	9
Nazarene	17	8	10
Lae	17	9	6
Highlands Regional	19	9	9
Mendi	17	0	7
All Schools Average	**16**	**8**	**58**

Source: Health Training Institution Survey 2009.
Note: [1] Staff with and without formal teaching qualifications. Part-time staff not included.

Table 4-14: Total Full-Time CHW School Teaching Staff by Gender (2009)

CHW Schools	Female	Male	Total	Percent Female	Percent Male
St Margaret's (Oro)	4	1	5	80	20
Salamo (Milne Bay)	2	3	5	40	60
Tinsley (Western Highlands)	2	2	4	50	50
Braun (Morobe)	2	2	4	50	50
Raihu (Sandaun)	3	3	6	50	50
St Gerard's (Central)	5	1	6	83	17
Onamuga (Eastern Highlands)	2	1	3	67	33
Kapuna (Gulf)	3	2	5	60	40
Gaubin (Madang)	1	3	4	25	75
Rumginae (Western)	3	3	6	50	50
Kumin (Southern Highlands)	3	3	6	50	50
Lemakot (New Ireland)	6	0	6	100	0
All Schools Total	**36**	**24**	**60**	**60**	**40**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

Table 4-15: Total Full-Time CHW School Teaching Staff by Age (2009)

CHW School	<35 Years	35–44 Years	45–54 Years	55–64 Years	65 + Years	Unknown
St Margaret's (Oro)	3	1	1	0	0	**0**
Salamo (Milne Bay)	0	4	0	1	0	**0**
Tinsley (Western Highlands)	1	3	0	0	0	**0**
Braun (Morobe)	0	1	0	0	0	3
Raihu (Sandaun)	1	1	1	0	0	3
St Gerard's (Central)	1	2	2	1	0	**0**
Onamuga (Eastern Highlands)	1	2	0	0	0	**0**
Kapuna (Gulf)	5	0	0	0	0	0
Gaubin (Madang)	0	2	2	0	0	0
Rumginae (Western)	2	3	1	0	0	0
Kumin (Southern Highlands)	3	3	0	0	0	0
Lemakot (New Ireland)	1	2	3	0	0	0
All Schools Total	**18**	**24**	**10**	**2**	**0**	**6**
All Schools %	**30**	**40**	**17**	**3**	**0**	**10**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

staff (60 percent of the total) have a Diploma level qualification. In addition, eight teaching staff (13 percent) have a Bachelors Degree level education qualification. Two teaching staff member have a Masters Degree. It is interesting that six CHW schools have no teaching staff with only a Certificate and that three schools are fully staffed by Diploma qualified staff.

As is the case with nursing schools, teaching staff with a formal teaching qualification, all other things being equal, are likely to be better teachers—at least

Table 4-16: Education Qualifications of Full-Time CHW Schools Teaching Staff (2009) (Percent)

CHW Schools	Certificate	Diploma	Bachelors	Masters	PhD	Total %	Total No.
St Margaret's (Oro)	20	80	0	0	0	100	5
Salamo (Milne Bay)	60	40	0	0	0	100	5
Tinsley (W. Highlands)	0	75	25	0	0	100	4
Braun (Morobe)	0	100	0	0	0	100	4
Raihu (Sandaun)	0	50	50	0	0	100	6
St Gerard's (Central)	67	–	16.5	16.5	0	100	6
Onamuga (E. Highlands)	0	100	0	0	0	100	3
Kapuna (Gulf)	60	20	20	0	0	100	5
Gaubin (Madang)	0	100	0	0	0	100	4
Rumginae (Western)	16.5	67	16.5	0	0	100	6
Kumin (S. Highlands)	0	83	0	17	0	100	6
Lemakot (New Ireland)	33	50	17	0	0	100	6
All Schools Total	**14**	**36**	**8**	**2**	**0**	**100**	**60**
All Schools %	**23**	**60**	**13**	**3**	**0**	**100**	**60**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

early in their careers. Data compiled from the survey and presented in Table 4-17 indicate that 62 percent of teaching staff at CHW schools have an education teaching qualification—with 5 percent having a certificate to teach and 57 percent having a Diploma in Education. It is noteworthy that a number of schools have a high proportion of teaching staff without an education teaching qualification—Kapuna (Gulf Province) has 60 percent unqualified as teachers; Salamo (Milne Bay Province) has 80 percent unqualified as teachers and St Gerard's

Table 4-17: Teaching Qualification of Full-Time CHW Schools Teaching Staff (2009) (Percent)

CHW Schools	Nil	Certificate	Diploma	Bachelors	Masters	Total %	Total No.
St Margaret's (Oro)	20	0	80	0	0	100	**5**
Salamo (Milne Bay)	80	20	0	0	0	100	**5**
Tinsley (Western Highlands)	25	0	75	0	0	100	**4**
Braun (Morobe)	50	0	50	0	0	100	**4**
Raihu (Sandaun)	16.5	16.5	67	0	0	100	**6**
St Gerard's (Central)	100	0	0	0	0	100	**6**
Onamuga (Eastern Highlands)	0	0	100	0	0	100	**3**
Kapuna (Gulf)	60	0	40	0	0	100	**5**
Gaubin (Madang)	25	0	75	0	0	100	**4**
Rumginae (Western)	17	0	83	0	0	100	**6**
Kumin (Southern Highlands)	16.5	16.5	67	0	0	100	**6**
Lemakot (New Ireland)	33	0	67	0	0	100	**6**
All Schools Total	**23**	**3**	**34**	**0**	**0**	**100**	**60**
All Schools %	**38**	**5**	**57**	**0**	**0**	**100**	**60**

Source: Health Training Institution Survey 2009.
Note: Part-time staff not included.

(Central Province) has 100 percent without a teaching qualification.

The experience of staff teaching in CHW schools is presented in Table 4-18. The average experience of qualified teaching staff is 10 years while that for unqualified teaching staff is eight years. It is interesting that the average length of service of qualified teaching staff in two schools—Gaubin (Madang Province) and Lemakot (New Ireland Province)—is significantly above the overall average as is Raihu (Sandaun Province) for unqualified teaching staff. This may indicate that that Gaubin and Lemakot face a renewal problem for qualified personnel due to the aging of their staffing cohort.

4.5. Key Indicators for Nurse and CHW Schools: A Summary

This section summarizes some of the key indicators for each of the nursing schools and CHW training schools for 2009.

In the Schools of Nursing 479 students were taught by 54 staff at an average student-to-staff ratio of 9 to 1 (Table 4-19). The average unit cost per student per year in 2009 was K9,481 with total recurrent expenditures of K4.5 million. The student-to-staff ratios vary from 12:1 to 7:1. Interestingly, the school with the lowest student-to-staff ratio (St Barnabas, Milne Bay Province) does not have the highest unit costs while the school with the highest student-to-staff ratio school—Lutheran (Madang Province)—does not have the lowest average unit cost.

In Community Health Worker Schools 449 students are taught by about 60 staff at an average student-to-staff ratio of 8:1 (Table 4-20). The average unit cost per enrolled student in 2009 was K5,724. The total recurrent budget expended for all 12 schools in 2009 was K2.6 million. The school with the highest student-to-staff ratio (Gaubin, Madang Province with 14:1) does have one of the lowest unit costs at about K3,500 while the school with the lowest unit cost at K2,208 (Lemakot, New Ireland Province) also has a higher than average student-to-staff ratio.

4.6. A Qualitative and Quantitative Assessment of Nurse and CHW Training Schools: A Summary Report of the Survey of Principal's Views

The survey also sought key information on the views of the principals of nurse training schools on a range

Table 4-18: Average Years of Experience of Full-Time CHW School Teaching Staff (2009)

CHW School	Qualified Teaching Staff[1]	Unqualified Teaching Staff[1]	Total Staff
St Margaret's (Oro)	10.5	1	5
Salamo (Milne Bay)	7.5	9	5
Tinsley (Western Highlands)	5	10	4
Braun (Morobe)	–	–	4
Raihu (Sandaun)	7	21	6
St Gerard's (Central)	0	12	6
Onamuga (Eastern Highlands)	7	0	3
Kapuna (Gulf)	2	1	5
Gaubin (Madang)	27	7	4
Rumginae (Western)	8	4	6
Kumin (Southern Highlands)	6	1	6
Lemakot (New Ireland)	15	6	6
All Schools Average	**8.6**	**6.5**	**60**

Source: Health Training Institution Survey 2009.
Note: [1] Staff with and without formal teaching qualifications. Part-time staff not included.

Table 4-19: Key Indicators for SoNs (2009)

School of Nursing	No. of Students	No. of Staff	Student: Staff Ratio	Recurrent Expenditure (Kina)	Unit Costs (Kina)
St Barnabas (Milne Bay)	52	8	7:1	646,658	12,436
St Mary's (East New Britain)	90	10.6	9:1	633,000	7,033
Lutheran (Madang)	108	9	12:1	840,155	7,779
Nazarene (W. Highlands)	78	10.5	8:1	580,653	7,444
Lae (Morobe)	58	7	9:1	1,092,323	18,833
Highlands Regional (E. Highlands)	93	9	11:1	511,897	5,504
All Schools	**479**	**54.1**	**9:1**	**4,541,637**	**9,481**

Source: Health Training Institution Survey 2009.
Note: St Mary's (one-third), Nazarene (one-half), and Lae (one-half) of their total part-time staff had been added to total permanent staff.

Table 4-20: Key Indicators for CHW Schools (2009)

CHW School	No. of Students	No. of Staff	Student: Staff Ratio	Recurrent Expenditure (Kina)	Unit Costs (Kina)
St Margaret's (Oro)	49	5	10:1	184,756	3,771
Salamo (Milne Bay)	44	5	9:1	194,993	4,432
Tinsley (W. Highlands)	19	4	5:1	107,153	5,640
Braun (Morobe)	25	4	6:1	244,470	9,779
Raihu (Sandaun)	56	6	9:1	539,502	9,634
St Gerard's (Central)	44	6.5	7:1	258,716	5,880
Onamuga (E. Highlands)	20	3	7:1	226,376	11,319
Kapuna (Gulf)	34	5	7:1	137,953	4,057
Gaubin (Madang)	54	4	14:1	188,693	3,494
Rumginae (Western)	30	6	5:1	238,845	7,962
Kumin (S. Highlands)	20	6	3:1	129,418	6,471
Lemakot (New Ireland)	54	6	9:1	119,255	2,208
All CHW Schools	**449**	**60.5**	**8:1**	**2,570,130**	**5,724**

Source: Health Training Institution Survey 2009.
Note: One-half of total part-time staff had been added to St Gerard's total permanent staff.

of aspects of the schools and the educational processes within schools including: (i) student entry, quality of curriculum and of students and graduates; and (ii) school assets infrastructure and its quality.[12]

4.6.1 Nursing School Student Entry Requirements, Quality of Curriculum and of Graduates

(i) ***Formal Entry Requirements: General Schools of Nursing.*** Entry requirements according to the survey respondents vary somewhat between institutions but can be summarized as: (i) Grade 12 education with sound grades in core subjects including English, Mathematics, and Science; (ii) aged 18 years.

[12] Detailed information on each Nursing School and Community Health Worker Training Center is available from the Human Resources Division or the Planning Division of the National Department of Health. This section of the report summarizes the results of the survey but the detailed data will be available for detailed planning for the supply response needed to respond to the conclusions of this report.

Entry requirements for nonschool leavers are similar to those for school leavers but applications are considered on individual merit.

(ii) ***Application of Entry Requirements at Institution Level.*** Institutions were also how they apply the criteria for entry at the institution level. This produced some interesting results that indicate each institution is also responding to perceived local needs. One institution (St Barnabas) indicated that 50 percent of students were selected from the local province—Milne Bay—and 50 percent from other provinces. Lae indicated that ("qualified") nonschool leavers from remote areas of Morobe are given priority over others. Mendi (about to open) prioritizes the Southern Highlands as many facilities have closed due to lack of staff. One institution (Lutheran) indicated that they were beginning to recruit CHW graduates with Grade 12 and good recommendations from employers to their program.

(iii) ***Official Student Selection Guidance and Support Received from NDoH and or OHE.*** Generally, the OHE provides direction for selection, including grade point averages and lists of students giving the specific school their first choice. The NDoH has only a limited role and does not advise on selection but does pay some of the costs for school principals attending the selection conference (accommodation and airfares) while the OHE pays meal costs and some boarding. One commented that there is no opportunity to discuss the numbers of students for which there will be scholarships even if the school feels it has the capacity.

(iv) ***Principals Perceived Quality of Students at Entry.*** Quality of entry of students entering SoNs and CHW training institutions in 2010 was rated on a five point scale as follows: excellent 4; good 3; fair 2; poor 1; and unsatisfactory 0. The overall results seem to indicate principals have a reasonably good view of student quality at entry with four principals (of six) indicating quality of entry rated excellent or good. Principals were also asked to rate how student quality was trending over time. Here a less flattering picture emerged. Three principals believed quality was improving while the remaining four believed quality was declining. Some principals did acknowledge a considerable need for remedial work, particularly for lower grade point averages at entry. One observed that there were severe time and capacity limitations for remedial work while others observed that needs in English, Mathematics and Science were fairly common. Two principals commented that the current Grade 12 students are not as good as the previous Grade 10 students in both preparation and attitude.

(v) ***Principals Perceived Strengths and Weaknesses of Students at Entry.*** On the positive side there was a general response that many students have an improved ability to analyze problems, in part because they are more mature (including those who have done previous courses such as CHWs with Grade 12 and mature-entry students) and in part because of an emphasis on grades and Mathematics/Science requirements. The weaknesses perhaps offer more insights into the problems schools may have teaching students. Negative issues enumerated include a problem with students enrolling and then dropping out after a few weeks, lack of motivation and bad attitudes/discipline of students (including uncontrolled use of mobile phones), poor English and writing skills, false recommendations and late payment of student fees.

(vi) ***Ability to Attract Female Students.*** All of the schools responding to this question (six of seven) indicated that there was no problem attracting female students to their programs. Respondents were also asked if safety issues for female students were a concern. Nearly all respondents indicated this was not a major concern. A number indicated that they gave students advice on precautions and or explained their school rules and regulations associated with this issue. One college indicated they required consent forms from parents/guardians before "out-of-province" students could spend weekends locally off campus. One facility (Nazarene in the Western Highlands Province) indicated that high community respect for their hospital and their students enhanced campus safety.

(vii) ***Qualitative Assessment of Nonstaff Inputs to Teaching and Curriculum Delivery.*** A wide range of factors can affect the quality of the teaching process. The survey covered principals' views of the quality of the library, quality of teaching aids, number and

quality of computers and quality of internet access (if any). With reference to the library one school indicated it was totally unsatisfactory (the new school at Mendi) and four indicated it was poor, another rated it as fair and only one (Vunapope) indicated it was good. None indicated they had an excellent library.

The quality of teaching aids was rated as being less than wholly satisfactory. One school (Mendi) indicated they were unsatisfactory, three schools indicated they were poor, two fair and one (Vunapope) good. With the exception of Vunapope with 36 computers available for teaching and 16 for the Lutheran school all the others had extremely low (0–3) numbers of computers for teaching. With the exception of Vunapope—which rated the quality of their computers as excellent (together with their access to the internet)—most other schools indicated their computers were of fair quality. Three schools had no access to the internet, one had poor access and two other schools rated the internet as fair. Overall this indicates that schools have a great need for investments in basic efforts to support teaching and the curriculum.

(viii) ***Assessment of Overall Ability to Teach Curriculum and Adequately Support Clinical/Rural Placements.*** Notwithstanding the apparent quality constraints in support of teaching identified above, only one school indicated their overall ability to teach the curriculum was poor, another two indicated it was fair, three indicated it was good and another (Vunapope) indicated it was excellent. The tapestry of comments is worth noting. Three schools indicated getting good quality and qualified teaching staff was an issue—a matter taken up in Chapter 4. Inadequate equipment to undertake clinical procedures was mentioned by two schools, including Lae which reported an overall ability to teach rating of poor. Vunapope, clearly a better resourced school, indicated that adequate support comes from institution and hospital administration for training and that they had good relationships with specialist staff in rural health facilities.

Each school indicated they had access to hospitals and rural facilities for clinical and rural placements. Two schools indicated that clinical and rural placements were inadequate while four indicated they were adequate and another did not respond. When the survey questionnaire was being developed, discussions with principals often centered on the fragility of their capacity to adequately support the curriculum and that clinical/rural placements and their supervision taxed their abilities to meet curriculum requirements.

(ix) ***Approval Authority for Curriculum and Principals' Assessment of the Quality of the Curriculum.*** Each institution expressed a view of who is involved in the approval of the standard curriculum—with a general consensus that the final authority is the Nursing Council of PNG for the centrally approved curriculum. Nevertheless, a wide range of stakeholders, including school governing councils, academic boards of universities (where colleges are in the process of affiliating), and the NDoH (Curriculum Committee Training Division) were seen as key stakeholders. The overarching view of principals is that the curriculum is either good (5) or excellent (2). Suggestions to improve the curriculum include improving the connection between practice and theoretical aspects of the curriculum, a need to review the curriculum to ensure what is implemented is standard across the country, and a need for auditing bodies (Nursing Council, NDoH and universities) to do annual school visits.

(x) ***Ability to Qualify for Professional Registration and Date of Last School Evaluation Post 2000.*** All principals who responded (six of seven) indicated that their student graduates could automatically qualify for professional registration. Some schools noted administrative problems affecting registration while one indicated there were processes to enable remedial actions for those who do not initially pass all subjects. Four schools had been evaluated in 2007 or 2008, Mendi in 2009 and another was evaluated in 2004. One school, Vunapope, had not been audited or visited/evaluated by the Nursing Council since the late 1980s. The Nazarene school has been evaluated by the Nazarene Churches International Board of Education. Another, Lutheran, indicated it was reviewed in 2008, 2009, with a further review in 2010 as part of the institutional affiliation process with a university (Divine Word). One princi-

pal (Lae) calls for a Professional Registration Team to monitor schools annually and to provide feedback to make improvements.

(xi) ***Professional Standards Reviews: Issues and Solutions Identified.*** Two schools indicated that they did not have problems in reaching registration requirements for their graduates (Vunapope and Lutheran, although Vunapope has not been assessed for more than 20 years) while the remainder indicated they did face problems. A range of suggestions to improve student quality were made, including the cost of achieving the improvements. Suggestions included employment of additional staff (or filling of all vacancies—particularly for clinical nurses and/or clinical preceptors for field supervision, staff development programs), improvement of conditions of service (particularly since increased grading of service-delivery staff) and adequate libraries and teaching aids including computers and access to the internet. Two institutions (St Barnabas and Lutheran) identified infrastructure development as key (costing K5-6 million. Excluding the infrastructure, the total annual costs represented an additional annual cost of about K500,000 per institution. It is noteworthy that principals are very focused on efforts which they feel will directly support teaching and education. These items have been starved for funds over the past decade or more due to the squeeze on recurrent costs—particularly nonsalary recurrent costs.

(xii) ***Information on Availability of Jobs at Graduation.*** Principals' knowledge of what happens to students at graduation is mixed. Overall, they estimated that a range of 50 percent to 100 percent had jobs at graduation in 2009. Different schools had different proportions going to government and church services but one facility (Lae) indicated that most went to private facilities and another (Vunapope) indicated that almost 100 percent went to church health services. All facilities indicated that in the past there have been no problems with graduates finding jobs. It is, however, noted that delays in professional registration with the Nursing Council constrain the ability for graduates to find jobs immediately. This is probably the reason why many did not get jobs immediately after graduation in 2009.

4.6.2 Nursing School Assets and Infrastructure Quality

(i) ***Land Ownership Levels and How Configured with Other Institutions (if any).*** There was little clear information available on how much land each institution owned—in part because most are on either mission land or hospital land. All schools except the Lutheran School are part of larger institutions—five are part of hospital compounds.

(ii) ***Value and Condition of Land and Assets.*** Little reliable information was available on the value of land on which schools are located. Comments on the state of electricity, water, sewerage and vehicles indicate that these assets are either very run down or are nonexistent. For example, many facilities have inadequate water and electricity connections and many houses do not have connections.

(iii) ***Value and Adequacy of Offices and Buildings.*** Three schools valued their buildings in the range K0.5–K1 million while others were unable to adequately answer the question. Four schools have indicated their buildings are inadequate while three indicated they are adequate. Those indicating their buildings were inadequate blamed staff housing, student dormitories or major refurbishments while one of those with adequate buildings noted that the need for maintenance funding.

(iv) ***Number, Value and Quality of Staff Housing.*** A majority of schools indicated that they had less staff housing than teaching staff although two facilities indicated they had more housing than teaching staff. By and large, principals were unable to value the teaching staff housing for the survey. The quality of teaching staff housing was rated as poor by three schools; satisfactory by three and excellent by one. The additional comments indicate much of the housing probably needs refurbishment and/or replacement.

(v) ***Boarding Places and Their Quality.*** All institutions are 100 percent boarding institutions. Clearly some schools have significant shortages of dormitories and/or they are in relatively poor condition. Two schools rate their dormitories as being in poor condition, one as unsafe, three as satisfactory and one as excellent (Vunapope). Although most indicate

that their dormitories are safe for female students, a number still require adequate fencing. Those on institutions (such as hospitals) are often better off from a safety perspective.

(vi) ***Amount Spent on Maintenance at Nursing Schools in 2009.*** For the schools reporting maintenance budgets (four) in 2009 the average spend was about K40,000 with Mendi—being prepared for opening—spending K250,000. This was considered significantly underfunded given the maintenance backlog.

(vii) ***Nurse School Teaching Staff Accommodation Arrangements.*** The number of staff living off school premises is a fraction of total staff numbers (less than 20 percent) except for the Highlands Regional College which has a significant majority living off campus. A few colleges have staff in rented accommodation.

(viii) ***Nursing School Administrative Staff Accommodation Arrangements.*** A significant share of nursing school administrative staff lives off the school campus—most live in rented accommodation.

(ix) ***Nursing School Housing Rented Out for Rental Income Purposes.*** Housing rentals to nonstaff by schools are not a significant source of revenue for most schools although one facility (Lutheran) earns K62,000 per year and acknowledges this helps with budget shortfalls. Some institutions, at least the government-owned ones, collect rental incomes from salaries. The level of funds available from this source to schools remains uncertain.

(x) ***Land Constraints to Nursing School Expansion.*** School principals were asked if, assuming resources were made available, land constraints would affect the ability of schools to expand. Two schools (St Barnabas and Highlands Regional College) indicated they did not have enough land for the existing program. All others indicated they did. When asked if they could cope with a 100 percent expansion Lae indicated there was a land dispute with their hospital, Mendi indicated they would need to build upwards and/or buy land elsewhere within the township (indicating this new site may not be optimal) and Nazarene indicated they had enough land but that the hospital would need to expand to cope with extra students.

4.6.3 CHW School Student Entry Requirements, Quality of Curriculum and of Graduates

(i) ***Formal Entry Requirements: CHW Schools.*** Entry requirements according to the survey respondents vary somewhat between institutions but can be summarized as: (i) Grade 10 or, increasingly, a Grade 12 education with sound grades (upper passes) in core subjects, including English, Mathematics, and Science; (ii) aged 18–25 years (some schools say 20 years); (iii) a few schools emphasize good attitudes and/or one to three years living in the community.

(ii) ***Application of Entry Requirements at Institution Level.*** Principals were also asked how they apply the criteria for entry at the institution level. This produced some interesting results that indicate each institution is also responding to perceived local needs and/or priorities within the region and/or with their overall mission service. Many institutions indicated they reserved some proportion of student places for students from their province or neighboring provinces. One institution (Kapuna) indicated that they were forced to accept local Grade 10s to boost the local health workforce. Others indicated that being Christian and not married were given weightings in the selection criteria.

(iii) ***Official Student Selection Guidance and Support Received from NDoH and/or OHE.*** The official guidelines for entry are set out in the "Curriculum Information Handbook" (final draft October 2001) that was issued by the NDoH Curriculum Development Unity. By and large, institutions seem to report that they conduct the selection process with School Boards approving the final list, independent of NDoH (except where they are sponsoring students)—in this context NDoH approves the list of students selected. The OHE does not have any role in the selection process.

(iv) ***Principals Perceived Quality of Students at Entry.*** Of the 11 schools admitting students in 2010,[13] one principal assessed students entering as poor, four as good, four as excellent and two did not report. A number of principals, including those rating stu-

[13] Kapuna did not admit students in 2010.

dents as good, noted that remedial work with many students was needed. One school (Kumin), which rated entering students as good, also indicated that the selection process had been fraught with cheating. When asked if the quality of students at entry was improving or declining, three indicated it was the same, six indicated it was improving and one that indicated quality was declining. Interestingly, one principal (Lemakot) claimed that Grade 12 students have more behavioral problems than Grade 10 entrants.

(v) ***Principals Perceived Strengths and Weakness of Students at Entry.*** On the positive side, there is general agreement that many students have an improved ability to analyze problems, in part because they are more mature (including those who have done previous courses such as CHWs with Grade 12 and mature-entry students) and in part because of an emphasis on grades and Mathematics/Science requirements. The weaknesses perhaps offer more insights into the problems schools may have teaching students. Negative issues enumerated include a problem with students enrolling and then dropping out after a few weeks, lack of motivation and bad attitudes/discipline of students (including uncontrolled use of mobile phones), poor English and writing skills, false recommendations and late payment of student fees.

(vi) ***Ability to Attract Female Students.*** A significant majority of responding principals (eight of ten) indicated that they had no major problems attracting female students. Of the two schools indicating it was a problem, one (Tinsley) indicated that security and safety was an issue. Others acknowledged security as an issue but it is clear schools have strategies to alleviate safety concerns—including working with local communities.

(vii) ***Qualitative Assessment of Nonstaff Inputs to Teaching and Curriculum Delivery.*** Principals were asked to rate key quality inputs to the teaching program. Of the ten who reported on the quality of the library, one did not have a library, another indicated it was totally unsatisfactory, three indicated it was poor, one rated it as fair, two as good and a further two felt it was excellent. With respect to views on the quality of teaching aids, one indicated they were poor, three fair, four as good and one as excellent. Most schools only had one or two computers available for teaching (one school had none, one had four and another six). The quality of these computers was also seen by principals as variable. Seven of the schools (over one-half) indicated they had no access to the internet and those having access reported problems most of the time.

(viii) ***Assessment of Overall Ability to Teach Curriculum and Adequately Support Clinical/Rural placements.*** Principals had a relatively high assessment of their schools ability to teach the curriculum. Two schools rated their capacity to teach the curriculum as excellent, six as good and two as fair (two did not report on this question). Clinic placements are an important part of the curriculum. A vast majority (nine of ten) reporting schools indicated they were able to mount adequate clinical placements. It is apparent from general comments that schools have a good relationship with nearby service providers for student placements. On the other hand, transport and staff for field-based supervision is a constraining factor.

(ix) ***Approval Authority for Curriculum and Principals' Assessment of the Quality of the Curriculum.*** By and large, schools responded that they teach the standard curriculum and a number of schools have mechanisms to oversee its implementation. The overall rating of curriculum quality by principals was positive—with four indicating it was excellent, six as good and one as fair. Observations on how to improve the curriculum included removal of repetitive content, reduction of theory relative to practice; more external auditing of the curriculum, and more staff.

(x) ***Ability to Qualify for Professional Registration and Date of Last School Evaluation Post2000.*** All responding principals indicated that graduates could qualify immediately for professional registration. Responses to the question about the number of evaluations for professional registration since 2000 and the time of their last evaluation revealed that three schools had not been evaluated since 2000 and that a further four had only been evaluated once, one had four evaluations and another nine. The last school to be evaluated was in 2008 (after more than 15 years)

and only one other had been evaluated since 2006. Given that the revised curriculum started in 2006 this means there has been little review of the current curriculum.

(xi) ***Professional Standards Reviews: Issues and Solutions Identified.*** Three principals indicated that they did not have trouble meeting registration requirements, while the other five responding principals indicated they did have problems meeting requirements. The lack of workplace standards, equipment and facilities was cited by one school, shortage of staff by another and one mentioned community social unrest as an issue. There is a rich array of suggestions to improve student graduate quality, including an additional period of practical training for students, staff development, improved teaching materials (including computers and the internet), infrastructure (including houses, dormitories and facilities), transport, and additional technical staff.

(xii) ***Information on Availability of Jobs at Graduation.*** Principals report that the vast majority of students got a job at graduation (75–100 percent) in 2009. It is noteworthy that 50 percent of graduates of Kapuna went on for further training. If this is an emerging trend it could have implications for planning of student numbers. Government and church health services are the major employer, but at Kapuna the principal noted that 20 percent of the graduates went to the private sector. The response to the question: "Have past graduates had trouble getting a job" did not suggest there were major unemployment problems for graduates, but did suggest some graduates could not go to rural services because of a lack of vacancies and instead ended up working in hospitals. Another school emphasized that there were clear vacancies in remoter rural services and graduates went there.

4.6.4 CHW School Assets and Infrastructure Quality

(i) ***Land Ownership Levels and How Configured with Other Institutions (if any).*** All responding schools indicated that they were part of another institution or compound—some are close to mission hospitals/health centers or on a mission compound. Thus they typically do not own the land themselves.

(ii) ***Value and Condition of Land and Assets.*** The information collected on land values is problematic—largely because schools are part of larger compounds owned by other institutions. The value of plant and equipment reported averages about K275,000 per school. Quite a few schools indicated that basic infrastructure services (sewerage, water and electricity) were a significant issue. While a few schools report having vehicles for carrying students, most are eight to ten years old.

(iii) ***Value and Adequacy of Offices and Buildings.*** The average estimated cost by principals who responded to the question of the value of offices and buildings was K688,000—with a majority indicating a value of K500,000 or below. Five of nine responses indicated that offices and buildings were adequate and four indicated they were not. Quite a few principals were concerned at the level of maintenance required to maintain very old buildings.

(iv) ***Number, Value and Quality of Staff Housing.*** On the basis of responses, about one-half of teaching staff are housed by schools. Some have all staff housed and others have very limited stock. The value of staff housing reported is problematic with the average staff housing being reported at K87,000 (from a response covering 24 houses). The overall picture on the quality of staff housing is that it is mixed—with half of it being reported as either satisfactory or excellent.

(v) ***Boarding Places and Their Quality.*** All students are boarders and live in school-owned dormitories. Five institutions rate the quality of dormitories as poor, including two that also indicate they are not safe. Five have responded that the dormitories are satisfactory. A few schools are concerned about safety of female students.

(vi) ***Amount Spent on Maintenance in 2009.*** The reported average spent on building maintenance was about K30,000 per school. The quality of administration and teaching buildings was rated as unsafe by one (St Gerards), partly poor or satisfactory/unsafe by two others and the remaining five as satisfactory.

(vii) ***Teaching Staff Accommodation Arrangements.*** The vast majority of teaching staff are housed at the

school/host compound, with a handful of staff renting accommodation off campus.

(viii) ***Administrative Staff Accommodation Arrangements.*** The vast majority of administrative staff are housed at the school/host compound with a handful of staff renting accommodation off campus.

(ix) ***Housing Rented Out for Rental Income Purposes.*** There are only nominal amounts earned from house rental income at a few schools.

(x) ***Land Constraints to School Expansion (E2).*** All responding schools indicated that there was enough land for existing programs and, with the exception of one school, that there was enough land to at least double the program (assuming money was made available.

4.7. A Brief Conclusion to Chapter 4

This chapter has presented detailed information of costs and operations of nursing and CHW training schools. Some implications of the information presented in this chapter are drawn out in Chapter 7 which discusses strategy and options to develop the health training system in PNG to meet human resource requirements. The next chapter will look at anticipated demand for health workers over the next 10 and 20 year periods based on assumptions in the NHP and the subsequent chapter will look at the balance between existing supply (as discussed in Chapter 3) and the various demand scenarios discussed in Chapter 5.

CHAPTER 5

FUTURE STAFFING DEMAND SCENARIOS FOR PNG'S NATIONAL HEALTH SYSTEM

5.1. Introduction

This chapter explores factors which may affect the demand for health service-delivery staff over the coming two decades. First, it notes that there is an expectation that resources available to government and the health sector will be significantly better than in the immediate past. On the other hand, it is still too early to be sure what the full revenue implications will be to government of the planned LNG projects and other potential major developments. The NHP forecasts the population to grow at about 2.8 percent per annum over the next decade to 2020. The PNGDSP expects population growth to reduce to about 2.5 percent over the period 2020 to 2025 and to 2.1 percent between 2025 and 2030.

Population projections form the basis for all the scenarios for demand and supply of health staff discussed in this report. The PNGDSP forecast for declining population growth is, however, probably ambitious unless decisive action is taken on the family planning front and on education, particularly of girls. The NHP proposes to turn the recent significant decline in outpatient services per capita in rural areas around. This will be achieved by a variety of actions but, strategically, the proportion of the budget available for service-delivery staff will decline and that for nonsalary budget quality-enhancing expenditures will increase—albeit of an expanding budget in real terms per capita.

The NHP envisages that the current low workloads of direct service-delivery staff—at least in rural areas—will be reversed through higher per capita use of services—a not unreasonable assumption. It is also noted that neither the NHP nor other reports on PNG health service delivery have suggested that there should be a major revision of the structure of health cadres within the health system—although the NHP does suggest there should be an expansion of "rural doctors" by 40 per annum. The chapter also notes that there has been considerable discussion over the years of whether HEO cadres should be maintained or replaced by "Nurse Practitioners" or some similar cadre.

Five demand and supply scenarios for direct service-delivery health staff are summarized for the period 2009 to 2030. Scenario 1 demonstrates that there is a health human resource crisis given expected population growth rates, expected workforce retirements and the existing supply (training capacity) of the four main direct service-delivery cadres. Scenarios 2–4 present three different demand for health staff scenarios, including: (i) the "aspirational targets" for service-delivery staff proposed by the PNGDSP; (ii) maintaining current population to service-delivery staff numbers; and (iii) the suggested WHO "Threshold" service-delivery staff numbers required to achieve the MDGs. The recommended scenario—Scenario 5—presents a suggested expansion of service-delivery staff which is affordable given the likely resources available for health. This scenario also suggests there be a modest change in the structure of direct service-delivery cadres. These are then discussed in more detail in Chapter 6.

5.2. Key Aspects of Demand for Direct Health Service Providers

5.2.1 Historic Government Recurrent Resource Constraints

It was observed in Chapter 3 that real recurrent government expenditure since independence has declined 45 percent per capita (from 1993 to 2009 it declined by one-third). The health sector was not protected from these very significant reversals of fortune. Between 1997 and 2004 real recurrent expenditures on health declined 20 percent while the population continued to increase at around 2.8 percent per annum. Goods and services expenditures and recurrent expenditures on capital—critical for the quality of services—fell 27.4 percent and 77.4 percent respectively over this period. Chapter 3 also notes that government real recurrent expenditures on nurse training facilities are around 25 percent of what they were in the 1980s. In short, the health system has been, and still remains, in crisis. This, as discussed in all major reports on the PNG health system in recent years, has been—together with dysfunctional national-provincial relations—the major cause of the well-documented decline in health outcomes in PNG over the past two decades.[14] This is a significant part of the background setting for the NHP and the discussion of future demand scenarios for health workers.

5.2.2 Health Outcomes and Revealed Demand for Health Services

The NHP notes that life expectancy at birth remains low at 57 years and recognizes that efforts to increase life expectancy significantly over the coming years may well be severely challenged by the specter of the further sustained spread of HIV. Consensus estimates indicate that HIV-positive cases may well represent 1.6 percent of the population aged 15–59 years.[15] The IMR remains high at 57/1,000 live births as does the Child Mortality Rate (CMR) of 75/1,000 live births—although each has improved 20 percent over the past decade. The NHP notes: "Preventable and treatable diseases, including malaria, pneumonia, diarrhea, tuberculosis, HIV, and neonatal sepsis remain the most frequent causes of childhood deaths. Adequate space between births provides for greater survival rates of children". Risk factors to infectious disease are also significant—only 32 percent of the rural population has access to safe water and 42 percent to sanitation. While the situation in urban areas is better–88 percent have access to safe water and 67 percent to sanitation facilities—anecdotal evidence indicates that the situation in urban squatter settlements is deteriorating and that urban settlements are growing faster than official records indicate at face value (see below).

The most recent Demographic Household Survey (2006) highlighted a key feature of the crisis in the health system—with results indicating that the MMR had climbed to 773/100,000 live births (from 370/100,000 live births a decade ago).[16] UNICEF estimates that the average MMR for developing countries is 450. As the NHP notes: "This ranks PNG as second highest in the world in maternal mortality, after Afghanistan and outside Sub-Saharan Africa. The main causes of deaths related to pregnancy are prolonged labor and excessive bleeding. A safe and accessible delivery environment could save many lives. The risks for maternal deaths have increased due to the still high fertility levels (many children) and shortened birth intervals over the past decade. The neonatal death rate (within one month of birth), frequently the result of poor maternal health and the delivery environment, has shown little change over the past decade."

The national population growth rate, as noted, remains high at 2.7 percent per annum (2.8 percent for the citizen population)[17] **due to the total fertility rate which remains high at 4.4 births per woman.** The contraceptive prevalence rate is only 32 percent of the repro-

14 See, for example: World Bank, Asian Development Bank and AusAID. 2007. "Strategic Directions for Human Development in Papua New Guinea".

15 The national population-based HIV Bio-behavioral Survey led by the World Bank in partnership with the NDoH, National AIDS Council Secretariat and other development partners currently being implemented after years of earlier resistance by a number of development partners, WHO and the UN System will provide the first national population-based estimate of the disease and its drivers.

16 There has been some discussion of technical aspects of these estimates which suggest the 2006 estimate may be somewhat overstated and that the 1996 estimate was somewhat understated but no one has suggested that these numbers are not indicative of the trend or are inconsistent with other information available—the MMR is unacceptably high.

17 Citizen population means nationals of PNG. Total population includes the noncitizen population residing in country at the time of the census.

ductive age group. Some 60 percent of expectant mothers have at least one antenatal visit but a significant majority have two or antenatal visits or fewer and very few have the recommended four antenatal visits. Postnatal visits are also low and only 37 percent of mothers have a supervised delivery (it was estimated at 52 percent in 1991). Under the design of the service delivery system, CHWs are the first point of contact but this cadre (as discussed in Chapter 3) does not have any competency in dealing with birth complications and emergency obstetric care and basic level nurses also have very little training related to birth complications and emergency obstetric care. This is a glaring health staffing issue as this means only a few doctors and a handful of nurses with postgraduate training in rural areas (less than 250 doctors and nurses in total) are available and qualified in rural areas to deal with birth complications and emergency obstetric care to deal with the more than 5 million people living in rural areas.

Mother and child nutritional issues remain a cause of concern. Ten percent of babies have a birthweight of less than 2,500 grams. Some 26 percent of children under five are underweight. Meanwhile, immunization rates do not reach levels likely to give populations adequate herd immunity—only 61 percent of children get the third dose of the Diptheria, Pertusis, and Tetanus vaccine and 62 percent get a measles vaccination—well below the desirable target of 80 to 90 percent. The NHP also highlights the significant differences that exist between provinces for almost all indicators. Chapter 2 demonstrates the inequitable distribution of staff across provinces.

One very important indicator of the effective demand for health services is outpatient visits per capita per annum. This is an indicator of the overall use of the health system given the state of the health system (funding, staffing, pharmaceuticals and other medical supplies) and the disease burden of the population. As discussed, recurrent resourcing of the health system has been falling considerably. The disease burden has not changed significantly—with the significant exception of the emergence of HIV and a growing importance of some lifestyle diseases. There is little doubt that ambulatory care visits per capita has been decreasing and that this, without a reversal, will be having a negative impact on health outcomes.

The existing disease burden does not suggest that demands on the health system should be falling on a per capita basis with the number of outpatient visits per person per annum declining from 2.39 in 1988 to 1.49 in 2003. According to the NHP, outpatient visits per capita per annum in rural areas on average for the years 2007 to 2008 are only 0.88.[18] While the urban population may have been growing much faster than overall population growth (see below) and many rural dwellers are likely to be bypassing rural facilities to attend urban facilities, it is unlikely that total outpatient visits per capita per annum for the population in rural areas has not continued to decline. In addition to ambulatory care, the MTEF background tables indicate that there were an additional 0.44 visits per capita to health facilities for deliveries (84,400 visits); antenatal care (198,900 visits), child health visits (1,474,000); and immunizations (2,203,000). Thus, overall visits to rural health facilities, for all purposes, is less than 1.4 visits per capita per annum. A well-functioning health system, with the disease profile of PNG could expect 2.5 to 3.5 visits per capita per annum just for ambulatory care.

According to the NHP, for the years 2007–2008 the most common single reason for an ambulatory care visit was malaria (29 percent of the total); skin disease (10.8 percent); simple cough (9.7 percent); pneumonia (7.7 percent); diarrhea (4.4 percent); and other respiratory conditions (4.1 percent). Overall, the top six conditions leading to ambulatory care visits account for about 66 percent of all visits. The next largest category—accidents—accounts for an additional 3.4 percent of visits. It is interesting to note that yaws, pertussis and measles—the first easily treated and eradicated by antibiotics and the latter two preventable through vaccination—are among the top 15 causes of ambulatory care visits. This fact further underpins the notion of fragility in the health status of the population.

To round off this discussion of the demand for health services, the NHP records that hospital admissions resulted in 1.5 million hospital bed days in 2008. The largest cause of admissions was normal delivery (14.8 percent of the total); tuberculosis (12.5 percent); accidents and injury (10.5 percent); pneumonia/Acute Respiratory Infections (ARI) (9.1 percent); malaria and other vector-borne diseases (6.8 percent); obstetric and maternal conditions (5.2 percent); perinatal conditions (5.1 percent); and diarrhea and enteric conditions (4.2 percent). In other

[18] The data collected for urban areas (mainly hospitals) is unreliably reported and as such is not reported. Unfortunately we do not have access to rural data for the years 1998 and or 2003 to make a direct comparison.

Table 5-1: Official Population Estimates and Projections 2000–2030 (Selected Years '000)

Source	2000	2009	2010	2015	2020	2025	2030
PNG DSP 2010–2030	5,191	6,637	–	7,846	8,090	8,950	9,860
MTDP 2010–2015	5,191	–	–	7,280	–	–	9,880
NHP 2010–2020	5,191	–	6,829	7,846	9,025	–	–
Growth Rates	2.8	–	2.8	2.8	2.8	–	–
Mission Projections	–	–	–	–	9,025	10,211	11,329
Growth Rates	–	–	–	–	–	2.5	2.1

Source: Papua New Guinea NHP 2011–2020 and the Papua New Guinea Development Strategic Plan 2010–2030.

words over two-thirds of hospital days are accounted for by the top eight conditions.

In summary, health outcomes in PNG have seen very little improvement over the past 35 years and evidence from the past decade indicates extreme fragility of health outcomes, a rising MMR and sustained population growth. New diseases, including HIV and lifestyle-related diseases are also emerging. This has happened while government recurrent expenditures on health have declined rapidly in real terms per capita—including key expenditures on quality-enhancing nonsalary budgets. There has also been a dysfunctional national-provincial relations arrangement bedeviling management of health staff and of finances for health more generally. Demand for health services—as measured by ambulatory care has fallen steadily—at least in rural areas.

5.2.3 Population Growth Notes: Projections, Rural-Urban Distribution and Mobility

The total population of PNG has been growing, as discussed, at 2.7 percent per annum—the citizen population has been growing at 2.8 percent from 1980 to 2000. Table 5-1 presents actual census data for 2000 and estimates of the current population in 2009 and 2010 and projection for the years through 2030 from either official planning documents or projections undertaken for this report. One set of projections is presented in the PNGDSP 2010–2030—this shows the population growth rate being reduced quite significantly over the next few years (as a result of interventions in the health system and due to a decisive national population policy. These assumptions have also been used to underpin the population estimates used in the Medium-Term Development Plan.

The NHP presents population projections for the period 2010 to 2020. These essentially assume the citizen population will grow at about 2.8 percent over the period to 2020. These may well be a little pessimistic—that is population growth rates may well start to decline before 2020.[19] This report has, nevertheless, used these population projections as the basis for the report. For the period 2020–2030 this report has assumed that in these outer years the rate of population increase will start to decline along the lines assumed in the PNGDSP as shown in Table 5-1.

The population in 1980 was estimated by census at 3.1 million and 5.2 million in 2000—an average population growth of 2.8 percent over the 20 year period to 2000. Thus a key driver or component of the decline in real per capita recurrent expenditure on health discussed above was the rate of population growth itself—not just the decline in recurrent resources available to government (in large part caused by the unplanned closure of the Bougainville copper mine and in the rapid decline in budget support from Australia to support recurrent expenditures).

Another issue relevant to the discussion of future demand for health services is the distribution of population between rural and urban areas and between provinces. Official census results and most official planning documents suggest that PNG has not rapidly urbanized—that is that the urban population has not been rising substantially faster than the total population. Census estimates suggest the urban population has grown by 1 per-

19 Population estimates in PNG have been mired in problems with the census estimation arising from the sheer magnitude of the effort required to implement a census in PNG—particularly the 1990 census. There has been very little effort to systematically project population growth and trends in PNG by government, academics or development partners.

cent per annum over the period 1980–2000. The 2000 census reported that only 13.2 percent of the population resided in urban areas. It is probable that the 2000 census has underestimated the urban population. The key reason is likely to be because urban census boundaries were not adjusted for the expansion in urban boundaries. As a consequence, recorded urban growth does not really include all those who really live in urban areas.[20]

Casual empiricism of population trends in the larger PNG towns of Port Moresby, Lae, Mount Hagen and the emergence of new enclave developments throughout the country strongly suggest the urban population in 2000 was underestimated. Growth trends since 2000, notwithstanding sluggish economic growth over most of the past decade, have also probably been very significant. Port Moresby has certainly grown significantly over the last few years. If the urban population has been growing at 3 percent per annum—only marginally faster than the total population—over the past decade then the urban population would be about 925,000 or about 13.2 percent of the total population (notwithstanding the 2000 estimate is probably an underestimate). If, however, it has been growing at say 5 percent (a not unreasonable conservative assumption) the urban population could have reached over 1.1 million—or about 16.2 percent of the total population. If this trend continued over the next decade the urban population could reach 1.8 million or 22 percent of the total population. If the 2000 estimate of the urban population is an underestimate then it is entirely feasible that PNG could have one-quarter of its population living in urban areas by 2020—by 2030 if urban areas grow at 5 percent per annum. Under this scenario the urban population could reach about 3 million or one-third of the population. Trends of this nature, if they turn out to be realized, will bring new challenges and opportunities for health service-delivery strategies.

The forthcoming census will be critical for gaining a better understanding of the movement of the population as between provinces. The census results for 1980 and 2000 indicate that over this period 11 provinces grew at a rate slower than the average and that another two are the same as average and seven grew faster than average. It is not clear how much these trends can be extrapolated into the next two decades with any accuracy. Nevertheless, the NHP presents population estimates based on these historic trends to 2015. This report does not look at demand and population by province; rather it makes the projections at a national level and makes suggestions in Chapter 7 on how decisions should be made in allocating staff between provinces. It also argues that the core of this exercise should be updated annually to take account of new trends as they emerge.

The information available on population mobility in PNG is poorly documented and studied. When the PNG health system architecture was established in the late 1960s and 1970s the primary focus was primary health care (before the Health for All declarations) delivered by health centers, subcenters and aid posts—the latter staffed by aid post orderlies who are now CHWs. At that time cash cropping and access to cash incomes was quite constrained—with less than 20 percent of the population being significantly dependent on cash for their incomes. In this context the population was not mobile and access to health services depended on services being located very close to where they lived. For significant sections of the rural population this remains true. Nevertheless, cash cropping and informal employment opportunities have increased significantly—in short, market penetration into the lives of rural communities has increased significantly. To participate in this commerce it is clear that growing sections of many communities gather regularly at markets and other meeting sites throughout the country—often by the roadside and most visibly in the major towns.

This trend of greater population mobility has been happening notwithstanding the near collapse of a significant proportion of the rural road and coastal trading (shipping) infrastructure that used to ply the copra and related trade in the maritime provinces. As we look forward, government planning documents have a set of policies designed to expand access to incomes and this will increase the daily mobility of the population. This raises the possibility for the health system to rethink and

20 It is hoped that the census currently in advanced stages of planning looks very closely at the definition of urban. It would also be helpful if the census also carefully looked at the option of rural enclaves (areas which are not defined as urban but are settlements around commercial agriculture or industry supporting rural commercial activities and are not rural in the commonly thought of way. The 1980 and earlier census's had such a definition. Often these areas become significant markets on some day(s) of the week and many rural dwellers come to them on a very regular basis. This could as discussed below lead to a different differentiated strategy for delivery health services.

diversify its supply response to service delivery and supply key services more centrally—at least in some areas. While serving populations in this way offers some important opportunities of how best to serve population it would, of course, not be a reason to abandon the need to continue to provide first line health services. A clear focus on referral systems may, however, achieve significant gains in service-delivery quality delivered through larger facilities with multiple cadres (allocated according to workload). Larger facilities typically make it easier to create a professional work environment for service-delivery staff.

5.2.4 Resources Available to Health: the Future

Resources available for health (and the government more generally) are expected to increase significantly over the next five years and beyond to 2030. In order to estimate a reasonable resource envelope for the health sector over the period of the health human resource projections, three different scenarios have been developed. The first is based on "historical trends" and assumes that real GDP will grow at about the historical average of 3 percent—marginally above the rate of growth of the population. The second is a "central" or "medium" projection scenario which assumes that GDP will grow at an average of 5 percent in real terms over the period of the projections to 2030. This is significantly faster than the first scenario and would see per capita GDP almost double over the period—assuming the likely trends in the population growth rate discussed above. The third scenario is based on the PNGDSP 2010–2030 which posits an "aspirational" real GDP growth rate of 8.4 percent per annum over this period. This would radically transform the economy and see GDP per capita grow at almost 5 percent per annum. The three scenarios (projections) of real GDP growth are presented in Table 5-2 and discussed more fully below.

The first scenario is fairly conservative but still shows GDP doubling in real terms over the period to 2030. It also shows that if the total government budget maintained its current share of GDP (about 30 percent) it would also double over the period to 2030. If the recurrent budget for health maintained its current (2009) share of total government expenditure of about 14.7 percent then the recurrent budget for health would increase by 100 percent. This would see only marginal changes in per capita GDP or recurrent health expenditure—thus making it extremely difficult to dramatically improve health services and population to health service-delivery staff ratios. As discussed below, however, there is now an

Table 5-2: Potential Resource Scenarios for Public Expenditure on Health (Real 2009 Prices in '000 Kina)

Growth Scenarios	2009	2015	2020	2025	2030
Gross Domestic Product					
Historic Trends	21,800	32,420	34,748	38,553	42,775
Central Trends	21,800	34,305	40,738	50,283	62,142
PNGDSP "Aspirational"	21,800	34,635	50,185	76,863	117,722
Total Budget					
(30 Percent of GDP)					
Historic Trends	6,540	9,726	10,424	11,566	12,833
Central Trends	6,540	10,292	12,221	15,085	18,643
PNGDSP "Aspirational"	6,540	10,391	15,056	23,059	35,317
Health Recurrent Budget					
(14.7% of Total Budget)					
Historic Trends	958.7	1,426	1,528	1,700	1,881
Central Trends	958.7	1,509	1,791	2,211	2,733
PNGDSP "Aspirational"	958.7	1,523	2,207	3,380	5,177

Source: Mission estimates.

expectation that PNG is at an important crossroads and it is reasonable to assume that government can expect reasonable growth in the economy and thus an expanding budget and health budget.

The question is how fast the economy is likely to grow given current and expected developments in the economy. There has to be considerable uncertainty about the future—in GDP growth rates, growth of the government budget and in the share of the budget devoted to health and, in particular, the recurrent health budget. This in turn strongly influences—in fact it determines to a very large extent—the number of health staff who can be employed and thus the number of health staff who need to be trained. It is critical that the numbers being trained and are able to be employed is fiscally and economically sustainable. To this end the discussion of the likely growth scenario is critical to the recommendations in this report.

The second scenario—the "central" or "middle" scenario—is one that is between the historic trends presented as Scenario 1 and the PNGDSP "aspirational" targets presented in Scenario 3. This scenario (as for Scenarios 1 and 3) recognizes that the economy will grow significantly through 2015 as a result of major projects currently under way. The MTDP and the NHP documents both discuss the medium-term fiscal future (compared with the long-term future which must be subject to greater levels of uncertainty) with implications for the resources likely to be available for health. The MTDP assumes economic growth (GDP) will average 8.5 percent per annum over the period 2010 to 2015 fueled in significant part by investment in the LNG project. This compares to GDP growth of about 7 percent over the previous four year period. The LNG project is expected to come on line in 2014 enabling reasonable sustained growth through subsequent plan periods.

The impact on government revenues will largely depend on the elasticity of government revenues with respect to GDP growth and be significantly determined by the fiscal impact of the LNG project—which is as yet not fully understood. The challenges to government of sustaining a stable fiscal environment are likely to be significant given volatility in global commodity prices and exchange rate movements. To this end, Scenario 2 assumes that growth will fall back to about 4 to 4.3 percent per annum over the subsequent period to 2030—in recognition that the growth rates posited under Scenario 3 must be much less certain than for the earlier period of the MTDP. On the other hand, it recognizes that the planning period for this exercise will more than likely be one which is a decisive shift from the past—historic trends when per capita growth of both GDP and government budgets were almost zero.[21]

The third scenario—the PNGDSP 2010–2030 scenario—is very optimistic and should perhaps be better considered an "aspirational" scenario. This scenario posits that GDP will grow at an average of 8.4 percent per annum over the period to 2030 and that this will result in more than a five-fold increase in real GDP over the next 20 years. This would mean that per capita GDP would increase significantly given that population is only expected to increase about 45 percent over this period. This scenario also suggests that government revenues should maintain the equivalent of 30 percent of GDP—the current average—and that, as a consequence, government expenditure (recurrent and capital) can be expected to grow at about the same rate as GDP. If health expenditures (not discussed except for that implied by the significant increases in staff posited) were to be maintained as a similar share of total government expenditure then health expenditure could be expected to also increase at the same rate as GDP.[22]

21 It is a central recommendation of this report (see Chapter 7) that exercises such as this should be conducted annually. This will enable trends in the economy and of governments fiscal and development policies (including priorities for health) to be factored into health workforce planning.

22 It is not clear that government revenues (and thus long-term expenditures) will be able to rise as fast as GDP under either this or the second scenario discussed below. A detailed analysis of this is well beyond the scope of this report. However, there is a considerable downside risk that government revenues will not rise quite as fast as real GDP. This would mean that government might not be able to maintain government expenditure at 30 percent of GDP—it will depend on government revenue and taxation policies and on the nature of tax expenditures (breaks) granted to the major companies developing oil, gas and mining projects. On the other hand, the overall priority given to health will determine the share of the government budget available to health. The scenarios assume that the share of the health recurrent budget will remain the same. It could vary either way and will also depend on the share of the health budget which is allocated to recurrent spending and which to development expenditures. For human resource planning purposes the health recurrent budget is critical. The NHP documents a huge backlog of capital expenditures over the next 10 years. To this end there will be pressures to constrain recurrent expenditures. Thus the assumptions used to maintain the budget share of GDP and for health recurrent budget to maintain its share is a reasonably optimistic set of assumptions.

Other important and positive trends are noted within the health budget. The NHP notes that total health recurrent expenditure increased by 65 percent in nominal terms between 2007 and 2010. With inflation running at about 6.5 percent per annum (about 26 percent over this period) real health recurrent expenditure increases of about 3 percent have been achieved. At the same time, expenditures on personnel, including on church health services, and provincial general hospitals has increased almost 60 percent while overall expenditures on operational costs for rural health services has doubled between 2007 and 2010. This has been enabled by the changes to the intergovernmental financing which has seen a three-fold increase in health functions grants to provinces over this period. This is a substantial reversal of trends identified in the late 1990s and first half of the first decade beginning in 2000 and which were responsible for a significant part of the collapse of rural health service delivery. Nevertheless, the NHP clearly recognizes that there is a sustained need to ensure more effective usage and allocation of financial resources over the next decade.

The NHP estimates that personnel emoluments need to increase from K371.3 million in 2010 to K417.4 million in 2016 in real (2010) terms—an increase of 12.4 percent over five years or about 2.4 percent per annum—not quite keeping pace with estimated population growth. The NHP provides estimates for the costing of the plan through 2020 (Table 5-3). This indicates that personnel costs will increase from K371.3 million in 2010 to an average of K456 million over the period 2016–2020—an increase of 23 percent or 4.6 percent per annum. This implies maintaining the current average population to service-delivery staff ratios that exist at present (see Chapter 2)–significantly below those implied by the PNGDSP and the MTDP issued by the DNP&M and discussed in more detail below.

5.3. Projecting the Demand for Health Cadres: Five Scenarios

The current stock of health-related human resources is fixed, consisting primarily of doctors, HEOs, nurses (general and specialty nurses including midwives) and CHWs. The aggregate staff that can be employed in the future will be constrained by the resource envelope available to health (the personnel budget) and the mix of cadres employed given their price. The NHP has focused on only modest increases in staff for the period 2010–2015 and slight expansion in numbers through 2020 because of: (i) a view that real resources available for health will be relatively constrained over this NHP plan period; (ii) a recognition that the health system needs a sustained real increase in quality-enhancing nonsalary budgets to enable staff to deliver services. This has started but it remains clear that insufficient resources are yet allocated; (iii) infrastructure requirements—particularly refurbishments—are needed because of an historic neglect of maintenance of existing

Table 5-3: Costing of the NHP 2010–2020 (Real Average per Year)(Millions of Kina 2010 Prices)

Input Items	2010	2011–15	2016–20	2011–20
Personnel	371	397	456	426
Medical Supplies	149	177	218	197
Operating Costs	382	410	502	456
Total Recurrent	**902**	**984**	**1,176**	**1,079**
Capital	23	356	319	337
Total Expenditure Required	**925**	**1,340**	**1,495**	**1,416**
Funding Available	**925**	**925**	**925**	**925**
Government	631	631	631	631
Development Partners	294	294	294	294
Funding Shortfall	**0**	**415**	**570**	**491**

Source: Papua New Guinea NHP 2011–2020.

buildings and only limited new infrastructure over the past decade; and (iv) a recognition (particularly following the recent "Monash Study" on the operations of the rural health system)[23] that the existing complement of staff in the rural health facilities was significantly underutilized and could handle (based on staff time available and used with existing demand) on average an additional 40 percent throughput.[24] In significant part this has resulted from the sustained decline in ambulatory care visits per capita and a failure of the other services (such as MCH and immunization) to also be delivered at the desirable level.

Broadly speaking, the NHP is seeking to improve the productivity of the health system's human resources. This means higher visits per capita per annum can be achieved without major expansion of staff.[25] The NHP notes: "Overall service improvements, primarily in rural health services, have been projected to reach 2004 levels per population by 2015, or an increase of general service provisions by up to 40 percent. The overall rural health services improvement is expected to reduce the load on Primary Health Care (PHC) services at provincial general hospitals, and thereby release capacity to enhance and increase referral and specialized services" (NHP Volume 2A, pp125). The health system was historically configured on the principle that first contact with health services would (should) be delivered at the lowest-level health facility and by the lowest level of trained staff able to deal with the condition being dealt with. If the condition could not be dealt with patients would be referred up the line to a higher category staff/facility as required. In PNG this meant the CHWs staffing aid posts were seen as the first point of contact.

A basic package of services to deliver or respond to the core MDG needs within the existing structure of facilities and health cadres in rural areas is outlined in Table 5-4.[26] The NHP commits NDoH to delivery of the MDGs. Table 5-4 lists, by MDG, where the health sector can intervene, the technical options that are known to be effective and the lowest level of the system that can deal adequately with the observed condition. For example, most maternal deaths are caused by hemorrhage, sepsis, eclampsia, and labor complications. Each of these problems has a series of technical options mapped into a package to prevent or treat them. Thus, the technical option for preventing hemorrhage at delivery with oxytocic drugs fits into a reproductive health primary health care package, while removing a retained placenta requires an emergency obstetric services package.

Broadly speaking the existing operational structure and health cadres can deliver these technical options—assuming they are appropriately financed (a key objective of the NHP)–and the referral system works as envisaged. It would be a sound idea to carefully review this table and to make sure staff have the skills required and that the health system delivers the right inputs to enable this to happen. In this context, future planning has to recognize that CHWs and nurses will provide the first level health services for at least the next 15 years, irrespective of whatever option for future staff development is adopted (see below). It will take at least this period–15 to 20 years—to produce enough doctors to place a doctor in each health center under even the best of conditions.

The NHP has been silent on the question of the mix of staff it would like to see deployed in the future—this should be driven by the technical options that it believes the health system should be delivering and how. It is beyond the focus of this study to determine how best to deploy cadres or even to consider abolishing a cadre. The information in Table 5-4 would suggest most core services can be delivered by the existing structure of cadres. On the other hand, this is not to say the skills currently imparted are optimal. There are a range of curriculum issues and gaps identified, but the most important seem to be the need for improved midwifery skills—neither the basic CHW or General Nursing Curriculum deals with more than normal deliveries and does not prepare graduates adequately for abnormal deliveries and/or emergency obstetric care. Many professional concerns have also been expressed about the level of practical training of

23 Monash Study 2010.

24 here have been no similar studies of the hospital sector—although some very useful work has been done as background for the MTEF.

25 As discussed below and in Chapter 6 this is fortunate. The current stock of the health workforce is aging and a substantial proportion will retire over the next decade (Chapter 2) and the existing capacity of the health-related training schools (Chapter 3) will be hard pressed over the next decade replacing existing staff. This means there is a breathing space of perhaps five years which will enable services being delivered to substantially increase without major increases in staff numbers.

26 This table is drawn from Annex 2C of Chapter 2 World Bank, Asian Development Bank and AusAID "Strategic Directions for Human Development in Papua New Guinea," 2007.

Table 5-4: Technical Options for Interventions to Deliver the MDGs by Level of Service in PNG

MDG	Problem	How to Intervene	Technical Options	Lowest Level to Implement Package
Maternal Mortality	Hemorrhage	Prevent at delivery	Drugs at delivery	RH-PHC *
		Prevent severe antenatal anemia	Iron and folic supplements	RH-PHC*
			Detection and treatment	RH-PHC*
			Drugs to prevent	RH-PHC*
			Impregnated nets	DC-Soc market**
		Reduce risk with high parity	Tubal ligation	RH-Hospital***
			Access to temporary methods	RH-PHC* RH-Soc market.****
		Treat postpartum hemorrhage	Drugs and resuscitation	RH-PHC * RH-EOC *****
		Manage retained placenta	General anesthetic & remove	RH-EOC *****
	Sepsis	Ensure clean delivery	Kits for attendants	RH-PHC *
			Supervised births	RH-PHC *
		Treat	Antibiotics	RH-PHC *
	Eclampsia	Treat	Magnesium sulphate	RH-EOC *****
		Treat pre-eclampsia	Antenatal care	RH-PHC *
	Obstructed Labor	Manage promptly	Vacuum extraction	RH-EOC *****
			Cesarean section	RH-EOC *****
		Anticipate	Antenatal care	RH-PHC *
		Reduce risk	Contraception for teenagers	RH-PHC *
	Labor complications	Treat	Anesthetic, blood, theater	RH-EOC ****
Neonatal Mortality	Sepsis	Prevent (clean delivery)	Supervised delivery	RH-PHC *
			Supervised birth attendants	RH-PHC *
	Asphyxia	Resuscitate at birth	Supervised delivery	RH-EOC *****
	HIV	Prevent congenital infection	ARVs to prevent transmission	RH-EOC *****
1 month – 5 year Mortality	Pneumonia	Treat early	Antibiotics	CH-PHC *
		Prevent measles	Vaccination	CH-PHC *
		Reduce smoke exposure	House construction; stoves	DC-public health
	Diarrhea	Improved water + sanitation	Wells, water supply, latrines	DC-public health
		Improved hygiene at home	Health education	DC-public health
		Oral rehydration solution	Dispense sachets	CH-PHC *
	Malaria	Reduce transmission	Impregnated mosquito nets	DC-Soc market **
		Treat	Treat promptly with ACTs	RH-PHC *
	Meningitis	Treat	Treat promptly with antibiotics	RH-PHC * CH-IPD
Infectious Diseases	Malaria	Vector control	Impregnated nets	DC-Social marketing
		Treatment	Effective drugs	CC-PHC
			Treat severe disease	CC-IPD AH-IPD

(*continued on next page*)

Table 5-4: Technical Options for Interventions to Deliver the MDGs by Level of Service in PNG (*continued*)

MDG	Problem	How to Intervene	Technical Options	Lowest Level to Implement Package
	Tuberculosis	Prevent	BCG vaccine	CH-PHC
			Contact tracing	CH-PHC AH-PHC
		Treat	Short course	CH-PHC AH-PHC
	HIV and AIDS	Change behavior in key populations	Safe sex with condoms +peer education	HIV-prevention
			Supply of condoms at high-risk sites (bars, hotels, clubs)	HIV-prevention
		Reduce risk of infection	Prompt treatment of STDs + condom promotion	HIV-prevention
			Counseling with VT + condom promotion	HIV-clinical
		Awareness raising	Mass media condom promotion & partner reduction	HIV-prevention
		Reduce morbidity and delay death	Treat common infections	AH-PHC *
			TB outpatient treatment	AH-PHC *
			ARV drugs for life	HIV-clinical

Source: Table 2C.1 MDGs-Technical Options for Interventions by Level of Service in "Strategic Directions for Human Development in Papua New Guinea".
Notes: RH-PHC = Reproductive Health – Primary Health Care; ** DC-Social Marketing = Direct to Community Social Marketing
*** RH-Hospital = Reproductive Health at Hospital Level; **** RH – Social marketing = Reproductive Health Social Marketing;
***** RH-EOC = Reproductive Health – Emergency Obstetric Care

midwives. These issues need to be addressed and are discussed further in Chapter 6 and in more detail in Chapter 7. They do not suggest that there needs to be a major change to the configuration of the different health service-delivery cadres.

Another study undertaken in 2000[27] and focused on hospitals examined the work of auxiliary-level nurses (CHWs) in hospitals. It revealed that: (i) many staff were trained long ago and had had no in-service training; (ii) many hospital CHWs are performing nursing procedures for which they have not been trained; and (iii) the new CHW curriculum targets rural health services and does not include a number of nursing skills considered very important for hospital practice. It is quite obvious that there has been very little systematic in-service training of health staff over at least the past decade—nurse and CHWs training schools have certainly reported very little involvement in in-service training. A lot of ad hoc in-service training has almost certainly been financed by development partners related to a desire to implement different programs (such as DOTS and MCH) but these, while of considerable value and intrinsic merit, are not systematic and are not well documented and recoded on individual personnel records—at least in a form that can be analyzed as part of the Human Resource Planning system.

There is a plan within the Health Vision 2050: Directions for the Next Forty Years and the NHP to progressively upgrade/introduce Community Health Posts (CHPs) and district hospitals. CHPs will "become the new outer periphery of the health system staffed by three health workers skilled in maternal and child health, midwifery, health promotion, and community awareness programs. These facilities will be slightly larger than the current Aid Posts, and differ by the inclusion of a labor room. It is anticipated that supervised deliveries and routine immunization will be conducted from these points"

27 CHW Pre-Service Curriculum Review and Revision Working Group: Community Health Worker Roles and Responsibilities. Report on findings (results) from stakeholder consultation in Lae, Finschafen and Tewae/Siassi Districts in Morobe Province; 18–22 September 2000 as reported in Papua New Guinea Human Resources for Health: Policy Issues Review Paper, 2002.

(NHP). District hospitals will be gradually introduced to most districts over the next 40 years to be staffed by a doctor. In order to implement this it is planned to establish a new rural doctors program with this service-delivery strategy in mind. Much more work needs to be done before both of these concepts are implemented on other than a pilot basis—there will be five pilot CHPs established under the NHP and district hospitals will be slightly upgraded health centers with the defining difference being the presence of a doctor equipped to undertake more complex obstetric care at the local level.

One important aspect of this discussion is how services can best be cost-effectively delivered. Different cadres have different skills and very different resource implications given existing remuneration rates (and costs of production as discussed in Chapter 3). Doctors are obviously capable of undertaking a far wider range of medical and general health interventions (assuming they are appropriately equipped and have functioning facilities) than a CHW. On the other hand, the salary of one doctor within the health system could employ 4.5 CHWs, three midwives and 3.3 general nurses (Table 5-5). It is, therefore, important on cost-effective grounds to get the mix of health cadres right.

5.4. Future Health Human Resource Demand Scenarios 2010–2030

This section presents five scenarios of the demand and possible supply options for health personnel (core direct service-delivery cadres) directly delivering services and costs them in real 2009 prices (using unit annual salary costs as documented in Table 5-5):

- **The first scenario is the "No-Change-in-Supply Scenario".** This scenario shows the implications of no change in human resource supply capacity over the period 2010–2030. It demonstrates the "crisis" to expect from declining total health service-delivery staff numbers which will result from a "Do Nothing" strategy on the supply side (that is no change in the current throughputs of the health training system).
- **The second scenario is the "PNGDSP-Posited Aspirational Scenario".** This scenario is a set of projections based on the number of health staff and/or population-to-health staff ratios posited in the PNGDSP 2010–2030 to be achieved by 2030. In this report we use the absolute staff numbers for each of Medical Officers, Nurses and CHWs as the population projections used in this report are different from those used in the PNGDSP (and would thus produce different population-to-staff ratios to those derived for the PNGDSP.
- **The third scenario is the "Maintaining Current Population-to-Staff Ratios Scenario".** This scenario assumes that core direct service-delivery health cadres maintain both their current share of the workforce and the current (2009) population-to-staff ratios over the period 2009–2030. The fundamental driver of the demand for health staff in this example is growth of the population.
- **The fourth scenario is the "WHO 'threshold' Service-Delivery Staff Scenario".** This scenario is based on the WHO "threshold" density of 2.28 per 1,000 population (or population-to-staff ratio of 439 to 1) of doctors, nurses (registered and enrolled) and midwives. According to WHO, coverage of essential

Table 5-5: Relative Costs of Core Health Service-Delivery Cadres (2009)

Health Cadre	Annual remuneration (Unit) costs (Kina)	Number who can be Employed per Doctor
Doctors	75,000	1.0
HEOs	25,600	2.9
General Nurses	22,673	3.3
Midwives (nurse 4)*	25,000	3.0
CHWs	16,800	4.5

Source: Health Medium-Term Public Expenditure Plan background documents and payroll information.
Note: * Nurse 4 on the civil service salary scale.

Table 5-6: Scenario 1: No Change in Supply Capacity 2010–2030

Indicator	2009	2015	2020	2025	2030
Population ('000)	6,637	7,846	9,025	10,210	11,329
Doctor Numbers	379	515	595	636	656
Population per Doctor	17,512	15,243	15,166	16,046	17,277
Nurse Numbers	3,252	3,051	2,971	2,912	2,869
Population per Nurse	2,041	2,572	3,038	3,506	3,949
CHW Numbers	4,398	3,899	3,621	3,556	3,537
Population per CHW	1,509	2,012	2,492	2,871	3,203
HEO Numbers	411	503	553	585	607
Population per HEO	16,148	15,609	16,322	17,452	18,663
Total Service-Delivery Staff	**8,440**	**7,968**	**7,740**	**7,690**	**7,669**
Population per Staff	**786**	**985**	**1,166**	**1,328**	**1,477**

Source: Summarized from Chapter 6: Scenario 1 – Tables 6-1 to 6-5.

interventions below this level, including those necessary to reach the health-related MDGs, is not likely.[28]

- **The fifth scenario is the recommended scenario which envisages: (i) a gradual reduction in the population-to-doctor, nurse and CHW ratios; and (ii) maintaining nurses and CHWs as the backbone of the service delivery system—particularly rural service delivery.** It is constrained by: (i) the growth in the resource envelope likely to be available for health and service-delivery staff; and (ii) the feasibility and speed with which preservice training can be ramped up to meet the demands of attrition from the workforce and the needs of a growing population.

5.4.1 Scenario 1: The No-Change-in-Supply Scenario

This scenario shows the implications to the overall supply of direct health service delivery over the period to 2030 if: (i) there is no change in the current preservice training capacity (described in Chapter 3) for doctors, nurses, HEOs and CHWs; and (ii) the expected retirements from the workforce described in Chapters 2 and 6 are realized. Overall, this scenario shows that the health system would face a major staff supply crisis and that there would have to be a major decline in staff ratios relative to the population. The total number of direct service-delivery staff could be expected to decline from 8,440 in 2009 to 7,740 in 2020 and 7,669 in 2030 (Table 5-6). The population-to-staff ratio would increase significantly from 786 to one staff to 985 to one staff in 2015, 1,166 to each staffer in 2020 and 1,477 to each staff by 2030—almost doubling the population per staff member ratio over the next 20 years. Total service-delivery staff would decline by 1 percent per annum over the period 2009–2015 and decline a further 0.6 percent per annum for the period to 2020 (Table 5-7).

The most significant decline under this scenario would be with CHWs and nurses who form the backbone of rural service delivery. Over the period 2009 to 2015 CHWs can be expected to decline by 2.3 percent per annum and a further 1.4 percent per annum over the period 2015 to 2020. Thus the total CHWs which can be expected to be available to the health system is 3,621 in 2020 or some 777 less than the 4,398 in service in 2009—an overall decline of 18 percent at a time when the population is expected to increase 36 percent. This will result in the expected population per CHW to increase from 1,509 in 2009 to 2,492 per CHW in 2020. A similar picture also holds for nurses. The number of nurses is expected to decline from 3,252 in 2009 to 3,051 in 2015 and 2,971 in 2020. The population per nurse can be expected to increase

[28] WHO. 2006. This report notes specifically that countries with densities of doctors, nurses, and midwives below 2.28 per 1,000 population fail, on average, to achieve 80 percent coverage for live deliveries by skilled birth attendants.

Table 5-7: Scenario 1: No Change in Supply Capacity 2010–2030

Indicator	2009	2015	2020	2025	2030
Population	2.8	2.8	2.8	2.5	2.1
Doctor Numbers	n.a.	5.9	3.1	1.4	0.6
Nurse Numbers	n.a.	–1.0	–0.5	–0.4	–0.3
CHW Numbers	n.a.	–1.9	–1.4	–0.4	–0.1
HEO Numbers	n.a.	3.7	2.0	1.2	0.8
Total Service-Delivery Staff	**n.a.**	**–1.0**	**–0.6**	**–0.1**	**–0.1**

Source: Calculated from Table 5-6.

from 2,041 in 2009 to 2,572 in 2015 and 3,038 in 2020. The number of doctors and HEOs would expand slightly but the population per doctor and HEO would not improve substantially over the period because of fast population growth (Table 5-6).

The costs of the direct service-delivery staff using the unit costs presented in Table 5-5 for each category of staff under this scenario are presented in Table 5-8. This table shows that total costs for service-delivery staff in real 2009 prices would not increase significantly over the period to 2030—it would only increase from K191.3 million in 2009 to K195.2 million in 2020 and K198.3 million in 2030. If, as discussed above, the budget for health can be expected to grow at around 5 percent in real terms per annum over the 20 years projection period it is expected that much more rapid growth of staff numbers would be sustainable (see Scenario 1 in Chapter 6). The following scenarios explore different demand options for the growth of staff and their implications for growth of the workforce relative to expected population growth and their costs. Chapter 6 explores in more detail these summary projections and reviews their sustainability from a fiscal perspective.

5.4.2 Scenario 2: The PNGDSP-Posited Aspirational Scenario

The PNGDSP proposes an extremely ambitious plan for the expansion of human resources for health together with very ambitious health outcome targets. Over the 20-year period to 2030 the target is to reduce the IMR from 57/1,000 live births to 20; the under-five mortality rate from 75/1,000 to 20; the MMR from 733/100,000 to 100 and to increase life expectancy from 57 to 70 years.

Table 5-8: Scenario 1: No Change in Supply Capacity 2010–2030

Indicator	Unit Cost	2009	2015	2020	2025	2030
Population ('000)	n.a.	6,637	7,846	9,025	10,210	11,329
Doctor Numbers		379	515	595	636	656
Total Doctor Costs[1,2]	K90,000	34.1	46.3	53.6	57.2	59.0
Nurse Numbers		3,252	3,051	2,971	2,912	2,869
Total Nurse Costs[1,2]	K22,700	73.8	69.3	67.4	66.1	65.1
CHW Numbers		4,398	3,899	3,621	3,556	3,537
Total CHW Costs[1,2]	K16,600	73.0	64.7	60.1	59.0	58.7
HEO Numbers		411	503	553	585	607
Total HEO Costs	K26,000	10.7	13.1	14.4	15.2	15.8
Total Service-Delivery Staff		**8,440**	**7,968**	**7,740**	**7,690**	**7,669**
Total Service-Delivery Staff Costs[1,2]		**191.6**	**193.4**	**195.5**	**197.5**	**198.6**

Source: Summarized from Chapter 6: Scenario 1 – Tables 6-1 to 6-5.
Note: [1] In millions of Kina. [2] Errors due to rounding.

Table 5-9: Scenario 2: Public Sector Health Workforce Envisioned by PNGDSP 2010–2030

Indicator	2009	2015	2020	2025	2030
Population ('000)	6,637	7,846	9,025	10,210	11,329
Doctor Numbers	379	515	646	1,641	4,184
Population per Doctor	17,512	15,243	13,969	6,224	2,707
Nurse Numbers	3,252	3,026	4,116	8,477	19,526
Population per Nurse	2,041	2,593	2,193	1,205	580
CHW Numbers	4,398	3,899	6,284	12,010	18,795
Population per CHW	1,509	2,012	1,436	850	603
HEO Numbers*	411	400	300	250	200
Population per HEO	16,148	19,615	30,083	40,840	56,645
Total Service-Delivery Staff	**8,440**	**7,840**	**11,346**	**22,378**	**42,705**
Population per Staff	**786**	**1,001**	**795**	**456**	**265**

Source: Summarized from Chapter 6: Scenario 2 – Tables 6-6 to 6-9.
Note: Assumes no new HEOs and that the existing stock gradually retires.

It also hopes to reduce the incidence of tuberculosis from 246/100,000 to 100 and the percentage of children under five with moderate to high malnutrition from 50 percent to 5 percent. This is to be achieved by the rapid expansion of most key service-delivery health cadres (Table 5-9). Using the population projections for the five-year periods and the base service-delivery staff complement known for 2009, the PNGDSP envisages the total service-delivery staff (comprising doctors, nurses, CHWs and, while not mentioned in the PNGDSP, HEOs) rising from a base of 8,440 in 2009 to more than 40,000 by 2030—an increase of about 375 percent.

The population-to-service delivery staff ratio would improve from 786 per staff to just 265. This is to be achieved by radically altering the composition of the health workforce—in particular by radically increasing the number of doctors from 4.5 percent of the service-delivery workforce to 9.8 percent of the workforce. To achieve this, it is planned to increase the number of doctors from the current 379 in 2009 to 4,184 by 2030 an increase of over 1,190 percent. As discussed in Chapter 6, this is almost impossible to achieve in a 20 year period. It would imply, as documented in Table 5-10 a growth rate of over 30 percent per annum in the graduation of doctors over the period 2020–2030. Given the delay between a need to invest in additional training facilities and then the training of doctors which takes six years an immediate decision to ramp up doctor training would not alter the supply of doctors for the workforce until well into the next Health Plan period 2016–2020. It would be very unlikely that PNG could reach a doctor population of about 4,200 by 2030 as posited in Table 5-9—simply because of the time it would take to establish a new medical school and/or radically expand the existing medical school and

Table 5-10: Scenario 2: Annual Public Sector Health Workforce Growth Rates Envisioned by PNGDSP 2010–2030

Indicator	2009	2015	2020	2025	2030
Population	2.8	2.8	2.8	2.5	2.1
Doctor Numbers	n.a.	5.9	5.1	30.8	31.0
Nurse Numbers	n.a.	–1.2	7.2	21.2	26.1
CHW Numbers	n.a.	–1.9	12.2	18.2	11.3
HEO Numbers	n.a.	–0.5	–5.0	–3.3	–4.0
Total Service-Delivery Staff	n.a.	0.6	6.0	19.5	18.2

Source: Calculated from Table 5-9.

it is unclear there are enough well-qualified science-based students graduating from high schools. Under this scenario the population-to-doctor ratio would improve from 17,512 to one in 2009 to 2,707 to one in 2030.

The PNGDSP scenario proposes that there be more than 19,500 nurses available for service delivery by 2030—up from 3,252 in 2009. This would result in the population-to-nurse ratio improving from 2,041 to one nurse to 580 to one nurse in 2030 (Table 5-9). To achieve this, the number of nurses would need to increase by 7.2 percent per annum over the period 2015–2020 and at well over 20 percent per annum over the period 2020–2030 (Table 5-10). This would, of course, also require a massive expansion in training capacity—starting immediately. It should also be noted that nurse numbers are expected to decline over the period 2009–2015 by –1.2 percent per annum. This is because attrition rates (including retirements) from the existing workforce are likely to be higher than the current flow of new graduates into the workforce. It will take at least four years to significantly expand nurse output—one year to build the required infrastructure and recruit the needed teaching staff and three years of schooling to generate additional nurse workforce entrants.

The PNGDSP envisages there being nearly 19,000 CHWs employed by 2030—up from the current estimate of 4,398 in 2009 or an increase of 327 percent (Table 5-9). To reach this level of CHWs available for the workforce the numbers employed between 2015 and 2020 would need to increase at over 12 percent per annum and over the period 2020–2030 it would need to grow at between 18 and 21 percent per annum (Table 5-10). This would entail the population-to-CHW ratio improving from the 1,509 to one in 2009 to about 600 to one CHW in 2030.

The PNGDSP scenario for the health sector is silent on the future plans for HEOs. For the purposes of this scenario it is assumed that a decision would be made to stop production of HEOs immediately and that their role would be taken over either by increased numbers of doctors and/or specially trained nurses. The existing numbers of HEOs in the workforce would, therefore, gradually decline as they retired. It is estimated that there would still be about 200 HEOs in the workforce in 2030 but after this the numbers would fall to zero over the subsequent 5 years.

In aggregate terms total health service-delivery staff would be expected to grow from 8,440 in 2009 to about 43,000 in 2030—an increase of over 400 percent in 21 years—and dramatically faster than the increase expected in the population growth rate. As a consequence, the PNGDSP envisages the population-to-service delivery staff ratio falling from 786 to 265 in 2030 (Table 5-9). This would involve service-delivery staff numbers growing marginally in 2009–2015 (at less than 1 percent per annum) and ramping up to 6 percent per annum over the period 2015 to 2020 and to between 18 and 19 percent per annum over the ten-year period 2020–2030 (Table 5-10).

Table 5-11: Scenario 2: Costs of Public Sector Health Workforce Envisioned by PNGDSP 2009–2030

Indicator	Unit Cost	2009	2015	2020	2025	2030
Population ('000)	n.a.	6,637	7,846	9,025	10,210	11,329
Doctors Numbers		379	515	646	1,641	4,184
Total Doctor Costs[1]	K90,000	34.1	46.3	58.1	147.7	376.6
Nurse Numbers		3,252	3,026	4,116	8,477	19,526
Total Nurse Costs[1]	K22,700	73.8	68.7	93.4	192.4	443.2
CHW Numbers		4,398	3,899	6,284	12,010	18,795
Total CHW Costs[1]	K16,600	73.0	64.7	104.3	199.4	312.0
HEO Numbers		411	400	300	250	200
Total HEO Costs[1]	K26,000	10.7	10.4	7.8	6.5	5.2
Total Service-Delivery Staff		**8,440**	**7,840**	**11,346**	**22,378**	**42,705**
Total Service-Delivery Staff Costs[1,2]		**191.6**	**190.1**	**263.6**	**546.0**	**1,137.0**

Source: Summarized from Chapter 6: Scenario 2 – Tables 6-6 to 6-9.
Note: 1 In millions of Kina. 2 Errors due to rounding.

The staff costs (remuneration) of this strategy—assuming all staff are employed by government—would increase from K191.6 million for the 8,440 service-delivery staff employed in 2009 to K1,135 million for 42,705 staff in 2030 (in 2009 prices). This is costed at the average 2009 unit costs of each cadre estimated by the Monash Study and by background working tables for the Health MTEF. This implies an increase in the budget of almost 500 percent in 21 years in real terms or an increase of over 20 percent per year. Clearly, Scenario 2 is unlikely to be achievable given both the resources likely to be available over this period or feasible given extremely likely constraints and the ability to expand training this dramatically. This issue is discussed in more detail in Chapter 6.

5.4.3 Scenario 3: Maintaining Current Population-to-Staff Ratios Scenario

The third scenario assumes the core direct service-delivery health cadres (doctors, nurses, CHWs and HEOs) maintain both their current share of the workforce and that the current population-to-staff ratios reported in 2009 are sustained over the period 2009–2030. The fundamental driver of the demand for health staff in this example is growth of the population. Under this scenario the number of each cadre will, in effect, grow at the same rate as the population. The number of doctors would increase from 379 in 2009 to 515 in 2020 and 647 in 2030. The population of nurses would grow from 3,252 in 2009 to 3,844 in 2015 and 5,551 in 2030. Similarly, the number of CHWs would increase from 4,398 in 2009 to 7,507 in 2030 and the number of HEOs would increase from 411 in 2009 to 702 in 2030. Total service-delivery staff would increase from 8,440 in 2009 to 9,977 in 2015, 11,477 in 2020 and 14,407 in 2030 (Table 5-12). Key issues associated with meeting these workforce targets from a supply side are discussed in more detail in Chapter 6.

The real (2009) remuneration costs associated with Scenario 3 are presented in Table 5-13. This estimates that at 2009 salary costs the personnel budget would grow from K191.3 million estimated in 2009 to K326.5 million in 2030—an increase of just overr 3.3 percent per annum or the estimated rate of population increase.

5.4.4 Scenario 4: The WHO-Recommended "Threshold" Service-Delivery Staff Scenario

The fourth scenario is based on the WHO-recommended "threshold" density of 2.28 per 1,000 population (or a population-to-staff ratio of 439 to 1) of doctors, nurses (registered and enrolled), and midwives. Below this level, according to WHO, coverage of essential interventions, including those necessary to reach the health-related MDGs, is not likely. Overall, this would mean an increase in total staff from 8,440 in 2009 to almost 25,000

Table 5-12: Scenario 3: Health Sector Service-Delivery Workforce Maintaining Current (2009) Population-to-Staff Ratios 2009–2030

Indicator	2009	2015	2020	2025	2030
Population ('000)	6,637	7,846	9,025	10,210	11,329
Doctor Numbers	379	448	515	583	647
Population per Doctor	17,512	17,512	17,512	17,512	17,512
Nurse Numbers	3,252	3,844	4,422	5,003	5,551
Population per Nurse	2,041	2,041	2,041	2,041	2,041
CHW Numbers	4,398	5,199	5,980	6,766	7,507
Population per CHW	1,509	1,509	1,509	1,509	1,509
HEO Numbers	411	486	559	632	702
Population per HEO	16,148	16,148	16,148	16,148	16,148
Total Service-Delivery Staff	8,440	9,977	11,476	12,984	14,407
Population per Staff	786	786	786	786	786

Source: Summarized from Chapter 6: Scenario 3 (Tables 6-10 to 6-14).

Table 5-13: Scenario 3: Costs of Health Service-Delivery Staff Workforce When Maintaining Current (2009) Population Staff Ratios (2009–2030)

Indicator	Unit Cost	2009	2015	2020	2025	2030
Population ('000)	n.a.	6,637	7,846	9,025	10,210	11,329
Doctors Numbers		379	448	515	583	647
Total Doctor Costs[1,2]	K90,000	34.1	40.3	46.4	52.5	58.2
Nurse Numbers		3,252	3,844	4,422	5,003	5,551
Total Nurse Costs[1,2]	K22,700	73.8	87.3	100.4	113.6	126.0
CHW Numbers		4,398	5,199	5,980	6,766	7,507
Total CHW Costs[1,2]	K16,600	73.0	86.3	99.3	112.3	124.6
HEO Numbers		411	486	559	632	702
Total HEO Costs[1,2]	K26,000	10.7	12.6	14.5	16.4	18.3
Total Service-Delivery Staff		**8,440**	**9,977**	**11,476**	**12,984**	**14,407**
Total Service-Delivery Staff Costs[1,2]		**191.6**	**226.5**	**261.0**	**295.2**	**327.5**

Source: Summarized from Chapter 6: Scenario 3 – Tables 6-10 to 6-14.
Note: 1 In millions of Kina. 2 Errors due to rounding.

in 2030—an increase of over 190 percent over 21 years (Table 5-14). Doctor numbers would need to rise 6 percent per annum over the period 2009–2015 and between 23 and 29 percent per annum over the subsequent 15 years (Table 5-15). This scenario, while ambitious, results in about 40 percent less staff than envisaged by the PNGDSP in 2030 (Scenario 1).

Scenario 4 does not distinguish between staff employed by government and the private sector—so strictly speaking the numbers recommended by WHO do not mean that all will be employed and/or financed by government. The PNGDSP is silent on the role of the private sector and it is assumed from the documentation that it was staff numbers for the government to finance (government and mission/church). Until now this report has been relatively silent on the role of the private sector. This is because there are no numbers available on staff employed in the private sector. This does not mean that the private sector is either insignificant now or will be insignificant in the future. It is probable that the private sector employs 10–15 percent of the total health service-delivery workforce and that this may well rise to 20 percent or more over the next decade if the private sector grows in the ways envisioned in the PNGDSP. This issue will be taken up in more detail in Chapter 6.

The WHO "threshold" density of 2.28 service-delivery staff per 1,000 population is made up of two key elements—an argument that this needs to consist of a doctor density of 0.55 doctors per 1,000[29] and a non-doctor staff density of 1.73. To this end, Scenario 3 has the doctor workforce growing to achieve the 0.55/1,000 target in 2030 and the combined nurse and CHW ratio growing to reach the 1.73/1,000 target by 2030 but with the two cadres maintaining the same proportion as current (2009) staffing. For simplicity purposes, we have let HEOs grow at the same rate as the population because they represent a small proportion of the total. It is probable that HEOs could substitute for a proportion of the doctors as a minor variation of this scenario.

This scenario implies a very significant rise in the absolute number of doctors (a rise from 379 in 2009 to 515 in 2015, 1,173 in 2020 and over 6,200 in 2030. It would also involve a more than proportionate increase in the doctors in the workforce—from 4.5 percent in 2009 to over 24 percent in 2030. This would result in a rapid decline in the ratio of population per doctor from 17,512 in 2009 to 1,818 per doctor in 2030. Given the discussion about the staff and facilities required to deliver a core MDG package, discussed above and summarized in Table 5-3,

[29] The work of Scheffler et al (2009) found that in order to achieve the system performance desired (80 percent coverage of live births by a skilled attendant) a doctor density of 0.55/1,000 population would be required ranging from 0.41 to 0.61 based on a 95 percent confidence interval.

Table 5-14: Scenario 4: Achieving WHO "Threshold" Health Service-Delivery Staff Density (2009–2030)

Indicator	2009	2015	2020	2025	2030
Population ('000)	6,637	7,846	9,025	10,210	11,329
Doctor Numbers	379	515	1,173	2,553	6,231
Population per Doctor	17,512	15,234	7,692	4,000	1,818
Nurse Numbers	3,252	3,295	4,964	6,229	8,497
Population per Nurse	2,041	2,381	1,818	1,639	1,333
CHW Numbers	4,398	4,315	6,137	8,271	10,310
Population per CHW	1,509	1,818	1,471	1,235	1,099
HEO Numbers	411	486	559	632	702
Population per HEO	16,148	16,148	16,148	16,148	16,148
Total Service-Delivery Staff	**8,440**	**8,611**	**12,833**	**17,685**	**25,739**
Population per Staff	**786**	**911**	**703**	**577**	**440**

Source: Summarized from Chapter 6: Scenario 4 – Tables 6-15 to 6-19.

it is not clear that this number of doctors would be cost effective—particularly given the relative costs of doctors and other service-delivery staff described in Table 5-4.

The scenario also involves a quite significant expansion of other cadre numbers. The number of nurses would increase from 3,252 in 2009 to almost 5,000 in 2020 and to about 8,500 in 2030—an increase of about 160 percent (Table 5-10). This would mean a rapid expansion of nurses by 10.1 percent per annum between 2015 and 2020, 5.1 percent between 2020 and 2025 and 7.3 percent between 2025 and 2030 (Table 5-14). The population-to-nurse ratio would improve from 2,041 per nurse in 2009 to 1,333 per nurse in 2030. For CHWs the numbers would increase from 4,398 in 2009 to 6,137 in 2020 and 10,310 in 2030. This would imply CHWs growing at 8.4 percent per annum between 2015 and 2020 and around 6.8 percent per annum over the period 2020 to 2030 (Table 5-15). HEOs, as discussed, grow at the same rate as the population in this scenario.

Table 5-15: **Scenario 4: Service-Delivery Staff Growth Rates Required to Achieve WHO "Threshold" Service-Delivery Staff Density 2009–2030** *Source:* Calculated from Table 5-14.

The cost of employing doctors to implement Scenario 3 would rise from K34.1 million in 2009 to K560.8 million in 2030—an increase of nearly 17 times the cost of doctors in 2009 (Table 5-16). The share of doctor costs in total remuneration costs would go from about 18 percent of the total remuneration budget to about 60 percent in 2030. It is very unlikely, in the PNG context,

Table 5-15: Scenario 4: Service Delivery Growth Rates Required to Achieve WHO "Threshold" Service-Delivery Density 2009–2030

Indicator	2009	2015	2020	2025	2030
Population	2.8	2.8	2.8	2.5	2.1
Doctor Numbers	n.a.	6.0	25.6	23.8	28.8
Nurse Numbers	n.a.	–1.3	10.1	5.1	7.3
CHW Numbers	n.a.	–1.9	8.4	7.0	4.9
HEO Numbers	n.a.	3.0	3.0	2.6	2.2
Total Service-Delivery Staff	n.a.	3.4	9.8	7.5	8.0

Source: Calculated from Table 5-14.

Table 5-16: Scenario 4: Costs of Achieving WHO "Threshold" Health Service-Delivery Staff Density 2009–2030

Indicator	Unit Cost	2009	2015	2020	2025	2030
Population ('000)	n.a.	6,637	7,846	9,025	10,210	11,329
Doctor Numbers		379	515	1,173	2,553	6,231
Total Doctor Costs[1,2]	K90,000	34.1	46.3	105.6	229.7	560.8
Nurse Numbers		3,252	3,295	4,964	6,229	8,497
Total Nurse Costs[1,2]	K22,700	73.8	74.8	112.7	141.4	192.9
CHW Numbers		4,398	4,315	6,137	8,271	10,310
Total CHW Costs[1,2]	K16,600	73.0	71.6	101.9	137.3	171.1
HEO Numbers		411	486	559	632	702
Total HEO Costs[1,2]	K26,000	10.7	12.6	14.5	16.4	18.3
Total Service-Delivery Staff		**8,440**	**8,611**	**12,833**	**17,685**	**25,740**
Total Service-Delivery Staff Costs[1,2]		**191.6**	**205.3**	**334.7**	**524.8**	**943.1**

Source: Summarized from Chapter 6: Scenario 4—Tables 6-15 to 6–19.
Note: 1 In millions of Kina. 2 Errors due to rounding.

(even with considerable additional work to demonstrate the optimum number of doctors required in PNG) that this would be a cost-effective investment.

5.4.5 Scenario 5: The Recommended Scenario

This scenario envisages: (i) a gradual reduction in the population to doctor, nurse and CHW ratios; (ii) maintaining nurses and CHWs as the backbone of the service delivery system—particularly rural service delivery. Rural service delivery is constrained by: (i) the growth in the resource envelope likely to be available for health and service-delivery staff; and (ii) the feasibility and speed with which preservice training can be ramped up to meet the demands of attrition from the workforce and the needs of a growing population. It is also recommended that there is careful monitoring of effective demand for staff at the provincial, district and hospital levels based on staff workloads. The key results of this scenario are presented in Table 5-17.

Under Scenario 5 doctor numbers are planned to rise from 379 to 515 in 2015, 694 in 2020, 1,069 in 2025 and a target of 1,535 in 2030. This would imply the doctor workforce growing at 6.0 percent per annum between 2009 and 2015; 6.9 percent per annum between 2015 and 2020; 10.8 percent between 2020 and 2025 and fall to 8.7 percent between 2025 and 2030. The population-to-doctor ratio would go from 17,512 per doctor in 2009 to 13,004 in 2020 and to 7,380 per doctor in 2030.

The number of nurses would increase from 3,252 in 2009 to 4,277 in 2020 (an increase of about 32 percent) and to just over 8,000 by 2030 an increase of about 146 percent over current numbers by 2030. The growth rate of nurse numbers will be negative through 2015 (due to the attrition rate from the workforce and the time needed to ramp up training) but would then ramp up to be much faster than the rate of population increase over the years 2015 to 2030. Over this period the nursing numbers would increase at an average of over 10 percent per annum. Thus the population-to-staff ratio would improve from around 2,041 to one nurse in 2009 to 1,414 to one by 2030.

Under this scenario the number of CHWs would increase from 4,398 to 5,133 in 2020 and about 8,250 in 2030. The population to CHW numbers would decline from around 1,500 to a CHW in 2009 to about 1,370 per CHW over the next two decades—however, the rapidly rising population, high attrition rates and the time needed to ramp up training capacity means that the population to CHW ratio will decline through 2015, increase modestly over the next 15 years re-establishing current levels by 2025. Overall, CHW numbers would grow from 2015 at over twice the rate of growth of the population—about 6.7 percent per annum (Table 5-18). This scenario assumes the existing capacity for producing HEOs is sustained over

Table 5-17: Scenario 5: Recommended Scenario for Direct Service-Delivery Health Staff 2010–2030

Indicator	2009	2015	2020	2025	2030
Population ('000)	6,637	7,846	9,025	10,210	11,329
Doctor Numbers	379	515	694	1,069	1,535
Population per Doctor	17,512	15,234	13,004	9,551	7,380
Nurse Numbers	3,252	3,136	4,277	6,082	8,012
Population per Nurse	2,041	2,502	2,110	1,679	1,414
CHW Numbers	4,398	4,111	5,133	6,671	8,256
Population per CHW	1,509	1,909	1,758	1,531	1,372
HEO Numbers	411	498	546	580	604
Population per HEO	16,148	15,755	16,529	17,603	18,756
Total Service-Delivery Staff	**8,440**	**8,260**	**10,650**	**14,402**	**18,407**
Population per Staff	**786**	**950**	**847**	**709**	**616**

Source: Summarized from Chapter 6: Scenario 5 – Tables 6-20 to 6-24.

the period—on the grounds that they provide an important management and supervisory cadre—particularly for rural health services (see also discussion in Chapters 3, 6 and 7).

Total service-delivery staff numbers under Scenario 5 would rise from 8,440 in 2009 to 18,407 in 2030—an increase of 118 percent. The total workforce can be expected to decline over the period 2009 to 2015 due to the expected attrition from the workforce and the time it will take to ramp up training, starting immediately. Overall, the growth of the workforce would be around 8.2 percent per annum from 2015 (Table 5-17). The population to direct service-delivery staff ratio is still expected, despite the growth of the workforce proposed, to worsen from the current 786 to one staff in 2009 to 950 to one staff in 2015 and then begin to decline through the next 15 years to 616 to one staff by 2030 (Table 5-17).

It is expected that the remuneration budget for all staff would increase from K191.6 million in 2009 to K472.8 million in 2030 (Table 5-19). The share of the budget allocated to doctors would increase from 18 percent in 2009 to 29 percent of the budget in 2030. This scenario is more fully explained in Chapter 6.

Under Scenario 5—the recommended scenario—more careful attention has been paid to how fast training can be ramped up for the different cadres and to likely budget constraints. Each cohort of cadres has a different gestation period from input to the training school to the workforce and some allowance in time has to be made to allow for construction of additional

Table 5-18: Scenario 5: Direct Service-Delivery Health Workforce Growth Rates For Recommended Scenario 2010–2030

Indicator	2009	2015	2020	2025	2030
Population	2.8	2.8	2.8	2.5	2.1
Doctor Numbers	n.a.	6.0	6.9	10.8	8.7
Nurse Numbers	n.a.	–0.7	7.3	8.4	6.3
CHW Numbers	n.a.	–1.1	5.0	6.0	4.8
HEO Numbers	n.a.	3.5	1.9	1.2	0.8
Total Service-Delivery Staff	n.a.	–0.4	5.8	7.0	4.0

Source: Calculated from Table 5-17.

Table 5-19: Scenario 5: Costs of Recommended Scenario for Direct Service-Delivery Health Staff 2010–2030

Indicator	Unit Cost	2009	2015	2020	2025	2030
Population ('000)	n.a.	6,637	7,846	9,025	10,210	11,329
Doctor Numbers		379	515	694	1,069	1,535
Total Doctor Costs[1]	K90,000	34.1	46.3	62.5	96.2	138.2
Nurse Numbers		3,252	3,136	4,277	6,082	8,012
Total Nurse Costs[1]	K22,700	73.8	71.2	97.1	138.1	181.9
CHW Numbers		4,398	4,111	5,133	6,671	8,256
Total CHW Costs[1]	K16,600	73.0	68.2	85.2	110.7	137.0
HEO Numbers		411	498	546	580	604
Total HEO Costs[1]	K26,000	10.7	12.9	14.2	15.1	15.7
Total Service-Delivery Staff		**8,440**	**8,260**	**10,650**	**14,402**	**18,407**
Total Service-Delivery Staff Costs[1]		**191.6**	**198.6**	**259.0**	**360.1**	**472.8**

Source: Summarized from Chapter 6: Scenario 5 – Tables 6-20 to 6-24.
Note: 1 In millions of Kina.

facilities for the increased capacity. There is a need to be very realistic about what can be achieved on the supply side even with important decisions being taken over the next 18 months.

The NHP indicates that there are plans to expand the number of doctors trained—particularly "rural" doctors to be trained under a new training program, probably undertaken by Divine Word University. This is discussed further in Chapter 7. Certainly data presented in Chapter 2 indicates that there are very few doctors working in rural areas—in 2009 there were only 51 doctors in rural areas. The justification for expansion in doctor numbers proposed here would be in order to expand numbers working in rural areas. Nevertheless, much would need to be done to encourage doctors to practice in rural areas.

5.5. Conclusions

This chapter has explored some of the issues and factors which affect efforts to project the demand for service-delivery staff. The final effective demand for health workers will depend in no insignificant part on the efforts of the health system to increase the quality-enhancing nonsalary budgets—which need to increase faster than total expenditure on health and of expenditure on service-delivery staff. This will help ensure that demand for health services as expressed by outpatient visits per capita per annum and other services, including antenatal care and immunizations also increase. Without the health system being responsive to the real needs of the population as expressed by increased demand for services, the demand for health staff will not be as great as that assumed in any of these scenarios.

Given the demand for services documented in the Monash Report for 2009, existing staff numbers are some 40 percent over the required numbers—at least in rural areas. There is considerable scope to increase rural services with existing staff. On the other hand, existing services demanded are well below what should be demanded if the health system was responding to the burden of disease within the population. If the demand for services increases as projected by the NHP, existing staff will not be underemployed. It is unlikely, however, that demand for services will change significantly overnight—it will be a more gradual process. This is just as well since the current training system is not producing—particularly for nurses and CHWs—enough graduates to enable a replacement of the expected retirements from the workforce and to meet even a gradual expansion of the workforce. In fact, it is expected that the workforce for nurses and CHWs will decline over the NHP period to 2015 because of the age of the current workforce.

Chapter 6 looks at the five scenarios described in this chapter in both more detail (year to year over the period 2009 to 2030). In particular, it looks at the implications for the ramping up of training capacity that would be required to try and achieve each of the four scenarios (2–5) involving increased training. Scenario 1 holds existing training capacity constant and shows what no action on the training front involves. To this end it discusses in more detail the supply constraints that effectively rule out Scenarios 2 and 4 as realistic possibilities—in the near term. Scenario 3—growth at the same rate as the population—is certainly feasible but the resource envelope likely to be available for health will allow much more to happen. Scenario 5—the recommended strategy—constrains overall expenditure on health staff to that which can be afforded. It assumes about a 7 percent real increase in the health budget each year through 2030 as discussed above. Space is left to expand the quality-enhancing recurrent expenditures on health—particularly the financing of pharmaceuticals, medical supplies and vaccines and other quality-enhancing expenditures on transport, training and referral systems. Without this it is unlikely that effective demand for services per capita will reverse and later increase as desired.

As further discussed in both Chapters 6 and 7 it is argued that this building of scenarios should be done annually as part of the health MTEF processes. The likely future resource envelope available to government for health is uncertain. The outer years are thus subject to significant variations (up and down). Such a review process would enable changes in the fiscal situation, considerations of the role of cadres and progress with increasing training capacity to be taken into account and appropriate adjustments made in outer years. In fact, as discussed above and in more detail in Chapter 6, the most immediate decisions need not constrain options in the future.

Without action to expand training, particularly of nurses and CHWs, the existing outputs of training institutions will not be enough to replace expected attrition from the workforce. Provided adequate initial planning goes into planning the expansion of the training system (including strategic planning for possible stage 2 and 3 expansion of the system) the issues facing the supply side will constrain options. One major issue is the expansion of secondary education and particularly of Grade 12 entrants to the training system. As discussed in Chapter 3 it is important that entrants to training programs come from the provinces where staff will be required—in order to attract staff to the needed areas of the country. In fact, with some of the more ambitious scenarios, it is unlikely that enough qualified high school graduates—at either the micro (province or district level) or at the macro level—will be available to enter the training schools over the next few years—particularly if the demand for skilled (high school educated) workers required for the LNG and other developments come to fruition.

CHAPTER 6

SUPPLY AND DEMAND: KEY HEALTH CADRE SUPPLY GAPS

6.1. Introduction

This chapter presents the detailed demand and supply projections for the five scenarios described in Chapter 5 and, for each scenario, the implications for each cadre. In addition to showing the detailed (year by year) growth of the direct service-delivery staff (by cadre) implied for each scenario the detailed tables also show: (i) the expected trend in population to staff and staff per 1,000 population ratios; (ii) the expected attrition from the workforce; (iii) the expected outputs from the training schools in the initial years of the NHP (prior to implementing any expansion plans and allowing for new trainees to graduate) and how fast graduations from training schools will need to ramp upwards to the employment targets implied by each of the scenarios; (iv) the first year intakes to respective training schools required to ensure, given expected dropout rates for each school, the needed graduates to reach the employment targets for the specific scenario; and (v) the costs in 2009 prices of employing all he graduates given average remuneration costs of each cadre. The tables also show the recurrent costs of training nurses and CHWs at: (i) 2009 unit costs; and (ii) quality-enhanced unit costs for the training of nurses and CHWs.

Each set of scenario tables is collated into a summary table looking at the "Total Service-Delivery Staff" picture. This includes the: (i) staff to be employed; (ii) population to service-delivery staff ratios and total service-delivery staff per 1,000 population ratios; and, critically; (iii) salary costs for direct service-delivery staff under each scenario; (iv) expected total recurrent budget (as discussed in Chapter 5); and (v) share of the total service-delivery staff costs of the expected total recurrent budget. These tables also show the combined costs of nurse and CHW training which are also expressed as a percentage of the expected recurrent budget for health—for 2009 unit costs and for the quality-enhanced unit costs of training. Finally, the implications for policy on the expansion of direct service-delivery staff training programs are discussed for each scenario.

6.2. The Range and Scale of Supply and Demand Gaps by Key Health Worker Cadre

The range and scale of the supply and demand gaps for each of the direct service-delivery cadres (and for all service-delivery staff) are set out in the five scenarios described in Chapter 5:

- ***Scenario 1: No Change in Human Resource Supply Capacity 2010–2030.*** This scenario is designed to show the implications of a "Do Nothing" Strategy on the supply side (that is no change in the current throughputs of the health training system) given the expected retirements of the workforce due to its aging and the sustained growth in the population and in the expected budget for health. It clearly demonstrates the current crisis facing the human resource requirements of the health sector in PNG.
- ***Scenario 2: Aspirational Targets Envisioned by PNGDSP 2010–2030.*** The second set of projections is based on the number of staff and/or population-to-staff

ratios posited in the PNGDSP 2010–2030. These are in the form of absolute staff numbers for each of medical officers, nurses and CHWs. The report argues that this scenario: (i) is not affordable on current likely resource envelope projections; and (ii) does not adequately reflect the likely needed composition of cadres in the future health workforce.

- ***Scenario 3: Maintaining Existing Population to Service-Delivery Staff Ratios.*** The third scenario assumes the core direct service-delivery health cadres maintain both their current share of the workforce and the current (2009) population-to-staff ratios over the period 2009–2030. The fundamental driver of the demand for health staff in this example is population growth. This scenario is probably affordable but it is also probably not the right mix of cadres required for the health workforce.
- ***Scenario 4: WHO Recommended "Threshold" Service-Delivery Staff Density Targ*ets.** The fourth scenario is based on the WHO "threshold" density of 2.28 per 1,000 population (or population to staff ratio of 439 to 1) of doctors, nurses (registered and enrolled) and midwives below which, according to WHO, coverage of essential interventions, including those necessary to reach the health-related MDGs, is not likely.[30] This scenario is not affordable—particularly in the outer years—and recommends a doctor/population ratio which is probably not feasible from a supply constraint perspective and which is lower than is need to meet the health needs of the population.
- ***Scenario 5: A Suggested Preservice Training Scenario for Direct Service-Delivery Staff.*** The fifth scenario—which is the broadly recommended scenario—envisages: (i) a gradual reduction in the population to doctor, nurse and CHW ratios; (ii) maintaining nurses and CHWs as the backbone of the service-delivery system—particularly rural service delivery constrained by: (a) the growth in the resource envelope likely to be available for health and service-delivery staff; and (b) the feasibility and speed with which preservice training can be ramped up to meet the demands of attrition from the workforce and the needs of a growing population.

One common element of each scenario is the population projection used. This is discussed more fully in Chapter 5 but the population projections are based on the ones used in the NHP (Volume 2) for the years 2010 to 2020. This essentially assumes the citizen population will grow at about 2.8 percent per annum over this period. These numbers have been projected forward for the period to 2025 at 2.5 percent per annum and from 2025 to 2030 at 2.1 percent per annum.[31]

Another common element in each of the five scenarios is the resource envelope used for health recurrent budget growth over the period 2010–2030. A range of scenarios are fully discussed in Chapter 5–which cover a combination of expected GDP growth, growth of the government recurrent budget and the share of the recurrent budget allocated to health—all significant variables with significant uncertainty. Nevertheless, the future expectations for growth of the economy and of the government budget and of health is significantly more positive than over the past 10–15 years when growth of both the economy and the government budget in real terms has been less than the growth of the population. For the purpose of the discussion in Chapter 6 we have assumed the health budget will grow at about 5 percent in real terms—the middle-growth scenario—over the period of the projections. This growth rate varies over time, as discussed in Chapter 5, but broadly follows the estimates of the IMF and the Ministry of Finance (MoF) over the period 2010–2015 and an average growth of 4–5 percent over subsequent periods.

6.3. Detailed Scenario Analysis

6.3.1 Scenario 1: No Change in Human Resource Supply Capacity 2010–2030

This scenario looks at what will happen to the size of the health workforce with no change in the current out-

30 WHO, 2006. This report notes specifically that countries with densities of doctors, nurses, and midwives below 2.28 per 1,000 population fail, on average, to achieve 80 percent coverage for live deliveries by skilled birth attendants.

31 As discussed in Chapter 5 the population projections in the NHP may overestimate population growth slightly for the period 2010–2020 but have been used for consistency purposes for the rest of the NHP. The population projections for the period 2020–2030 are based on the assumptions for population growth for this period used by the PNGDSP. These growth rate reductions are probably ambitious and without formal population projections—badly needed for PNG but outside the scope of this report—it is hard to have too much certainty about the projections. Nevertheless, the average trend over the period 2020–2030 is probably reasonable.

puts of the health-related training system—for medical officers, nurses, CHWs and HEOs. The picture that emerges is one of an impending workforce crisis that will result in a fast-shrinking service-delivery workforce. Each of the health service-delivery cadres are discussed in turn and then the total service-delivery staff outcome over the period 2009–2030 is summarized, together with remuneration costs to the health budget and remuneration costs as a share of the expected recurrent budget.

The projections for medical officers are presented in Table 6-1. The key characteristic of this scenario is that it is assumed that new medical graduates remain at the current 49 per annum over the 20 year projection period.

The key points about Scenario 1 for medical officers as set out in Table 6-1 can be summarized as follows:

(i) The total number of medical officers employed would rise from 379 in 2009 to 515 in 2015 and to nearly 595 by 2020. This would increase more modestly to 636 in 2025 and 656 in 2030.

(ii) This scenario of a modestly increasing doctors workforce would result in the population to medical officer ratio falling from 17,512 to 1 medical officer in 2009 to 15,078 to 1 medical officer in 2018 but over the next decade or more the population to medical officer ratio would increase to 17,277 to 1 in 2030–approximately the same as in 2009.

(iii) One reason for this trend ((ii) above) is that population growth, as discussed above, remains relatively high. The growth in doctor numbers available for the workforce is not growing as fast as population growth.

(iv) A second very significant reason for this is the rate of attrition from the workforce. It is assumed that attrition from the existing doctor workforce will be 6 percent per annum rising to 7 percent per annum from 2021 to 2030. Thus the number of retirees from the workforce is estimated to rise from 23 per year in 2009 to about 36 in 2020 and to 46 per year in 2030. At the same time the new entrants is only 49 per year. We do not have studies of the attrition rate of the health workforce. The last estimate was done in about 2000 but this was also a guesstimate. We do know, however, that about 47 percent of medical officers will reach retirement age by 2020 so this alone could account for attrition from the workforce postulated. To this end the assumption underlying 6 percent attrition in the next decade assumes that policies are considered to keep doctors working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(v) The line for first year student intake required represents the number of students needing to enter the program six years earlier given the current estimated attrition rate (10 percent) from medical programs over the six years of the program. Thus, to achieve graduations of 49 the medical school needs to be enrolling about 54 students each year.

(vi) Costs of employing this number of doctors would rise in real terms from K34 million in 2009 to K54 million in 2020 and K59 million in 2030.

The projections for nursing officers for Scenario 1 are presented in Table 6-2. The key characteristic of this scenario is that it is assumed that new nursing officer graduates remain at the number expecting to graduate from 2012 (following the re-establishment of the Mendi School of Nursing in 2010. From 2012 it is expected that there will be 165 graduates per annum over the projection period to 2030.

The key points about Scenario 1 for nurses can be summarized as follows:

(i) The total number of nurses employed would decline from 3,252 in 2009 to 3,051 in 2015 and to 2,971 by 2020 and would continue to fall to 2,869 in 2030–a decrease of 383 by 2030 or about 12 percent.

(ii) This scenario of declining nurse numbers in the workforce would result in the population-to-nurse ratio rising from 2,041 to 1 nursing officer in 2009 to 3,038 to 1 nursing officer in 2020 and to almost 4,000 per nursing officer in 2030.

(iii) One reason for this trend ((ii) above) is that population growth, as discussed above, remains relatively high. Together with declining nurse numbers, this means the population-to-nurse ratio is falling dramatically.

(iv) A second very significant reason for this trend is the rate of attrition from the workforce. For the period of the projection, attrition from the workforce is expected to be greater than the number of new graduates entering the workforce. It is assumed that attrition from the existing workforce will be 6 percent per annum over the period of the projection scenario to 2030.

Table 6-1: Scenario 1: Medical Officers (MO): No Change in Supply Capacity (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Employed	379	405	430	453	475	495	515	533	550	566	581
Population per MO	17,512	16,852	16,330	15,929	15,625	15,401	15,243	15,142	15,089	15,078	15,105
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07
Attrition From MO Workforce	23	24	26	27	28	30	31	32	33	34	35
New Graduates Required	49	49	49	49	49	49	49	49	49	49	49
1st Year Student Intake Required (6 years earlier)		54	54	54	54	54	54	54	54	54	54
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	34.1	36.5	38.7	40.8	42.7	44.6	46.3	48.0	49.5	50.9	52.3

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Employed	595	608	621	626	632	636	641	645	649	652	656
Population per MO	15,166	15,206	15,272	15,515	15,774	16,046	16,269	16,504	16,751	17,008	17,277
MO per 1,000 Population	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From MO Workforce	36	37	43	44	44	45	45	45	45	46	46
New Graduates Required	49	49	49	49	49	49	49	49	49	49	49
1st Year Student Intake Required (6 years earlier)	54	54	54	54	54	54	54	54	54	54	54
MO Employment Cost (Kmn)	53.6	54.8	55.9	56.4	56.8	57.3	57.7	58.0	58.4	58.7	59.0

Table 6-2: Scenario 1: Nursing Officers: No Change in Supply Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
Nurses Employed	3,252	3,192	3,135	3,112	3,091	3,070	3,051	3,033	3,016	3,000	2,985
Population per Nurse	2,041	2,140	2,239	2,319	2,401	2,486	2,572	2,660	2,751	2,844	2,940
Nurse per 1,000 Population	0.49	0.47	0.45	0.43	0.42	0.40	0.39	0.38	0.36	0.35	0.34
Attrition From Nurse Workforce	195	192	188	187	185	184	183	182	181	180	179
New Graduates Required	135	135	135	165	165	165	165	165	165	165	165
1st Year Student Intake Required (3 years earlier)	139	139	139	170	170	170	170	170	170	170	170
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	73.8	72.5	71.2	70.6	70.2	69.7	69.3	68.8	68.5	68.1	67.8
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.0	3.0	3.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
(b) Quality-Enhanced Cost (K12,000)	5.0	5.0	5.0	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
Nurses Employed	2,971	2,958	2,945	2,933	2,922	2,912	2,902	2,893	2,885	2,877	2,869
Population per Nurse	3,038	3,128	3,220	3,313	3,409	3,506	3,592	3,679	3,768	3,857	3,949
Nurse per 1,000 Population	0.33	0.32	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.25
Attrition From Nurse Workforce	178	177	177	176	175	175	174	174	173	173	172
New Graduates Required	165	165	165	165	165	165	165	165	165	165	165
1st Year Student Intake Required (3 years earlier)	174	174	174	174	174	174	174	174	174	174	174
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	67.4	67.1	66.9	66.6	66.3	66.1	65.9	65.7	65.5	65.3	65.1
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
(b) Quality-Enhanced Cost (K12,000)	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3

(v) As discussed above, we do not have studies of the attrition rate of the health workforce. We do know, however, that about 50 percent of nurses will reach retirement age by 2020–suggesting that retirements alone could account for the workforce attrition rates postulated. The assumption underlying 6 percent attrition in the next decade assumes that policies are considered to keep nurses working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(vi) The line for first year student intake required represents the number of students needing to enter the program three years earlier given the current estimated attrition rate (5 percent) from nurse training programs over the three years of the program. Thus to achieve nurse graduations of 165 the nurse training schools need to enroll about 174 students into the first year program.

(vii) The cost of employing this number of nurses (in real terms) would decline significantly from about K74 million in 2009 to K67 million in 2020 and K65 million in 2030.

(viii) Finally, the total recurrent costs of training of nurses are presented. First, the total recurrent costs of training based on the 2009 estimate of recurrent unit costs of training (K7,273 in Table 4-7) are presented. In the case of Scenario 1 these costs remain constant as numbers under training remain constant as do the costs at about K3.7 million per annum from 2012. Second, the costs of training with a significant improvement in the quality of training (represented by increased unit costs to K12,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. This represents an increase in total costs for a constant capacity to K6.1 million from the K3.7 million estimate of current quality teaching.

The projections for CHWs for Scenario 1 are presented in Table 6-3 below. The key characteristic of this scenario is that it is assumed that new CHW graduates remain at the number currently graduating in 2009. From 2012 it expected that there will be 165 graduates per annum over projection period to 2030.

The key points about Scenario 1 for CHWs can be summarized as follows:

(i) The total number of CHWs employed would decline from 4,398 in 2009 to about 3,900 in 2015 and to 3,621 by 2020 and would continue to fall to about 3,537 in 2030–a decrease of 861 by 2030 or about 20 percent in the total workforce.

(ii) This scenario of declining CHW numbers in the workforce would result in the population to CHW ratio rising from 1,509 to 1 CHW in 2009 to 2,492 to 1 CHW in 2020 and to over 3,200 per CHW in 2030.

(iii) One reason for this trend ((ii) above) is that population growth, as discussed above, remains relatively high. Together with significantly declining CHW workforce numbers, this means the population-to-CHW ratio is falling dramatically.

(iv) Second a very significant reason for this trend is the significant rate of attrition from the workforce. For the period of the projection attrition from the workforce is expected to be greater than the number of new graduates entering the workforce. It is assumed that attrition from the existing workforce will be 7 percent per annum over the period 2009–2020 and 6 percent over the period 2020–2030. As discussed above, we do not have studies of the attrition rate of the health workforce. We do know, however, that about 56 percent of CHWs will reach retirement age by 2020–suggesting that retirements alone could account for the workforce attrition rates postulated. The assumption underlying 6 percent attrition in the next decade assumes that policies are considered to keep CHWs working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(v) The line for first year student intake required represents the number of students needing to enter the program two years earlier given the current estimated attrition rate (3–5 percent) from nurse-training programs over the three years of the program. Thus to achieve CHW graduations of 209 the CHW training schools need to enroll about 215 students into the first year program.

Table 6-3: Scenario 1: Community Health Workers (CHWs): No Change in Supply Capacity Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
CHWs Employed	4,398	4,299	4,207	4,122	4,042	3,968	3,899	3,835	3,776	3,721	3,669
Population per CHW	1,509	1,589	1,669	1,751	1,836	1,923	2,012	2,104	2,197	2,293	2,392
CHW per 1,000 Population	0.66	0.63	0.60	0.57	0.54	0.52	0.50	0.48	0.46	0.44	0.42
Attrition From CHW Workforce	308	301	295	289	283	278	273	268	264	260	257
New Graduates Required	209	209	209	209	209	209	209	209	209	209	209
1st Year Student Intake Required (2 years earlier)	215	215	215	215	215	215	215	215	215	215	215
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	73.0	71.4	69.8	68.4	67.1	65.9	64.7	63.7	62.7	61.8	60.9
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
(b) Quality-Enhanced Costs (K8,000)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
CHWs Employed	3,621	3,577	3,571	3,566	3,561	3,556	3,552	3,548	3,544	3,540	3,537
Population per CHW	2,492	2,586	2,655	2,725	2,797	2,871	2,935	3,000	3,067	3,134	3,203
CHW per 1,000 Population	0.40	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.33	0.32	0.31
Attrition From CHW Workforce	253	215	214	214	214	213	213	213	213	212	212
New Graduates Required	209	209	209	209	209	209	209	209	209	209	209
1st Year Student Intake Required (2 years earlier)	215	215	215	215	215	215	215	215	215	215	215
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	60.1	59.4	59.3	59.2	59.1	59.0	59.0	58.9	58.8	58.8	58.7
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
(b) Quality-Enhanced Costs (K8,000)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4

(vi) Costs of employing this number of CHWs (in real terms) would decline significantly from about K73 million in 2009 to K60 million in 2020 and K59 million by 2030.

(vii) The total recurrent costs of training based on the 2009 estimate of recurrent units costs of training (K6,221 in Table 4-8) are presented. In the case of Scenario 1 these costs remain constant as numbers under training remain constant as do the costs at about K2.7 million per annum. Second, the costs of training from a significant improvement in the quality of training (represented by increased unit costs to K8,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. This represents an increase in total costs for a constant capacity to K3.4 million from the K2.7 million estimate of current quality teaching.

The projections for HEOs are presented in Table 6-4 below. The key characteristic of this scenario is that it is assumed that new HEO graduates remain at the current 49 per annum over the 20 year projection period.

The key points about Scenario 1 for HEOs can be summarized as follows:

(i) The total number of HEOs employed would rise from 411 in 2009 to 503 in 2015 and to 553 by 2020. This would increase to 585 in 2025 and about 607 in 2030.

(ii) This scenario of a modestly increasing HEO workforce would result in the population-to-HEO ratio improving from 16,148 to 1 HEO in 2009 to 15,609 to 1 HEO in 2015 but over the next period of the projection to 2030 the population-to-HEO ratio would rise to 16,322 to 1 HEO in 2020 and to 18,663 to 1 HEO in 2030—a significantly higher population-to-HEO ratio than in 2009.

(iii) One reason for this trend ((ii) above) is that population growth, as discussed above, remains relatively high. The growth in HEO numbers available for the workforce is not growing as fast as population growth.

(iv) A second very significant reason for this is the rate of attrition from the workforce. It is assumed that attrition from the existing HEO workforce will be 7 percent per annum through 2030. Thus the number of retirees from the workforce is estimated to rise from 29 per year in 2009 to about 38 in 2020 and to 42 per year in 2030. At the same time the current capacity for new entrants to the workforce is only 49 per year. We do not have studies of the attrition rate of the health workforce. The last estimate was done in about 2000 but this was also a guesstimate. We do know, however, that over 50 percent of HEOs will reach retirement age by 2020–suggesting that retirements alone could account for the workforce attrition rates postulated. To this end the assumption underlying 7 percent attrition in the next decade assumes that policies are considered to keep HEOs working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(v) The line for first year student intake required represents the number of students needing to enter the program four years earlier given the current estimated attrition rate (7 percent) from the HEO program over the four years of the program. Thus to achieve graduations of 46 the medical school needs to enroll 49 at the start of the program.

Finally, Table 6-5 for Scenario 1 shows the total number of service-delivery staff which are estimated to be available for the health workforce over the projection period to 2030 assuming no change in existing training capacity.

Specifically, the following can be observed from Table 6-5:

(i) If existing training capacity is maintained over the period and the assumptions outlined for each of the cadres are as discussed above, the total service-delivery workforce for health would decline from 8,440 in 2009 to 7,968 in 2015 and to 7,740 by 2020–a decline of 700 or 8 percent. This declining trend would continue with the service-delivery health workforce estimated to be 7,689 in 2025 and to 7,669 in 2030.

(ii) As a consequence of the sustained increase in population and the decline in the total service-delivery workforce, the population to service-delivery staff ratio under this scenario can be expected to rise substantially from 786 to 1 service-delivery staff in 2009 to 985 to 1 service-delivery staff in 2015 to 1,166 to 1 staff in 2020. Over the subsequent decade the population to service-delivery staff ratio would rise to 1,477

Table 6-4: Scenario 1: Health Extension Officers (HEOs): No Change in Supply Capacity Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
HEOs Employed	411	428	445	461	476	490	503	514	525	535	544
Population per HEO	16,148	15,948	15,761	15,641	15,581	15,573	15,609	15,686	15,799	15,944	16,119
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	29	29	30	31	32	33	34	35	36	37	37
New Graduates Required	46	46	46	46	46	46	46	46	46	46	46
1st Year Student Intake Required (4 years earlier)	49	49	49	49	49	49	49	49	49	49	49
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	10.7	11.1	11.6	12.0	12.4	12.7	13.1	13.4	13.7	13.9	14.2

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
HEOs Employed	553	561	568	574	580	585	590	595	599	603	607
Population per HEO	16,322	16,494	16,706	16,937	17,185	17,452	17,666	17,895	18,138	18,394	18,663
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05
Attrition From HEO Workforce	38	39	40	40	41	41	41	42	42	42	42
New Graduates Required	46	46	46	46	46	46	46	46	46	46	46
1st Year Student Intake Required (4 years earlier)	49	49	49	49	49	49	49	49	49	49	49
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	14.4	14.6	14.8	14.9	15.1	15.2	15.3	15.5	15.6	15.7	15.8

Table 6-5: Scenario 1: Total Service-Delivery Staff: No Change in Supply Capacity Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Employed	379	405	430	453	475	495	515	533	550	566	581
Nurses Employed	3,252	3,192	3,135	3,112	3,091	3,070	3,051	3,033	3,016	3,000	2,985
CHWs Employed	4,398	4,299	4,207	4,122	4,042	3,968	3,899	3,835	3,776	3,721	3,669
HEOs Employed	411	428	445	461	476	490	503	514	525	535	544
Total Service-Delivery Staff	8,440	8,324	8,217	8,148	8,084	8,023	7,968	7,915	7,867	7,822	7,779
Population per Service Staff	786	820	854	886	918	951	985	1,019	1,055	1,091	1,128
Service Staff Per 1,000 Pop.	1.27	1.22	1.17	1.13	1.09	1.05	1.02	0.98	0.95	0.92	0.89
Total Staff Cost (Kmn)	191.6	191.1	191.0	191.5	192.1	192.6	193.4	193.5	194.0	194.4	194.8
Total Recurrent Budget	513.0	551.5	601.1	634.2	646.9	672.7	807.3	823.4	852.2	886.3	921.8
S.D Staff as % Recurrent Budget	37.3	34.7	31.8	30.2	29.7	28.6	23.9	23.5	22.8	21.9	21.1
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	5.7	5.7	5.7	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Quality-Enhanced Costs (Kmn)	8.5	8.5	8.5	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3
2009 Costs % Recurrent Budget	1.1	1.0	1.0	1.0	1.0	1.0	0.8	0.8	0.8	0.7	0.7
Quality-Enhanced % Recurrent Budget	1.6	1.5	1.4	1.5	1.5	1.4	1.2	1.2	1.1	1.1	1.0

(*continued on next page*)

Table 6-5: Scenario 1: Total Service-Delivery Staff: No Change in Supply Capacity Scenario (2010–2030) (*continued*)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Employed	595	608	621	626	632	636	641	645	649	652	656
Nurses Employed	2,971	2,958	2,945	2,933	2,922	2,912	2,902	2,893	2,885	2,877	2,869
CHWs Employed	3,621	3,577	3,571	3,566	3,561	3,556	3,552	3,548	3,544	3,540	3,537
HEOs Employed	553	561	568	574	580	585	590	595	599	603	607
Total Service-Delivery Staff	7,740	7,704	7,705	7,699	7,695	7,689	7,685	7,681	7,677	7,672	7,669
Population per Service Staff	1,166	1,201	1,231	1,262	1,295	1,328	1,357	1,386	1,416	1,446	1,477
Service Staff Per 1,000 Pop.	0.86	0.83	0.81	0.79	0.77	0.75	0.74	0.72	0.71	0.69	0.68
Total Staff Cost (Kmn)	195.5	195.6	196.5	196.8	197.1	197.5	197.6	197.8	198.0	198.2	198.6
Total Recurrent Budget	958.7	999.9	1,042.9	1,087.7	1,134.5	1,183.3	1,234.1	1,287.2	1,342.6	1,400.3	1,460.5
S.D Staff as % Recurrent Budget	20.4	19.6	18.8	18.1	17.4	16.7	16.0	15.4	14.7	14.2	13.6
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Quality Enhanced Costs (Kmn)	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7
2009 Costs % Recurrent Budget	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4
Quality-Enhanced % Recurrent Budget	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7

to 1 in 2030. This would mean that in 2030 the population to service-delivery staff ratio would be almost twice that in 2009, in other words that each staffer would, on average, be responsible for almost twice the number as at present. Clearly this is an alarming scenario.

(iii) The share of the remuneration costs in the expected health recurrent budget would decline from the current 37.3 percent to 13.6 percent in 2030.

(iv) Finally, the costs of the training of both nurses and CHWs are presented both at 2009 unit costs and at quality-enhanced unit costs (see above). The total recurrent costs of training for both nurses and CHWs are estimated at about K6.4 million (from 2012 when the Mendi School of Nursing will be running at planned capacity). The costs of a quality-enhanced teaching program for nurses and CHWs are also presented. This would cost about K9.6 million per annum (in 2009 prices).

(v) As a cost of the expected recurrent budget the total costs of nurse and CHW training in 2009 was about 1.1 percent. With no change in capacity and no improvement in unit costs, the share of the expected health budget allocated to training of these two cadres would fall to 0.7 percent by 2020 and to 0.4 percent by 2030. With no change in capacity and at enhanced unit costs, the training costs of these two cadres would represent about 1.6 percent of the health budget in 2009. This could be expected to fall to 1.0 percent by 2020 and to 0.7 percent by 2030.

6.3.2 Scenario 2: Aspirational Health Workforce Targets Envisioned in the PNGDSP 2010–2030

This scenario sets targets for medical officers, nurses and CHWs for 2030 in either absolute numbers and/or rates per 100,000 population. It does not consider either the timeline or the feasibility of expanding training of doctors and other staff to achieve these targets. This scenario is, however, included in this report because it is specified in an important national document as at least an important aspiration.

The formal PNGDSP target for medical officers is 4,900 by 2030 or 50 per 100,000 population (PNGDSP) (Table 6-6). As discussed in Chapter 5, the population base for 2030 assumed by the PNGDSP is lower by 1.5 million (Table 5-1). Under Scenario 2 the PNGDSP target of 4,900 doctors would be achieved by 2031 if the growth in doctor numbers was achieved as outlined.

The key points about Scenario 2 for medical officers can be summarized as follows:

(i) The total number of medical officers are planned to grow from 379 in 2009 to 4,184 in 2030 and about 4,900, as discussed, in 2031. This would result in the population per doctor improving from 17,512 to one to about 2,700 to one in 2030.

(ii) It is assumed that attrition from the existing workforce will be 6 percent per annum rising to 7 percent per annum from 2021 to 2030. We do not have studies of the attrition rate of the health workforce. The last estimate was done in about 2000 but this was also a guesstimate. We do know, however, that about 47 percent of medical officers will reach retirement age by 2020-suggesting that retirements alone could account for the workforce attrition rates postulated. The assumption underlying 6 percent attrition in the next decade assumes that policies are considered to keep doctors working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(iii) New graduates in this scenario are simply the numbers of graduates required, after allowing for: (a) some time to immediately ramp up training; and (b) the length of the course—six years. New medical graduates would need to rise from 49 per year in 2009 to 100 in 2019, 200 in 2021 and 700 per year from 2025. Simply put, it is extremely unlikely that the infrastructure or staffing required for such an expansion of training would be feasible. In addition, the state of the education system, and particularly senior secondary education, would make it extremely unlikely that enough students with an adequate science background would be available to enter medical school.

(iv) The line for first year student intake required represents the number of students needing to enter the program six years earlier, given the current estimated attrition rate (10 percent) from medical programs over

Table 6-6: Scenario 2: Medical Officers (MOs): Aspirational Targets Envisioned by PNGDSP (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Plan by PNGDSP	379	405	430	453	475	495	515	533	550	566	581
Population per MO	17,512	16,862	16,327	15,934	15,625	15,415	15,234	15,137	15,085	15,075	15,103
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07
Attrition from MO Workforce	23	24	26	27	28	30	31	32	33	34	35
New Graduates Required	49	49	49	49	49	49	49	49	49	49	100
1st Year Student Intake Required (6 years earlier)		54	54	54	54	54	54	54	54	54	111
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	34.1	36.5	38.7	40.8	42.7	44.6	46.3	48.0	49.5	50.9	52.3

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Plan by PNGDSP	646	707	865	1,004	1,334	1,641	2,226	2,770	3,276	3,747	4,184
Population per MO	13,969	13,084	10,961	9,680	7,468	6,222	4,684	3,843	3,317	2,962	2,707
MO per 1,000 Population	0.07	0.08	0.09	0.10	0.13	0.16	0.21	0.26	0.30	0.34	0.37
Attrition From MO Workforce	39	42	61	70	93	115	156	194	229	262	293
New Graduates Required	100	200	200	400	400	700	700	700	700	700	700
1st Year Student Intake Required (6 years earlier)	111	222	222	444	444	778	778	778	778	778	778
MO Employment Cost (Kmn)	58.1	63.7	77.8	90.4	120.1	147.7	200.3	249.3	294.8	337.2	376.6

the six years of the program. Thus, to achieve graduations of 200 in 2021, medical schools would need to be enrolling at least 221 students into first year by 2015 and 778 by 2018. In other words, investment decisions would need to be made during the current NHP to make this target at all feasible.

The cost of employing this number of doctors—aside from issues of real need to achieve the health outcomes desired—also raises feasibility questions. In 2009 expenditure on doctors is estimated at K34.1 million. This would increase to over K376 million by 2030 or about 26 percent of the expected health recurrent budget in 2030 (see Table 6-9 below) compared to K34.1 million in 2009 (7 percent of the total health recurrent budget).

The projections for nurses for Scenario 2 are presented in Table 6-7 below. The PNGDSP sets the target for nurses as 19,500 nurses by 2030 or 200 nurses per 100,000 population. As discussed above, the population estimates used in this report are 1.5 million higher than the PNGDSP report. Thus we use the target of 19,500 nurses as the specific one for this scenario for nurses.

The key points about Scenario 2 for nurses can be summarized as follows:

(i) The total numbers of nurses is planned to grow from 3,252 in 2009 to 19,526 in 2030. This would result in the population per nurse ratio improving from 2,041 to one to about 580 to one.

(ii) It is assumed that attrition from the existing workforce will be 6 percent per annum over the period of the projection scenario to 2030. As discussed above, we do not have studies of the attrition rate of the health workforce. We do know, however, that about 50 percent of nurses will reach retirement age by 2020–suggesting that retirements alone could account for the workforce attrition rates postulated. The assumption underlying 6 percent attrition in the next decade assumes that policies are considered to keep nurses working longer over the next decade. Working against this may well be increased attrition to the private sector if this expands as many believe it will—particularly with an expanding urban population and rising GDP from the LNG project and associated developments.

(iii) New graduates in this scenario are simply the numbers of graduates required, after allowing for: (i) some time to immediately ramp up training; and (ii) the length of the course—three years. New nurse graduates would need to rise from 135 per year in 2009 (or 165 per year from 2012 when the new capacity from the Mendi School of Nursing comes on line) to 300 in 2015, 1,000 in 2021, 1,500 in 2022 and 3,000 per year from 2025. Simply put, it is extremely unlikely that the infrastructure or staffing required for such an expansion of training would be feasible. In addition, the state of the education system, and particularly senior secondary education, would make it extremely unlikely that enough students with an adequate science background and aptitude would be available to enter nursing schools. This issue would be particularly acute for the remoter areas—where a policy of recruiting locally is a recommended strategy to get nurses going to areas currently lacking in staff—unless a decision was made to reduce school qualifications required for entry to nursing.

(iv) The line for first year student intake required represents the number of students needing to enter the program three years earlier—given the current estimated attrition rate (5 percent) from nurse training programs over the three years of the program. Thus, to achieve nurse graduations of 300 in 2015 nurse training schools would need to be enrolling at least 309 students into first year by 2012, increasing to 515 by 2014, 1,500 by 2022 and 3,000 by 2025. This is possible with an emergency program to ramp up training. In other words, investment decisions would need to be made immediately and of considerable scale in the current NHP to make this target at all feasible.

(v) The cost of employing this number of nurses—aside from issues of real need to achieve the health outcomes desired—also raises feasibility questions. In 2009, expenditure on nurses is estimated at K73.8 million. This would increase to over K443.2 million by 2030 or about 30 percent of the expected health recurrent budget in 2030 (Table 6-9) compared to K34.1 million in 2009 (6.6 percent of the total health recurrent budget).

(vi) The total recurrent costs of training based on the 2009 estimate of recurrent units costs of training (K7,273 in Table 4-7) are presented (Table 6-7). In the case of this scenario these costs would increase from about K3 million in 2009 to about K10.9 million in 2020. These costs would increase to about K65.5 million by

Table 6-7: Scenario 2: Nursing Officers (NOs): Aspirational Targets Envisioned by PNGDSP (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
Nurses Plan by PNGDSP	3,252	3,192	3,135	3,082	3,062	3,044	3,026	3,144	3,256	3,560	3,847
Population per Nurse	2,041	2,140	2,239	2,342	2,423	2,507	2,593	2,566	2,548	2,396	2,281
Nurse per 1,000 Population	0.49	0.47	0.45	0.43	0.41	0.40	0.39	0.39	0.39	0.42	0.44
Attrition From Nurse Workforce	195	192	188	185	184	183	182	189	195	214	231
New Graduates Required	135	135	135	165	165	165	300	300	500	500	500
1st Year Student Intake Required (3 years earlier)	139	139	139	170	170	170	309	309	515	515	515
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	73.8	72.5	71.2	70.0	69.5	69.1	68.7	71.4	73.9	80.8	87.3
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.0	3.0	3.0	3.6	3.6	3.6	6.5	6.5	10.9	11.2	11.2
(b) Quality-Enhanced Costs (K12,000)	4.9	4.9	4.9	5.9	5.9	5.9	10.8	10.8	18.5	18.5	18.5

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
Nurses Plan by PNGDSP	4,116	4,369	5,107	6,300	7,422	8,477	10,968	13,310	15,512	17,581	19,526
Population per Nurse	2,193	2,117	1,857	1,543	1,342	1,205	950	800	701	631	580
Nurse per 1,000 Population	0.46	0.47	0.54	0.65	0.75	0.83	1.05	1.25	1.43	1.58	1.72
Attrition From Nurse Workforce	247	262	306	378	445	509	658	799	931	1,055	1,172
New Graduates Required	500	1,000	1,500	1,500	1,500	3,000	3,000	3,000	3,000	3,000	3,000
1st Year Student Intake Required (3 years earlier)	526	1,053	1,579	1,579	1,579	3,158	3,158	3,158	3,158	3,158	3,158
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	93.4	99.2	115.9	143.0	168.5	192.4	249.0	302.1	352.1	399.1	443.2
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	10.9	21.8	32.7	32.7	32.7	65.5	65.5	65.5	65.5	65.5	65.5
(b) Quality-Enhanced Cost (K12,000)	18.5	36.0	54.0	54.0	54.0	108.0	108.0	108.0	108.0	108.0	108.0

2025 and remain constant as nurse training intakes stabilized at about 3,000 students per year. Second, the costs of training from a significant improvement in the quality of training (represented by increased unit costs to K12,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The costs of an "enhanced" quality of nursing graduate would increase from about K4.9 million in 2009 (with an enhanced unit cost of K12,000 per annum) to almost K11 million by 2015 and K18 million by 2020. It would reach almost K108 million by 2025 and remain at this level through 2030.

The projections for CHWs for Scenario 2 are presented in Table 6-8. The PNGDSP sets the target for CHWs as 20,000 by 2030 (it does not specify a CHW per 100,000 population ratio). Thus we use the target of 20,000 CHWs as the basis for this scenario for CHWs.

The key points about Scenario 1 for CHWs can be summarized as follows:

(i) The total number of CHWs is planned to grow from 4,398 in 2009 to 18,795 in 2030 and almost 20,000 by 2031. This would result in the population per CHW ratio improving from 1,509 to one to about 603 to one.

(ii) It is assumed that attrition from the existing workforce will be 6 percent per annum over the period to 2020 and 5 percent through 2030. As discussed above, we do not have studies of the attrition rate of the health workforce. We do know, however, that about 56 percent of CHWs will reach retirement age by 2020–suggesting that retirements alone could account for the workforce attrition rates postulated. The assumption underlying 6 percent attrition in the next two decades assumes that policies are considered to keep nurses working longer over the next decade.

(iii) New graduates in this scenario are simply the numbers of graduates required, after allowing for: (i) some time to immediately ramp up training; and (ii) the length of the course—two years. New CHW graduates would need to rise from 209 per year in 2009 to 500 in 2015, 1,000 in 2017, 1,600 in 2021 and 2,100 per year from 2024. Simply put, it is extremely unlikely that the infrastructure or staffing required for such an expansion of training would be feasible. In addition, the state of the education system, and particularly senior secondary education, would make it extremely unlikely that enough students with an adequate science background and aptitude would be available to enter CHW schools unless there is effort to increase the proportion of Grade 12 students entering the program and a decision is made to revert to all students coming from a Grade 10 background (see discussion in Chapter 4).

(iv) The line for first year student intake required represents the number of students needing to enter the program two years earlier given the current estimated attrition rate (3–5 percent) from CHW training programs over the two years of the program. Thus, to achieve CHW graduations of 500 in 2015 CHW training schools would need to be enrolling at least 515 students into first year by 2013 (possible at a stretch) and 1,031 by 2015, 1,684 by 2019 and 2,211by 2022. In other words, investment decisions would need to be made immediately and of considerable scale in the current NHP to make this target at all feasible. At present all CHW training is conducted by church agencies. It is highly unlikely that these would be prepared to expand so rapidly for government facilities—thus much of the training would need to be done by new government training institutions established from scratch.

(v) The cost of employing this number of CHWs—aside from issues of real need to achieve the health outcomes desired—also raises feasibility questions. In 2009 expenditure on CHWs is estimated at K73.0 million (about the same as nurses in 2009). This would increase to over K312 million by 2030 or about 21 percent of the expected health recurrent budget in 2030 (Table 6-9) compared to K73 million in 2009 (14.2 percent of the total health recurrent budget).

(vi) Finally, the total recurrent costs of training of CHWs based on the 2009 estimate of recurrent unit costs of training (K6,221 in Table 4-8) are presented. In the case of Scenario 2 these costs would increase from about K2.7 million in 2009 to K6.4 million in 2015 and almost K13 million by 2017 when first year intakes would be 1,031–up from about 215 in 2009. With the training program ramping up to meet the desired targets (intake of almost 1,700 by 2021) the costs of training would increase to K21 million in 2021 and to K27.5 million by 2024 and stabilize with student graduates at about 2,100 per year. Second, the costs of

Table 6-8: Scenario 2: Community Health Workers (CHWs): Aspirational Targets Envisioned by PNGDSP (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
CHWs Plan by PNGDSP	4,398	4,299	4,207	4,122	4,042	3,968	3,899	4,126	4,338	5,034	5,682
Population per CHW	1,509	1,589	1,669	1,751	1,836	1,923	2,012	1,955	1,913	1,695	1,544
CHWs per 1,000 Population	0.66	0.63	0.60	0.57	0.54	0.52	0.50	0.51	0.52	0.59	0.65
Attrition From CHW Workforce	308	301	295	289	283	278	273	289	304	352	398
New Graduates Required	209	209	209	209	209	209	500	500	1,000	1,000	1,000
1st Year Student Intake Required (2 years earlier)	215	215	215	215	215	215	515	515	1,031	1,031	1,031
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	73.0	71.4	69.8	68.4	67.1	65.9	64.7	68.5	72.0	83.6	94.3
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	2.7	2.7	2.7	2.7	2.7	6.4	6.4	12.8	12.8	12.8
(b) Quality-Enhanced Costs (K8,000)	3.4	3.4	3.4	3.4	3.4	3.4	8.2	8.2	16.5	16.5	16.5

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
CHWs Plan by PNGDSP	6,284	6,844	8,102	9,297	10,432	12,010	13,510	14,934	16,288	17,573	18,795
Population per CHW	1,436	1,352	1,170	1,045	955	850	772	713	667	631	603
CHWs per 1,000 Population	0.70	0.74	0.85	0.96	1.05	1.18	1.30	1.40	1.50	1.58	1.66
Attrition From CHW Workforce	440	342	405	465	522	601	675	747	814	879	940
New Graduates Required	1,000	1,600	1,600	1,600	2,100	2,100	2,100	2,100	2,100	2,100	2,100
1st Year Student Intake Required (2 years earlier)	1,031	1,684	1,684	1,684	2,211	2,211	2,211	2,211	2,211	2,211	2,211
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	104.3	113.6	134.5	154.3	173.2	199.4	224.3	247.9	270.4	291.7	312.0
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	12.8	21.0	21.0	21.0	27.5	27.5	27.5	27.5	27.5	27.5	27.5
(b) Quality-Enhanced Costs (K8,000)	16.5	26.9	26.9	26.9	35.4	35.4	35.4	35.4	35.4	35.4	35.4

training with a significant improvement in the quality of training (represented by increased unit costs to K8,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The costs of this "quality" enhanced teaching program would increase under this scenario from K3.4 million in 2009 to K8.2 million by 2015, K16.5 million by 2017, K27 million by 2021 and to K35 million by 2024 when student intakes would be 2,100 compared to 215 in 2009.

This scenario does not have a set of proposals for HEOs—for the purposes of Scenario 2 we assume the program for HEOs is shut down and the capacity for this training is used to ramp up medical officer training. If doctors were expanded at the rate proposed there would be little rationale for sustaining the HEO cadre. Thus they would phase out as they retired. This is the assumption underlying the data on HEOs included in Table 6-9 which looks at trends in the total service-delivery cadres proposed under the PNGDSP.

The data presented in Table 6-9 shows clearly that this plan is extremely ambitious. The total number of service-delivery staff by 2030 would be about 42,700–up from 8,440 in 2009. It would reach 8,183 by 2016, 11,346 by 2020 and then rapidly ramp up to almost 22,400 by 2025 and 42,700 by 2030. This would enable the population to total service-delivery staff ratio to shift from 786 to one in 2009 to about 795 to one in 2020 and then ramp up rapidly, as training capacity is expanded, to about 456 to one in 2025 and 265 to one in 2030. These ratios imply far lower staff-to-population ratios than those proposed by WHO (see Scenario 3 below) for a country at the stage of the epidemiological transition that PNG currently finds itself.

A critical part of the data presented in Table 6-9 is the cost implied by trying to employ all the planned staff. In 2009 the total expenditure on direct service-delivery staff was K191.6 million or about 37 percent of the total health recurrent budget. If we assume the budget grows at an average of 5 percent per annum (the example shown)[32] the total cost of service-delivery staff would rise to 78 percent of the expected total recurrent budget.

Using the recurrent unit costs of training of both nurses and CHWs, this program would see training costs (excluding doctors and HEOs for which data is not available) rise from K5.7 million in 2009 to K12.9 million in 2015 and K24 million by 2017 (Table 6-9). It would further increase to K43 million by 2021 (as a consequence of rapid student expansion) and to level off at about K93 million by 2025 through 2030. As a share of the expected recurrent health budget the costs of training nurses and CHWs at 2009 unit costs would increase from 1.1 percent of the budget to 1.6 percent by 2015 and 2.8 percent by 2017. It would eventually rise to about 8 percent of the expected budget by 2025 and then decline to about 6.6 percent of the expected budget in 2030.

If we use a "reasonable quality-enabling" unit cost (see discussion above) the total costs of training would increase from K8.3 million in 2009 to K19 million by 2015 and K34.5 million by 2020. It would then increase dramatically to about K63 million by 2021 and to K143 million by 2025–this level of expenditure would be sustained through 2030. The costs of nurse and HEO training would increase as a share of the expected health budget from 1.6 percent in 2009 to 4 percent by 2017 and 12.1 percent by 2025 when it would then begin to decline to about 10 percent of the expected health budget by 2030.

6.3.3 Scenario 3: Maintaining Existing Population-to-Service Delivery Staff Cadre Ratios 2010 to 2030

The discussion of Scenarios 3 to 5 does not repeat the assumptions included in the relevant scenario except where they vary from the more detailed description of Scenarios 1 and 2. Thus, this and subsequent scenarios assumes: (i) the same population projections; (ii) the same attrition rates from the workforce for each cadre as described above for Scenarios 1 and 2; and (iii) the same dropout rates from the respective training programs.

The fundamental drive for this scenario is population growth which assumes the core direct service-delivery health cadres maintain both their current share of the workforce and the current (2009) population-to-staff ratios over the period 2009–2030. It suggests, therefore, that additional demand for services can be achieved by using the existing staff more efficiently (the "Monash" Study suggests existing rural staff could increase services 40 percent) and letting the workforce grow at the rate of

32 See discussion above and in Chapter 5.

Table 6-9: Scenario 2: Total Service-Delivery Staff: Aspirational Targets Envisioned by PNGDSP (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Plan by PNGDSP	379	405	430	453	475	495	515	533	550	566	581
Nurses Plan by PNGDSP	3,252	3,192	3,135	3,082	3,062	3,044	3,026	3,144	3,256	3,560	3,847
CHWs Plan by PNGDSP	4,398	4,299	4,207	4,122	4,042	3,968	3,899	4,126	4,338	5,034	5,682
HEOs Existing Stock Only	411	440	440	420	415	411	400	380	360	340	320
Total Service-Delivery Staff	8,440	8,336	8,212	8,077	7,994	7,918	7,840	8,183	8,504	9,500	10,430
Population per Service Staff	786	819	855	894	928	964	1,001	986	976	898	841
Service Staff per 1,000 Pop.	1.27	1.22	1.17	1.12	1.08	1.04	1.00	1.01	1.02	1.11	1.19
Total Staff Cost (Kmn)	191.6	191.4	190.8	189.8	189.8	189.9	190.1	197.4	204.4	223.8	241.9
Total Recurrent Budget	513.0	551.5	601.1	634.2	646.9	672.7	807.3	823.4	852.2	886.3	921.8
S.D Staff as % Recurrent Budget	37.3	34.7	31.7	29.9	29.3	28.2	23.5	24.0	24.0	25.3	26.2
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	5.7	5.7	5.7	6.3	6.3	6.3	12.9	12.9	24.0	24.0	24.0
Quality-Enhanced Costs (Kmn)	8.3	8.3	8.3	9.3	9.3	9.3	19.0	19.0	34.5	34.5	34.5
2009 Costs % Recurrent Budget	1.1	1.0	1.0	1.0	1.0	1.0	1.6	1.6	2.8	2.7	2.6
Quality-Enhanced % Recurrent Budget	1.6	1.5	1.4	1.5	1.5	1.4	2.4	2.3	4.0	3.9	3.7

(*continued on next page*)

Table 6-9: Scenario 2: Total Service-Delivery Staff: Aspirational Targets Envisioned by PNGDSP (2010–2030) (*continued*)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Plan by PNGDSP	646	707	865	1,004	1,334	1,641	2,226	2,770	3,276	3,747	4,184
Nurses Plan by PNGDSP	4,116	4,369	5,107	6,300	7,422	8,477	10,968	13,310	15,512	17,581	19,526
CHWs Plan by PNGDSP	6,284	6,844	8,102	9,297	10,432	12,010	13,510	14,934	16,288	17,573	18,795
HEOs Existing Stock Only	300	290	280	270	260	250	240	230	220	210	200
Total Service-Delivery Staff	11,346	12,210	14,354	16,871	19,448	22,378	26,944	31,244	35,296	39,111	42,705
Population per Service Staff	795	758	661	576	512	456	387	341	308	284	265
Service Staff Per 1,000 Pop.	1.26	1.32	1.51	1.74	1.95	2.19	2.58	2.94	3.25	3.52	3.77
Total Staff Cost (Kmn)	263.6	283.5	335.0	394.1	467.7	546.0	678.7	804.0	921.5	1,137	1,135.1
Total Recurrent Budget	958.7	999.9	1,042.9	1,087.7	1,134.5	1,183.3	1,234.1	1,287.2	1,342.6	1,400.3	1,460.5
S.D Staff as % Recurrent Budget	27.5	28.4	32.1	36.2	41.2	46.1	55.0	62.5	68.6	73.7	77.7
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	24.0	42.8	53.7	55.4	60.2	93.0	96.4	96.4	96.4	96.4	96.4
Quality-Enhanced Costs (Kmn)	34.5	62.9	80.9	83.8	89.4	143.9	149.1	149.1	149.1	149.1	149.1
2009 costs % Recurrent Budget	2.5	4.3	5.1	4.9	5.3	7.9	7.5	7.2	6.9	6.6	6.6
Quality-Enhanced % Recurrent Budget	3.6	6.3	7.8	7.4	7.9	12.1	11.6	11.1	10.7	10.2	10.2

Table 6-10: Scenario 3: Medical Officers (MOs): Maintaining Existing Population to Staff Ratio (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Required	379	390	401	412	424	436	448	461	474	487	501
Population per MO	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From MO Workforce	23	23	24	25	25	26	27	28	28	29	30
New Graduates Required	49	34	35	36	37	38	39	40	41	43	44
1st Year Student Intake Required (6 years earlier)		38	39	40	41	42	44	45	46	47	49
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	34.1	35.1	36.1	37.1	38.2	39.2	40.3	41.5	42.7	43.8	45.1

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Required	515	528	541	555	569	583	595	608	621	634	647
Population per MO	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512	17,512
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From MO Workforce	31	32	38	39	40	41	42	43	43	44	45
New Graduates Required	45	45	51	52	54	55	54	55	56	57	59
1st Year Student Intake Required (6 years earlier)	50	50	57	58	60	61	60	61	62	64	65
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	46.4	47.5	48.7	49.9	51.2	52.5	53.6	54.7	55.9	57.1	58.2

Table 6-11: Scenario 3: Nursing Officers (NOs): Maintaining Existing Population to Staff Ratios (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
Nurses Required	3,252	3,346	3,440	3,537	3,636	3,739	3,844	3,953	4,065	4,181	4,300
Population per Nurse	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041
Nurse per 1,000 Population	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Attrition From Nurse Workforce	195	201	206	212	218	224	231	237	244	251	258
New Graduates Required	135	165	165	309	318	327	336	346	356	366	377
1st Year Student Intake Required (3 years earlier)	139	304	310	318	328	337	347	357	367	378	389
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	73.8	76.0	78.1	80.3	82.5	84.9	87.3	89.7	92.3	94.9	97.6
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.0	6.4	6.5	6.7	6.9	7.1	7.3	7.5	8.0	8.0	8.2
(b) Quality-Enhanced Cost (K12,000)	4.9	10.6	10.8	11.1	11.4	11.8	12.1	12.5	12.8	13.2	13.6

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
Nurses Required	4,422	4,533	4,646	4,762	4,881	5,003	5,108	5,216	5,325	5,437	5,551
Population per Nurse	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041	2,041
Nurse per 1,000 Population	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Attrition From Nurse Workforce	265	272	279	286	293	300	306	313	320	326	333
New Graduates Required	388	383	392	402	412	422	412	420	429	438	447
1st Year Student Intake Required (3 years earlier)	408	403	413	423	434	444	433	442	452	461	471
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	100.4	102.9	105.5	108.1	110.8	113.6	116.0	118.4	120.9	123.4	126.0
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	8.5	8.3	8.6	8.8	9.0	9.2	9.0	9.2	9.4	9.6	9.8
(b) Quality-Enhanced Cost (K12,000)	14.7	14.5	14.9	15.2	15.6	16.0	15.6	15.9	16.3	16.6	16.9

Table 6-12: Scenario 3: Community Health Workers (CHW): Maintaining Existing Population to Staff Ratios (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
CHWs Required	4,398	4,525	4,652	4,783	4,918	5,057	5,199	5,346	5,498	5,654	5,815
Population per CHW	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509
CHWs per 1,000 Population	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Attrition From CHW Workforce	308	317	326	335	344	354	364	374	385	396	407
New Graduates Required	209	444	453	466	479	493	507	522	536	552	568
1st Year Student Intake Required (2 years earlier)	215	458	467	480	494	508	522	538	553	569	585
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	73.0	75.1	77.2	79.4	81.6	83.9	86.3	88.7	91.3	93.9	96.5
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	5.7	5.8	6.0	6.1	6.3	6.5	6.7	6.9	7.1	7.3
(b) Quality-Enhanced Costs (K8,000)	3.4	7.3	7.5	7.7	7.9	8.1	8.4	8.6	8.8	9.1	9.4

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
CHWs Required	5,980	6,130	6,283	6,440	6,601	6,766	6,908	7,053	7,202	7,353	7,507
Population per CHW	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509	1,509
CHWs per 1,000 Population	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Attrition From CHW Workforce	419	368	377	386	396	406	415	423	432	441	450
New Graduates Required	584	517	530	543	557	571	557	568	580	592	605
1st Year Student Intake Required (2 years earlier)	602	533	547	560	574	589	574	586	598	611	624
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	99.3	101.8	104.3	106.9	109.6	112.3	114.7	117.1	119.5	122.1	124.6
Recurrent Unit Cost of Training (kmn)											
(a) 2009 Costs (K6,221)	7.5	6.6	6.8	7.0	7.1	7.3	7.1	7.3	7.4	7.6	7.8
(b) Quality-Enhanced Costs (K8,000)	9.6	8.5	8.7	9.0	9.2	9.4	9.2	9.4	9.6	9.8	10.0

population growth. Thus it does not imply maintaining the existing service levels in rural areas but envisages significantly increased service levels and sustaining them over time. Further, it is consistent with many of the implications in the NHP that the existing cadres remain relevant to health service delivery. It is noted that no major case is made in the NHP to adjust the structure of service-delivery cadres.

The key observations about this scenario for medical officers are:

(i) The number of doctors would increase from 379 in 2009 to 515 in 2020 and to 647 in 2030. This would sustain a population-to-doctor ratio of 17,512 per doctor.

(ii) The number of graduates required from medical school(s) to sustain these ratios would decrease from 49 at present to between the mid-thirties to mid-forties over the next decade and gradually rise to about 60 per year by 2030. In other words, sustaining current capacity would achieve the target implied.

(iii) The costs of employing the staff would increase from K34.1 million in 2009 to 58.2 million in 2030.

The key observations about the projections for nurses under Scenario 3 are that:

(i) The number of nurses would increase from 3,252 in 2009 to 4,422 in 2020 and 5,551 in 2030. This would sustain the population-to-nurse ratio at 2,041 per nurse over this period.

(ii) The number of graduates from the nursing schools would need to increase from the expected numbers graduating in 2009 to around 300 immediately and this would need to rise to 336 in 2015, 388 by 2020 and almost 450 by 2030.

(iii) It should be noted that the projected attrition from the nurse workforce is significantly greater than the 2009 output. Without expansion of training above and beyond the opening of the Mendi School of Nursing, which should increase nursing diploma graduates to about 165 per annum, the population to nurse ration will not be maintained. Thus this scenario is suggesting that nurse training capacity increase from 165 in 2012 to 388 by 2020. New graduates would need to increase a further 16 percent over the 2020 to reach 447 per year by 2030.

(iv) The cost of the nurse expansion to the budget would grow from K 73.8 million in 2009 to K100 million in 2020 and to K126 million in 2030.

(v) The total recurrent costs of training based on the 2009 estimate of recurrent unit costs of training (K7,273 in Table 4-7) are presented. In Scenario 3 these costs would increase from about K3 million in 2009 to about K7 million in 2013 to "catch up" with training capacity to the population growth rate. These costs would increase to about K9 million by 2024 and to K10 million by 2030 as student entry to nurse training increases to ensure supply of graduates grows to enable the population-to-nurse ratio to be sustained. Second, the costs of training with a significant improvement in the quality of training (represented by increased unit costs to K12,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The costs of an "enhanced" quality of nursing graduate would increase from about K5 million in 2009 to K12.5 million by 2015 and K14.4 million by 2020. It would reach almost K16 million by 2025 and K17 million by 2030.

The key observations about the projections for CHWs under Scenario 3 are that:

(i) The number of CHWs would increase from 4,398 in 2009 to 5,980 in 2020 and over 7,500 in 2030. This would sustain the population-to-CHW ratio at 1,509 per CHW over this period.

(ii) The number of graduates from the CHW training schools would need to increase from the expected numbers graduating in 2009 of 209 to around 450 immediately and this would need to rise to over 500 in 2015, 584 by 2020 and over 600 by 2030.

(iii) It should be noted that the projected attrition from the CHW workforce is significantly greater—about 50 percent—than the current 2009 output. This suggests that there is a real emerging crisis on the supply side for CHWs. Specifically, (and this applies to all scenarios), it can be expected that there may be a fall in the total CHW workforce unless the attrition rate from the workforce can be reduced (see Scenario 1). This might be achieved by encouraging CHWs to postpone retirement. Thus this scenario is suggesting that CHW training capacity, given expected workforce attrition, needs to grow about 190 percent from current 2009 output of 209 graduates to over 580 by 2020 and over 600 by 2030. It will be a significant

Table 6-13: Scenario 3: Health Extension Officers (HEOs): Maintaining Existing Population-to-Staff Ratios (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
HEOs Required	411	423	435	447	460	473	486	500	514	528	543
Population per CHW	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	29	30	30	31	32	33	34	35	36	37	38
New Graduates Required	46	42	42	44	45	46	47	49	50	52	53
1st Year Student Intake Required (4 years earlier)	49	45	45	47	48	50	51	52	54	55	57
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	10.7	11.0	11.3	11.6	11.9	12.3	12.6	13.0	13.4	13.7	14.1

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
HEOs Required	559	573	587	602	617	632	646	659	673	687	702
Population per HEO	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	39	40	41	42	43	44	45	46	47	48	49
New Graduates Required	55	54	55	57	58	60	58	60	61	62	64
1st Year Student Intake Required (4 years earlier)	59	58	60	61	63	64	63	64	66	67	68
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	14.5	14.9	15.3	15.6	16.0	16.4	18.8	17.1	17.5	17.8	18.3

challenge in the short run just expanding production to replace the existing workforce.

(iv) The cost of the CHW expansion to the budget would grow from K73 million in 2009 to almost K100 million in 2020 and to K125 million in 2030.

(v) The total recurrent costs of training of CHWs—based on the 2009 estimate of recurrent unit costs of training (K6,221 in Table 4-8)–would increase from about K2.7 million in 2009 to K6.5 million in 2015 and almost K7.5 million by 2020 when first year intakes would be 602–up from about 215 in 2009. The cost of training would be around K7 million by 2023 and would expand marginally to K7.8 million by 2030. Second, the costs of training assuming a significant improvement in the quality of training (represented by increased unit costs to K8,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The cost of this quality-enhanced teaching program would increase under this scenario from K3.4 million in 2009 to K8.4 million by 2015, K9.6 million by 2020 and this would be roughly sustained over the subsequent decade.

The key observations on the projections for HEOs under Scenario 3 are that:

(i) The number of HEOs would increase from 411 in 2009 to 559 in 2020 and about 700 in 2030. This would sustain the population-to-HEO ratio at 16,148 per HEO over this period.

(ii) The number of graduates from the DWU training program for HEOs would need to increase from the numbers graduating in 2009 of 46 to around 55 by 2020 and about 64 by 2030.

(iii) It should be noted that the projected attrition from the HEO workforce would account for about 70 percent of the required output of HEOs under this scenario.

(iv) The cost of HEOs to the budget would grow from K10.7 million in 2009 to K14.1 million in 2020 and to K18.7 million in 2030.

Table 6-14 for Scenario 3 shows the total number of service-delivery staff which would be required to achieve the targets set for the scenario. Total service-delivery staff would need to increase from 8,440 in 2009 to almost 10,000 by 2015 to almost 11,500 by 2020, to 13,000 by 2025 and reach 14,400 by 2030. This would enable the population to total service-delivery staff ratio to remain at 786 to one over the projection period to 2030.

The cost of employing all the staff under this scenario is also presented in Table 6-14. In 2009 the total expenditure on direct service-delivery staff was K191.6 million or just over 37 percent of the total health recurrent budget and these costs would rise to nearly K327 million by 2030 in real terms. With the recurrent budget assumed to grow at about 5 percent in real terms over the projection period, the share of total service-delivery staff cost to the budget would fall from 37 percent to about 22 percent of the estimated total health recurrent budget. The primary driver of this decline is that health expenditures are expected to grow faster than the population growth rate.

Using the recurrent unit costs of training of both nurses and CHWs, this program would see training costs (excluding doctors and HEOs for which data is not available) rise from K5.7 million in 2009 to K13.8 million in 2015 and K16.0 million by 2020. It would gradually rise to K17.6 million by 2030. As a share of the expected recurrent health budget the costs of training nurses and CHWs at 2009 unit costs would increase from 1.1 percent of the budget to 1.7 percent by 2015. This would be sustained through 2020 and would then decline as a percent of the expected health budget to 1.2 percent by 2030–largely as a consequence of the expected growth of the recurrent health budget.

If we use a "reasonable quality-enabling" unit cost (see discussion above) the total costs of training would increase from K8.5 million in 2009 to K20.8 million by 2015 and K24 million by 2020. It would then increase to K25.4 million by 2025 and to almost K27 million in 2030. The cost of nurse and HEO training would increase as a share of the health budget from 1.6 percent in 2009 to 2.6 percent by 2015 and this would be sustained through 2020 and it would then fall away to 1.8 percent of the expected recurrent budget by 2030.

6.3.4 Scenario 4: WHO "Threshold" Service Delivery Staff Density Targets by 2030

This fourth scenario is based on the WHO "threshold" density of 2.28 per 1,000 population (or a population-to-staff ratio of 439 to 1) of doctors, nurse (registered

Table 6-14: Scenario 3: Total Service-Delivery Staff: Maintaining Existing Staff to Population Ratios for all Cadres (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Required	379	390	401	412	424	436	448	461	474	487	501
Nurses Required	3,252	3,346	3,440	3,537	3,636	3,739	3,844	3,953	4,065	4,181	4,300
CHWs Required	4,398	4,525	4,652	4,783	4,918	5,057	5,199	5,346	5,498	5,654	5,815
HEOs Existing Stock Only	411	423	435	447	460	473	486	500	514	528	543
Total Service-Delivery Staff	8,440	8,684	8,928	9,179	9,438	9,705	9,977	10,260	10,551	10,850	11,159
Population per Service Staff	786	786	786	786	786	786	786	786	786	786	786
Service Staff per 1,000 Pop.	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Total Staff Cost (Kmn)	191.6	196.8	202.4	208.1	213.9	219.9	226.1	232.6	239.1	245.9	252.9
Total Recurrent Budget	513.0	551.5	601.1	634.2	646.9	672.7	807.3	823.4	852.2	886.3	921.8
S.D Staff as % Recurrent Budget	37.3	35.7	33.7	32.8	33.1	32.7	28.0	28.2	28.1	27.7	27.4
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	5.7	12.1	12.3	12.7	13.0	13.2	13.8	14.2	14.9	15.1	15.5
Quality-Enhanced Costs (Kmn)	8.3	17.9	18.6	18.8	19.3	19.9	20.5	21.1	21.6	22.3	23.0
2009 Costs % Recurrent Budget	1.1	2.2	2.1	2.0	2.0	2.0	1.7	1.7	1.7	1.7	1.7
Quality-Enhanced % Recurrent Budget	1.6	3.3	3.1	3.0	3.0	3.0	2.5	2.6	2.5	2.5	2.5

(*continued on next page*)

Table 6-14: Scenario 3: Total Service-Delivery Staff: Maintaining Existing Staff to Population Ratios for all Cadres (2010–2030) (*continued*)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Required	515	528	541	555	569	583	595	608	621	634	647
Nurses Required	4,422	4,533	4,646	4,762	4,881	5,003	5,108	5,216	5,325	5,437	5,551
CHWs Required	5,980	6,130	6,283	6,440	6,601	6,766	6,908	7,053	7,202	7,353	7,507
HEOs Existing Stock Only	559	573	587	602	617	632	646	659	673	687	702
Total Service-Delivery Staff	11,476	11,764	12,057	12,359	12,668	12,984	13,257	13,536	13,821	14,111	14,407
Population per Service Staff	786	786	786	786	786	786	786	786	786	786	786
Service Staff per 1,000 Pop.	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Total Staff Cost (Kmn)	259.7	266.3	273.0	279.7	286.7	293.9	300.1	306.4	312.8	319.3	326.0
Total Recurrent Budget	958.7	999.9	1,042.9	1,087.7	1,134.5	1,183.3	1,234.1	1,287.2	1,342.6	1,400.3	1,460.5
S.D Staff as % Recurrent Budget	27.1	26.7	26.2	25.8	25.3	24.9	24.3	23.8	23.3	22.8	22.4
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	16.0	14.9	15.4	15.8	16.1	16.5	16.1	16.5	16.8	17.2	17.6
Quality-Enhanced Costs (Kmn)	24.3	23.0	23.6	24.2	24.8	25.4	24.8	25.3	25.9	26.4	26.9
2009 costs % Recurrent Budget	1.7	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2
Quality-Enhanced % Recurrent Budget	2.5	2.3	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.9	1.8

Table 6-15: Scenario 4: Medical Officers (MO): WHO "Threshold" Service Delivery Staff Density Target (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Required	379	405	430	453	475	495	515	533	550	617	878
Population per MO	17,512	16,862	16,327	15,934	15,625	15,415	15,234	15,137	15,085	13,828	9,994
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.10
Attrition From MO Workforce	23	24	26	27	28	30	31	32	33	37	53
New Graduates Required	49	49	49	49	49	49	49	49	49	100	313
1st Year Student Intake Required (6 years earlier)	53	54	54	54	54	54	54	54	54	111	348
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	34.1	36.5	38.7	40.8	42.7	44.6	46.3	48.0	49.5	55.5	79.0

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Required	1,173	1,388	1,659	1,944	2,241	2,553	3,128	3,726	4,347	5,548	6,231
Population per MO	7,692	6,664	5,715	5,000	4,445	4,000	3,332	2,856	2,500	2,000	1,818
MO per 1,000 Population	0.130	0.150	0.175	0.200	0.225	0.250	0.300	0.350	0.400	0.500	0.550
Attrition From MO Workforce	70	83	100	117	134	153	188	224	261	333	374
New Graduates Required	366	298	371	401	432	464	763	821	882	1,534	1,057
1st Year Student Intake Required (6 years earlier)	394	320	399	431	465	499	820	883	949	1,649	1,136
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	105.6	124.9	149.3	174.9	201.7	229.7	281.5	335.3	391.2	499.3	560.8

and enrolled) and midwives. Below this, according to WHO, coverage of essential interventions, including those necessary to reach the health-related MDGs, is not likely. This scenario assumes the same population projections, attrition rates from the workforce, and dropout rates from training programs as described above for Scenario 1 and 2.

The fundamental driver for this scenario is number of service-delivery staff that WHO believes are needed per 1,000 population (see discussion in Chapter 5). In summary, this scenario proposes: (i) that 0.55 per 1,000 population should be doctors; and (ii) 1.73 per 1,000 population should be "other service-delivery staff". Scenario 3 aims to reach these ratios by 2030 and demonstrates the substantial additional staffing and costs this would require.

The key observations about the projections for medical officers under Scenario 4 are:

(i) The number of doctors would increase from 379 in 2009 to 515 in 2015 and to 1,173 in 2020. It would then need to more than double to 2,553 by 2025 and to 6,231 by 2030. This would result in the population-to-doctor ratio improving from 17,512 to one doctor in 2009 to 15,243 to one in 2015, and 7,692 to one doctor by 2020. It would reach 1,818 per doctor—the aspirational target—by 2030.

(ii) The number of graduates required from medical school(s) to achieve these massive increases in doctor numbers would need to expand dramatically. Specifically, graduations would need to increase from the current 49 per year in 2009 to 100 in 2018 (this would entail first year enrollments for medical school rising to 111 immediately) and dramatically ramp up in each subsequent year. By 2025 new graduates required would be over 460 per year and by 2030 this would need to double-a clearly unachievable target. It would not be feasible to build the infrastructure, develop a reasonable quality faculty and/or recruit enough science graduates from the senior secondary system with adequate training in science.

(iii) The costs of employing this number of doctors would increase from K34.1 million in 2009 to K46.3 million in 2015 and to more than K105 million in 2020. It would then dramatically increase to almost K230 million in 2025 and K560 million in 2030. The implications of this are discussed below and are shown in Table 6-19.

The projections for nurses for Scenario 4 are presented in Table 6-16. For the purposes of this scenario it is assumed that the 1.73 per 1,000 population for nurses and CHWs are proportionately equal and that HEOs grow at the same rate as the population (see Chapter 5).

The key observations about this scenario are that:

(i) The number of nurses would increase from 3,252 in 2009 to 3,295 in 2015 and 4,964 in 2020. This would rise to 6,229 in 2025 and almost 8,500 in 2030. This rate of expansion would see the population-to-nurse ratio improve from 2,041 to one nurse in 2009 to 1,818 in 2020, 1,639 in 2025 and 1,333 per nurse in 2030 (or 0.75 nurses per 1,000 population).

(ii) Clearly, the number of graduates from the nursing schools would need to increase dramatically from the expected numbers graduating in 2012 of 165 to around 423 by 2015 and to nearly 700 by 2020 and over 1,200 by 2030. The feasibility of achieving this is in extreme doubt.

(iii) It should be noted, as discussed in the previous scenario, that the projected attrition from the nurse workforce is significantly greater than the current 2009 outputs and is expected to remain well above the expected outputs likely from 2012 to 2014 (with the recent opening of the Mendi School of Nursing, nursing diploma graduates will increase to about 165 per annum from 2012. This scenario suggests that nurse training capacity, given expected workforce attrition, needs to grow about 325 percent from the expected 2012 output of 165 graduates to about 700 by 2020. New graduate numbers would need to increase a further 77 percent over the 2020 rate to reach 1,240 per year by 2030.

(iv) The cost of the nurse expansion to the budget would grow from K73.8 million in 2009 to nearly K75 million in 2015 (because the workforce declines for a few years due to attrition unless older nurses are encouraged not to retire) and to K113 million in 2020 and to K193 million in 2030.

(v) The total recurrent cost of training of nurses—based on the 2009 estimate of recurrent unit costs of training (K7,273) would increase from about K3 million in 2009 to about K9.5 million in 2015 and K15.7 million by 2020. These costs would increase to about K16 million by 2024 and to K28 million by 2030. Second, the cost of training with a significant improvement

Table 6-16: Scenario 4: Nursing Officers (NOs): WHO "Threshold" Service-Delivery Staff Density Targets (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
Nurses Required	3,252	3,192	3,135	3,112	3,091	3,070	3,295	3,631	3,900	4,266	4,563
Population per Nurse	2,041	2,140	2,239	2,319	2,401	2,486	2,381	2,222	2,128	2,000	1,923
Nurse per 1,000 Population	0.49	0.47	0.45	0.43	0.42	0.40	0.42	0.45	0.47	0.50	0.52
Attrition From Nurse Workforce	195	192	188	187	185	184	198	218	234	256	274
New Graduates Required	135	135	135	165	165	165	423	553	503	623	571
1st Year Student Intake Required (3 years earlier)	139	139	139	170	170	170	436	570	518	642	588
Nurse Employment Cost (Kmn) (Unit cost = K22,700)(2009)	73.8	72.5	71.2	70.6	70.2	69.7	74.8	82.4	88.5	96.8	103.6
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.0	3.0	3.0	3.7	3.7	3.7	9.5	12.4	11.3	14.0	12.8
(b) Quality-Enhanced Cost (K12,000)	5.0	5.0	5.0	6.1	6.1	6.1	15.7	20.5	18.7	23.1	21.2

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
Nurses Required	4,964	5,180	5,405	5,637	5,977	6,229	6,568	6,919	7,281	7,767	8,497
Population per Nurse	1,818	1,786	1,754	1,724	1,667	1,639	1,587	1,538	1,493	1,429	1,333
Nurse per 1,000 Population	0.55	0.56	0.57	0.58	0.60	0.61	0.63	0.65	0.67	0.70	0.75
Attrition From Nurse Workforce	298	311	324	338	359	374	394	415	437	466	510
New Graduates Required	699	527	549	571	699	625	733	766	800	952	1,239
1st Year Student Intake Required (3 years earlier)	735	555	577	601	736	658	772	806	842	1,002	1,305
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	112.7	117.6	122.7	128.0	135.7	141.4	149.1	157.1	165.3	176.3	192.9
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	16.0	12.1	12.6	13.1	16.0	14.4	16.8	17.6	18.4	21.9	28.5
(b) Quality-Enhanced Cost (K12,000)	26.5	20.0	20.8	21.6	26.5	23.7	27.8	29.0	30.3	36.1	47.0

in the quality of training (represented by increased unit costs to K12,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The cost of an "enhanced" quality of nursing graduate would increase from about K5 million in 2009 to K15.7 million by 2015, almost K26 million by 2020 and would reach K47 million by 2030.

The key observations for the CHW projections in Scenario 4 are that:

(i) The number of CHWs would increase from 4,398 in 2009 to 6,137 in 2020 and over 10,300 in 2030. Expansion of CHWs to this schedule would see the population per CHW improve from 1,509 in 2009 to 1,471 in 2020 (the slow improvement due to attrition being higher than current CHW training outputs) and to a population of 1,235 per CHW in 2025 and to 1,099 in 2030.

(ii) The number of graduates from the CHW training schools would need to increase from the expected numbers graduating in 2009 of 209 to around 714 by 2015 (intakes to CHW training schools would need to expand to about 190 by 2013) and this would need to rise to over 774 by 2018, and to about 900 by 2025 and almost 950 by 2030.

(iii) It should be noted that projected attrition from the CHW workforce is significantly greater—about 50 percent—than the current 2009 output. This suggests a real emerging crisis on the supply side for CHWs. Specifically, (and this applies to all scenarios), a fall may be expected in the total CHW workforce unless the attrition rate from the workforce can be reduced. This might be achieved by encouraging CHWs to postpone retirement. Thus, Scenario 4 suggests that CHW training capacity, given expected workforce attrition, needs to grow about 350 percent from current 2009 output of 209 graduates to almost 950 by 2030. It will be a significant challenge in the short term just expanding production to replace the existing workforce.

(iv) The cost of the CHW expansion to the budget would grow from K73 million in 2009 to about K102 million in 2020 and to K171 million in 2030.

(v) The total recurrent costs of training of CHWs based on the 2009 estimate of recurrent unit costs of training (K6,221) would increase from about K2.7 million in 2009 to K9.2 million in 2015, K11.1 million by 2020, and K12.1 million by 2030. Second, the cost of training assuming a significant improvement in the quality of training (represented by increased unit costs to K8,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The cost of this "quality" enhanced teaching program would increase under this scenario from K3.4 million in 2009 to almost K12 million by 2015 and to over K14 million by 2020. This would increase further to about K15 million by 2025 and this would be roughly sustained over the five years to 2030.

The key observations about the projections for HEOs under Scenario 4 are that:

(i) The number of HEOs would increase from 411 in 2009 to 559 in 2020 and about 700 in 2030. This would sustain the population-to-HEO ratio at 16,148 per HEO over this period. This is the same as Scenario 3 for HEOs.

(ii) The number of graduates from the DWU training program for HEOs would need to increase from the numbers graduating in 2009 of 46 to around 55 by 2020 and about 64 by 2030.

(iii) It should be noted that the projected attrition from the HEO workforce would account for about 70 percent of the required output of HEOs under this scenario.

(iv) The cost of HEOs to the budget would grow from K10.7 million in 2009 to K14.9 million in 2020 and to K18.7 million in 2030.

To achieve the targets set for Scenario 4, total service-delivery staff would need to increase from 8,440 in 2009 to 8,611 by 2015 to 12,833 by 2020, to 17,685 by 2025 and reach about 25,739 by 2030. This would enable the population to total service-delivery staff ratio to improve from 786 to one in 2009 to 703 to one in 2020 and to 440 to one in 2030.

The cost of employing all the staff under this scenario is K191.6 million or just over 37 percent of the total health recurrent budget and these costs would rise to about K942 million by 2030 in real terms (where it would represent about 65 percent of the expected health recurrent budget). Even assuming much higher health recurrent budget growth, this scenario would seem to

Table 6-17: Scenario 4: Community Health Workers (CHWs): WHO "Threshold" Service-Delivery Staff Density Targets (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
CHWs Required	4,398	4,299	4,200	4,101	4,003	3,904	4,315	4,680	4,978	5,375	5,704
Population per CHW	1,509	1,589	1,672	1,760	1,854	1,955	1,818	1,724	1,667	1,587	1,538
CHWs per 1,000 Population	0.66	0.63	0.60	0.57	0.54	0.51	0.55	0.58	0.60	0.63	0.65
Attrition From CHW Workforce	308	301	294	287	280	273	302	328	348	376	399
New Graduates Required	209	202	195	188	181	174	714	692	647	774	728
1st Year Student Intake Required (2 years earlier)	215	208	201	194	187	180	736	713	667	797	750
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	73.0	71.4	69.7	68.1	66.4	64.8	71.6	77.7	82.6	89.2	94.7
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	2.6	2.5	2.4	2.3	2.2	9.2	8.9	8.3	9.9	9.3
(b) Quality-Enhanced Costs (K8,000)	3.4	3.3	3.2	3.1	3.0	2.9	11.8	11.4	10.7	12.8	12.0

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
CHWs Required	6,137	6,475	6,922	7,386	7,870	8,271	8,757	9,261	9,672	9,986	10,310
Population per CHW	1,471	1,429	1,370	1,316	1,266	1,235	1,190	1,149	1,124	1,111	1,099
CHWs per 1,000 Population	0.68	0.70	0.73	0.76	0.79	0.81	0.84	0.87	0.89	0.90	0.91
Attrition From CHW Workforce	430	389	415	443	472	496	525	556	580	599	619
New Graduates Required	863	727	862	908	956	897	1,012	1,059	992	913	942
1st Year Student Intake Required (2 years earlier)	889	749	888	936	985	925	1,043	1,092	1,023	942	971
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	101.9	107.5	114.9	122.6	130.6	137.3	145.4	153.7	160.6	165.8	171.1
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	11.1	9.3	11.1	11.6	12.3	11.5	13.0	13.6	12.7	11.7	12.1
(b) Quality-Enhanced Costs (K8,000)	14.2	12.0	14.2	15.0	15.8	14.8	16.7	17.5	16.4	15.1	15.5

Table 6-18: Scenario 4: Health Extension Officers (HEOs): WHO "Threshold" Service-Delivery Staff Density Targets (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
HEOs Required	411	423	435	447	460	473	486	500	514	528	543
Population per HEO	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	29	30	30	31	32	33	34	35	36	37	38
New Graduates Required	46	42	42	44	45	46	47	49	50	52	53
1st Year Student Intake Required (4 years earlier)	49	45	45	47	48	50	51	52	54	55	57
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	10.7	11.0	11.3	11.6	12.0	12.3	12.6	13.0	13.4	13.7	14.1

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
HEOs Required	559	573	587	602	617	632	646	659	673	687	702
Population per HEO	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148	16,148
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	39	40	41	42	43	44	45	46	47	48	49
New Graduates Required	55	54	55	57	58	60	58	60	61	62	64
1st Year Student Intake Required (4 years earlier)	59	58	60	61	63	64	63	64	66	67	68
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	14.5	14.9	15.3	15.7	16.0	16.4	16.8	17.1	17.5	17.9	18.3

be totally infeasible. This would remain the same even if we also assume a fairly rapid growth of the private sector—which in 2009 may have accounted for 15 percent of doctors and nurses and a much smaller share of CHWs.

Using the recurrent unit costs of training of both nurses and CHWs, this program would see training costs (excluding doctors and HEOs for which data is not available) rise from K5.7 million in 2009 to almost K19 million in 2015 and K27 million by 2020. It would remain at about this level through 2025 and would then rise to about K40 million by 2030. As a share of the expected recurrent health budget, the costs of training nurses and CHWs at 2009 unit costs would increase from 1.1 percent of the budget to 2.3 percent by 2015 and 2.8 percent by 2020 and this would be sustained through 2030.

If we use a "reasonable quality-enabling" unit cost (see discussion above) the total costs of training would increase from K8.5 million in 2009 to almost K28 million by 2015 and K40.2 million by 2020. It would then increase to K45.9 million by 2025 and to K70.3 million in 2030. The cost of nurse and HEO training would increase as a share of the expected health budget from 1.6 percent in 2009 to 3.4 percent by 2015 and 4.2 percent by 2020 and this would be roughly sustained through 2030.

6.3.5 Scenario 5: A Recommended Preservice Training Scenario to Meet Key Health Human Resource Needs

The fifth scenario—which is the broadly recommended scenario—is one which envisages: (i) a gradual reduction in the population-to-doctor ratio (from 17,512 to 1 doctor in 2009 to 7,380 to 1 doctor in 2030); (ii) a reduction in the population-to-nurse ratio (from 2,041 to 1 nurse in 2009 to 1,414 to 1 nurse in 2030), (iii) a reduction in the current population-to-CHW ratio (1,509 to 1 CHW in 2009) to 1,372 to 1 in 2030; and (iv) no expansion in the number of HEOS produced annually which would result in the HEO-to-population ratio falling from 16,148 to 1 HEO in 2009 to 18,756 to 1 in 2020..

This preservice strategy is affordable, responds to the demand requirements for staff from the health system and leaves space for recurrent health resources to be allocated to a significant expansion of training—both preservice and in-service. It also leaves space for increased allocations of both support staff and quality-enhancing nonsalary budgets so necessary for improved health outcomes. The scenario sees staff growth constrained by: (i) the likely level of resources available for health and service-delivery staff; and (ii) the feasibility and speed with which preservice training can be ramped up to meet the demands of attrition from the workforce and the needs of a growing population. This scenario assumes the same population projections, attrition rates from the workforce, and dropout rates from training programs as for the other scenarios.

The key observations about the projections for medical officers for Scenario 5 are:

(i) The number of doctors would increase from 379 in 2009 to 515 in 2015 and to nearly 700 in 2020. It would then increase by about 370 to 1,069 by 2025 and by another 466 to 1,535 by 2030. This would result in the population-to-doctor ratio improving from 17,512 to one doctor in 2009 to 15,243 to one in 2015, to 13,004 to one doctor by 2020. It would then improve more dramatically to be 9,556 to one in 2015 and 7,380 to one in 2030.

(ii) The number of graduates required from medical school(s) to achieve this increase in doctor numbers would need to rise from the current 49 per year in 2009 to 100 in 2019 (this would entail first year enrollments for medical school rising to 111 in 2013) and increasing graduates to 150 by 2023 and reaching 200 through the last years of the projection period. This build up of medical training would be feasible, at a stretch, although the efforts and costs to build the infrastructure, develop a reasonable quality faculty and/or recruit enough science graduates from the senior secondary system should not be underestimated. This strategy to increase doctor numbers should be focused on getting doctors into rural areas—a matter discussed in Chapter 7. It would need to be phased in—depending on the future performance of the economy.

(iii) The cost of employing this number of doctors would increase from K34.1 million in 2009 to K46.3 million in 2015 and to more than K62 million in 2020. It would then increase to about K96 million in 2025 and K138 million in 2030. This assumes doctors in rural areas would receive allowances equivalent to the average that doctors working in hospitals currently

Table 6-19: Scenario 4: Total Service-Delivery Staff: WHO "Threshold" Service-Delivery Staff Density Targets (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Required	379	405	430	453	475	495	515	533	550	617	878
Nurse Plan by PNGDSP	3,252	3,192	3,135	3,112	3,091	3,070	3,295	3,631	3,900	4,266	4,563
CHW Plan by PNGDSP	4,398	4,299	4,200	4,101	4,003	3,904	4,315	4,680	4,978	5,375	5,704
HEO Existing Stock Only	411	423	435	447	460	473	486	500	514	528	543
Total Service-Delivery Staff	8,440	8,319	8,200	8,113	8,029	7,942	8,611	9,344	9,942	10,786	11,688
Population per Service Staff	786	821	856	890	924	961	911	864	835	791	751
Service Staff per 1,000 Pop.	1.27	1.22	1.17	1.12	1.08	1.04	1.10	1.16	1.20	1.26	1.33
Total Staff Cost (Kmn)	191.6	191.0	190.6	190.8	191.0	191.1	205.3	220.7	233.6	254.9	290.9
Total Recurrent Budget	513.0	551.5	601.1	634.2	646.9	672.7	807.3	823.4	852.2	886.3	921.8
S.D Staff as % Recurrent Budget	37.3	34.6	31.7	30.1	29.5	28.4	25.4	26.8	27.4	28.8	31.6
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	5.7	5.6	5.5	6.1	6.0	5.9	18.7	21.3	19.6	23.9	22.2
Quality-Enhanced Costs (Kmn)	8.4	8.3	8.2	9.2	9.1	9.0	27.5	31.9	29.4	35.9	33.2
2009 Costs % Recurrent Budget	1.1	1.0	0.9	1.0	0.9	0.9	2.3	2.6	2.3	2.7	2.4
Quality-Enhanced % Recurrent Budget	1.6	1.5	1.4	1.5	1.4	1.3	3.4	3.9	3.4	4.0	3.6

(*continued on next page*)

Table 6-19: Scenario 4: Total Service-Delivery Staff: WHO "Threshold" Service-Delivery Staff Density Targets (2010–2030) (*continued*)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs WHO "Threshold"	1,173	1,388	1,659	1,944	2,241	2,553	3,128	3,726	4,347	5,548	6,231
Nurses Plan WHO Threshold	4,964	5,180	5,405	5,637	5,977	6,229	6,568	6,919	7,281	7,767	8,497
CHWs Plan WHO Threshold	6,137	6,475	6,922	7,386	7,870	8,271	8,757	9,261	9,672	9,986	10,310
HEOs Existing Stock Only	559	573	587	602	617	632	646	659	673	687	702
Total Service-Delivery Staff	12,833	13,616	14,573	15,569	16,705	17,685	19,099	20,565	21,973	23,988	25,740
Population per Service Staff	703	679	651	624	596	577	546	518	495	463	440
Service Staff per 1,000 Pop.	1.42	1.47	1.54	1.60	1.68	1.73	1.83	1.93	2.02	2.16	2.27
Total Staff Cost (Kmn)	334.7	364.3	401.7	440.6	483.5	524.8	592.1	662.5	733.9	858.5	943.1
Total Recurrent Budget	958.7	999.9	1,042.9	1,087.7	1,134.5	1,183.3	1,234.1	1,287.2	1,342.6	1,400.3	1,460.5
S.D Staff as % Recurrent Budget	34.9	36.4	38.5	40.5	42.6	44.3	48.0	51.5	54.7	61.3	64.5
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	27.1	21.4	23.7	24.7	28.3	25.9	29.8	31.2	31.1	33.6	40.6
Quality-Enhanced Costs (Kmn)	40.7	32.0	35.0	36.6	42.3	38.5	44.5	46.5	46.7	51.2	62.5
2009 Costs % Recurrent Budget	2.8	2.1	2.3	2.3	2.5	2.2	2.4	2.4	2.3	2.4	2.8
Quality-Enhanced % Recurrent Budget	4.2	3.2	3.5	3.4	3.7	3.3	3.6	3.6	3.5	3.7	4.3

Table 6-20: Scenario 5: Medical Officers (MOs): A Suggested Preservice Training Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Employed	379	405	430	453	475	495	515	533	550	566	632
Population per MO	17,512	16,862	16,327	15,934	15,624	15,415	15,234	15,137	15,085	15,075	13,884
MO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07
Attrition From MO Workforce	23	24	26	27	28	30	31	32	33	34	38
New Graduates Required	49	49	49	49	49	49	49	49	49	49	100
1st Year Student Intake Required (6 years earlier)	54	54	54	54	54	54	54	54	54	54	111
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	34.1	36.5	38.7	40.8	42.7	44.6	46.3	48.0	49.5	50.9	56.9

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Employed	694	752	807	901	988	1,069	1,144	1,214	1,329	1,436	1,535
Population per MO	13,004	12,301	11,749	10,786	10,082	9,551	9,113	8,767	8,177	7,727	7,380
MO per 1,000 Population	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.14
Attrition From MO Workforce	42	45	57	63	69	75	80	85	93	100	107
New Graduates Required	100	100	100	150	150	150	150	150	200	200	200
1st Year Student Intake Required (6 years earlier)	111	111	111	167	167	167	167	167	222	222	222
MO Employment Cost (Kmn) (Unit cost = K90,000) (2009)	62.5	67.7	72.7	81.1	88.9	96.2	102.9	109.2	119.6	129.2	138.2

Table 6-21: Scenario 5: Nursing Officers (NOs): A Suggested Preservice Training Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
Nurses Employed	3,252	3,192	3,135	3,112	3,091	3,070	3,136	3,298	3,450	3,743	4,018
Population per Nurse	2,041	2,140	2,239	2,319	2,401	2,486	2,502	2,447	2,405	2,280	2,184
Nurse per 1,000 Population	0.49	0.47	0.45	0.43	0.42	0.40	0.40	0.41	0.42	0.44	0.46
Attrition From Nurse Workforce	195	192	188	187	185	184	188	198	207	225	241
New Graduates Required	135	135	135	165	165	165	250	350	350	500	500
1st Year Student Intake Required (3 years earlier)	139	139	139	170	170	170	258	361	361	515	515
Nurse Employment Cost (Kmn) (Unit cost = K22,700)(2009)	73.8	72.5	71.2	70.6	70.2	69.7	71.2	74.9	78.3	85.0	91.2
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	3.0	3.0	3.0	3.7	3.7	3.7	5.6	7.9	7.9	11.2	11.2
(b) Quality-Enhanced Cost (K12,000)	5.0	5.0	5.0	6.1	6.1	6.1	9.3	13.0	13.0	18.6	18.6

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
Nurses Employed	4,277	4,621	4,943	5,347	5,726	6,082	6,517	6,926	7,311	7,672	8,012
Population per Nurse	2,110	2,002	1,918	1,818	1,740	1,679	1,600	1,537	1,487	1,446	1,414
Nurse per 1,000 Population	0.47	0.50	0.52	0.55	0.57	0.60	0.63	0.65	0.67	0.69	0.71
Attrition From Nurse Workforce	257	277	297	321	344	365	391	416	439	460	481
New Graduates Required	500	600	600	700	700	700	800	800	800	800	800
1st Year Student Intake Required (3 years earlier)	526	632	632	737	737	737	842	842	842	842	842
Nurse Employment Cost (Kmn) (Unit cost = K22,700) (2009)	97.1	104.9	112.2	121.4	130.0	138.1	147.9	157.2	166.0	174.2	181.9
Recurrent Unit Cost of Training (Kmn) (3 year course)											
(a) 2009 Costs (K7,273)	11.5	13.8	13.8	16.1	16.1	16.1	18.4	18.4	18.4	18.4	18.4
(b) Quality-Enhanced Cost (K12,000)	18.9	22.7	22.7	26.5	26.5	26.5	30.3	30.3	30.3	30.3	30.3

receive. The implications of this are discussed below and are shown in Table 6-24.

The key observations about the projections for nurses under Scenario 5 are that:

(i) The number of nurses would increase from 3,252 in 2009 to 3,136 in 2015 and 4,277 in 2020. This would rise to 6,082 in 2025 and just over 8,000 in 2030. This rate of expansion would see the population-to-nurse ratio decline from 2,041 to a nurse in 2009 to around 1,414 per nurse over the period of the scenario to 2030.

(ii) The number of graduates from the nursing schools under this scenario would still need to increase significantly to achieve the nurse numbers proposed. Specifically, the numbers expected to graduate in 2012 (165) would need to increase to 250 by 2015, to 500 by 2020 and to 800 by 2026. The feasibility of achieving this is possible but would be a challenge—at least in the early years. It implies entry to nurse training schools to be 170 in 2012–an increase of 20 percent over current (2011) entry numbers. In the next health plan period the intake would need to increase to about 258 by 2015 and 361 by 2016.

(iii) It should be noted, as discussed in previous scenarios, that the projected attrition from the nurse workforce over most of the current NHP plan period will be greater than current nurse school outputs whithout a decision to expand outputs—hence it can be expected that the total number of nurses employed will fall over this period unless nurses approaching retirement can be encouraged not to retire (also see discussion in Scenario 1 above).

(iv) The cost of nurse employment to the budget in real terms would decline from K73.8 million in 2009 to about K71 million in 2015 (because the workforce declines for a few years due to attrition unless older nurses are encouraged not to retire). This will increase to K97 million in 2020 to K138 million in 2025 and further to K182 million in 2030.

(v) The total recurrent cost of training of nurses based on the 2009 estimate of recurrent unit costs of training (K7,273) would increase from about K3 million in 2009 to about K5.6 million in 2015 and K11.2 million by 2018. These costs would increase to about K16 million by 2024 and to K18 million by 2030. The cost of training with a significant improvement in the quality of training (represented by increased unit costs to K12,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance) is presented. The cost of this "enhanced" quality of nursing graduate would increase from about K5 million in 2009 to K9.3 million by 2015 and almost K19 million by 2018. It would reach nearly K27 million by 2023 and K30 million by 2026 which would be sustained through 2030.

The key observations about the projections for CHWs for Scenario 5 are that:

(i) The number of CHWs would decrease from 4,398 in 2009 to 4,111 in 2015 (as a result of expected attrition from the workforce given CHW training school outputs) and would, thereafter, increase to 5,133 in 2020 even with the significant training expansion proposed (see below). Expansion of CHWs to this schedule would see the population-per-CHW improve from 1,509 to one CHW in 2009 to 1,909 in 2015, 1,758 in 2020 and reach 1,372 to each CHW by 2030.

(ii) The number of graduates from the CHW training schools would need to increase from the expected numbers graduating in 2009 of 209 to around 300 by 2014 (intakes to CHW training schools would need to expand to about 310 by 2013 given assumed drop-out rates)–an increase in graduations in 2015 over current output capacity by 44 percent. The number of graduates would need to expand to 500 by 2016 and to 600 by 2020. In the subsequent decade graduate numbers would need to further increase to 700 by 2023 and 800 by 2026.

(iii) It should be noted that the projected attrition from the CHW workforce is significantly greater—almost 50 percent—than the current 2009 output. This suggests, as discussed, a real emerging crisis on the supply side for CHWs. Specifically, (and this applies to all scenarios), it can be expected that there may be a fall in the total CHW workforce unless the attrition rate from the workforce can be reduced (see discussion under scenario 1). This might be achieved by encouraging CHWs to postpone retirement. Scenario 5, therefore, suggests that CHW training capacity, given expected workforce attrition, needs to grow about 200 percent from current 2009 output of 209 graduates to about 600 in 2020. It will be a signifi-

Table 6-22: Scenario 5: Community Health Workers (CHWs): A Suggested Preservice Training Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
CHWs Employed	4,398	4,299	4,207	4,122	4,083	4,097	4,111	4,323	4,520	4,704	4,875
Population per CHW	1,509	1,589	1,669	1,751	1,818	1,862	1,909	1,866	1,836	1,814	1,800
CHWs per 1,000 Population	0.66	0.63	0.60	0.57	0.55	0.54	0.52	0.54	0.54	0.55	0.56
Attrition From CHW Workforce	308	301	295	289	286	287	288	303	316	329	341
New Graduates Required	209	209	209	209	250	300	300	500	500	500	500
1st Year Student Intake Required (2 years earlier)	215	215	215	215	258	309	309	515	515	515	515
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	73.0	71.4	69.8	68.4	67.8	68.0	68.2	71.8	75.0	78.1	80.9
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	2.7	2.7	2.7	2.7	3.2	3.8	3.8	6.4	6.4	6.4	6.4
(b) Quality-Enhanced Costs (K8,000)	3.4	3.4	3.4	3.4	4.1	4.9	4.9	8.2	8.2	8.2	8.2

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
CHW s Employed	5,133	5,374	5,652	6,012	6,352	6,671	7,070	7,446	7,799	7,931	8,256
Population per CHW	1,758	1,721	1,678	1,616	1,568	1,531	1,475	1,430	1,393	1,399	1,372
CHWs per 1,000 Population	0.57	0.58	0.60	0.62	0.64	0.65	0.68	0.70	0.72	0.71	0.73
Attrition From CHW Workforce	359	322	339	361	381	400	424	447	468	476	495
New Graduates Required	600	600	600	700	700	700	800	800	800	800	800
1st Year Student Intake Required (2 years earlier)	619	619	619	722	722	722	825	825	825	825	825
CHW Employment Cost (Kmn) (Unit cost = K16,600) (2009)	85.2	89.2	93.8	99.8	105.4	110.7	117.4	123.6	129.5	131.7	137.0
Recurrent Unit Cost of Training (Kmn)											
(a) 2009 Costs (K6,221)	7.7	7.7	7.7	9.0	9.0	9.0	10.3	10.3	10.3	10.3	10.3
(b) Quality-Enhanced Costs (K8,000)	9.9	9.9	9.9	11.5	11.5	11.5	13.2	13.2	13.2	13.2	13.2

cant challenge in the short term just expanding production to replace the existing workforce.

(iv) The total cost of the CHW workforce to the budget would decline from K73 million in 2009 due to a smaller workforce to about K68 million in 2015, before increasing to K85 million in 2020–only with decisive action on the supply side. With the workforce subsequently expanding, the remuneration cost of CHWs would increase to K111 million in 2025 and K137 million in 2030.

(v) The total recurrent cost of training of CHWs, based on the 2009 estimate of the recurrent unit cost of training (K6,221) would increase from about K2.7 million in 2009 to K3.8 million by 2014 and about K7.7 million by 2020. The cost of training would increase to around K9 million by 2023 before plateauing at about K10 million from 2026. Assuming a significant improvement in the quality of training (represented by increased unit costs to K8,000 to allow for improved teaching inputs, library, internet connection, boarding costs and maintenance), the cost of this "quality" enhanced teaching program would increase under this scenario from K3.4 million in 2009 to almost K5 million by 2014 and to about K10 million by 2020. This would increase further to about K11.5 million by 2023 and to K13.2 by 2026 and this would be roughly sustained through 2030.

The key observations for the HEO projections for Scenario 5 are that:

(i) The number of HEOs would increase from 411 in 2009 to 546 in 2020 and about 600 in 2030. This would see the population-to-HEO ratio decline from the current 16,148 per HEO to 18,756 to one over this period.

(ii) The number of graduates from the DWU training program for HEOs would need to remain at current capacity of about 50 per year.

(iii) It should be noted that the projected attrition from the HEO workforce would account for over 90 percent of the required output of HEOs under this scenario.

(iv) The cost of HEOs to the budget would grow from K10.7 million in 2009 to K14.2 million in 2020 and to K15.7 million in 2030.

Under Scenario 5 total service-delivery staff numbers would fall from 8,440 in 2009 to 8,260 by 2015 but increase to 10,650 by 2020. Total staff numbers would subsequently increase to about 14,400 by 2025 and to 18,400 by 2030. This means that the population to total service-delivery staff ratio would decline from 786 to one staff in 2009 to 950 to one in 2015. It would improve as supply capacity is ramped up to be around 847 to one in 2020, 709 to one by 2025 and 616 to one by 2030.

The cost of employing all the staff under this scenario was about K191 million in 2009 or just over 37 percent of the total health recurrent budget and these costs would increase to about K259 million by 2020 in real terms (where it would represent 27 percent of the expected health recurrent budget). In the subsequent decade the cost of staff would increase to K360 million in 2025 (30 percent of the recurrent budget) and to K472 million in 2030 or about 32 percent of the expected health recurrent budget.

Using the recurrent unit costs of training of both nurses and CHWs, this program would see training costs (excluding doctors and HEOs for which data is not available) rise from K5.7 million in 2009 to K9.4 million in 2015 and almost K19 million by 2020. It would increase to K25 million by 2023 and to more than K28 million from 2026. As a share of the expected recurrent health budget, the cost of training nurses and CHWs at 2009 unit costs would rise from 1.1 percent of the budget to 1.7 percent by 2016 and 2 percent by 2018 which would be roughly sustained through the projection period to 2030.

If we use a "reasonable quality-enabling" unit cost (see discussion above) the total cost of training would increase from K8.4 million in 2009 to K14.2 million by 2015 and K21.2 million by 2016. It would then increase to almost K27 million by 2018 and to K33 million in 2021. It would reach about K38 million by 2023 and K44 million from 2026. The cost of nurse and CHW training would increase as a share of the expected health budget from 1.6 percent in 2009 to 1.8 percent by 2015 and 3 percent by 2020 and this would be roughly sustained through 2030.

The fundamental driver of this scenario in the first decade of the scenario is an assessment of how fast training capacity can be ramped up—not the desirable rate of training expansion. The historic neglect of managing the supply and demand for health staff over the last decade means there is an emerging crisis in the supply of health personnel. In the subsequent decade the health sector

has a greater degree of freedom to maneuver. Nevertheless, underlying this scenario is a suggestion to alter the structure of the health service-delivery workforce somewhat—particularly in the second decade of the scenario. Specifically, provision is made for a reasonable expansion of the number of doctors (to be targeted for rural facilities) and an expansion of general nursing graduates relative to CHWs.

Underlying this scenario is a firm suggestion that there needs to be a very significant expansion of recurrent (and capital) resources to support: (i) the expansion of pretraining; (ii) a very significant and decisive expansion of in-service training (for all rural staff every five years and some training for hospital staff) with the initial focus being on MCH and, in particular, training of nurses and CHWs in birth complications; (iii) additional staff for support services which follow from the decision to increase the number of doctors; and (iv) more quality-enhancing nonsalary budget expenditures. To this end we recommend this scenario as the starting point for moving forward. This exercise needs to be repeated with vastly improved data on the workforce and training capacity and as the expected economic boom emerges. At present it is not clear how fast revenues will become available to government to expand recurrent expenditures. Future repeats of this exercise can adjust for improved knowledge about the assumptions made in this report. This is further discussed in Chapter 7.

Table 6-23: Scenario 5: Health Extension Officers (HEOs): A Suggested Preservice Training Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
HEOs Employed	411	428	444	459	473	486	498	509	519	529	538
Population per HEO	16,148	15,956	15,812	15,726	15,690	15,701	15,755	15,850	15,986	16,129	16,310
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Attrition From HEO Workforce	29	30	31	32	33	34	35	36	36	37	38
New Graduates Required	46	46	46	46	46	46	46	46	46	46	46
1st Year Student Intake Required (4 years earlier)	49	49	49	49	49	49	49	49	49	49	49
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	10.7	11.1	11.6	11.9	12.3	12.6	12.9	13.2	13.5	13.8	14.0

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
HEOs Employed	546	554	561	568	574	580	585	590	595	599	604
Population per HEO	16,529	16,697	16,901	17,110	17,355	17,603	17,821	18,041	18,265	18,524	18,756
HEO per 1,000 Population	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Attrition From HEO Workforce	38	39	39	40	40	41	41	41	42	42	42
New Graduates Required	46	46	46	46	46	46	46	46	46	46	46
1st Year Student Intake Required (4 years earlier)	49	49	49	49	49	49	49	49	49	49	49
Cost of HEO Employment (Kmn) (Unit cost = K26,000) (2009)	14.2	14.4	14.6	14.8	14.9	15.1	15.6	15.2	15.5	15.6	15.7

Table 6-24: Scenario 5: Total Service-Delivery Staff: A Suggested Preservice Training Scenario (2010–2030)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Population	6,637,000	6,829,266	7,020,903	7,218,240	7,421,458	7,630,741	7,846,000	8,068,278	8,296,935	8,532,464	8,775,085
MOs Employed	379	405	430	453	475	495	515	533	550	566	632
Nurses Plan Employed	3,252	3,192	3,135	3,112	3,091	3,070	3,136	3,298	3,450	3,743	4,018
CHWs Employed	4,398	4,299	4,207	4,122	4,083	4,097	4,111	4,323	4,520	4,704	4,875
HEOs Employed	411	428	444	459	473	486	498	509	519	529	538
Total Service-Delivery Staff	8,440	8,324	8,216	8,146	8,122	8,148	8,260	8,663	9,039	9,542	10,063
Population per Service Staff	786	820	854	886	914	936	950	931	918	894	872
Service Staff per 1,000 Pop.	1.27	1.22	1.17	1.13	1.09	1.07	1.05	1.07	1.09	1.12	1.15
Total Staff Cost (Kmn)	191.6	191.1	190.9	191.5	192.7	194.6	198.6	207.5	216.0	227.4	242.6
Total Recurrent Budget	513.0	551.5	601.1	634.2	646.9	672.7	807.3	823.4	852.2	886.3	921.8
S.D Staff as % Recurrent Budget	37.3	34.7	31.8	30.2	29.8	28.9	24.6	25.2	25.3	25.7	26.3
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	5.7	5.7	5.7	6.4	6.9	7.5	9.4	14.3	14.3	17.6	17.6
Quality-Enhanced Costs (Kmn)	8.4	8.4	8.4	9.5	10.2	11.0	14.2	21.2	21.2	26.8	26.8
2009 Costs % Recurrent Budget	1.1	1.0	1.0	1.0	1.1	1.1	1.2	1.7	1.7	2.0	1.9
Quality-Enhanced % Recurrent Budget	1.6	1.5	1.4	1.5	1.6	1.6	1.8	2.6	2.5	3.0	2.9

(*continued on next page*)

Table 6-24: Scenario 5: Total Service-Delivery Staff: A Suggested Preservice Training Scenario (2010–2030) (*continued*)

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Population	9,025,023	9,250,649	9,481,915	9,718,963	9,961,937	10,210,985	10,425,416	10,644,350	10,867,881	11,096,106	11,329,125
MOs Employed	694	752	807	901	988	1,069	1,144	1,214	1,329	1,436	1,535
Nurses Plan Employed	4,277	4,621	4,943	5,347	5,726	6,082	6,517	6,926	7,311	7,672	8,012
CHWs Employed	5,133	5,374	5,652	6,012	6,352	6,671	7,070	7,446	7,799	7,931	8,256
HEOs Employed	546	554	561	568	574	580	585	590	595	599	604
Total Service-Delivery Staff	10,650	11,301	11,963	12,828	13,640	14,402	15,316	16,176	17,034	17,638	18,407
Population per Service Staff	847	819	793	758	730	709	681	658	638	629	616
Service Staff per 1,000 Pop.	1.18	1.22	1.26	1.32	1.37	1.41	1.47	1.52	1.57	1.59	1.62
Total Staff Cost (Kmn)	259.0	275.8	292.8	316.5	338.7	360.1	382.8	404.7	429.8	449.9	472.8
Total Recurrent Budget	958.7	999.9	1,042.9	1,087.7	1,134.5	1,183.3	1,234.1	1,287.2	1,342.6	1,400.3	1,460.5
S.D Staff as % Recurrent Budget	27.0	27.6	28.1	29.1	29.9	30.4	31.0	31.4	32.0	32.1	32.3
Nurse & CHW Training Costs (Kmn) (Recurrent Costs)											
Using 2009 Unit Costs (Kmn)	19.2	21.5	21.5	25.1	25.1	25.1	28.7	28.7	28.7	28.7	28.7
Quality-Enhanced Costs (Kmn)	28.8	32.6	32.6	38.0	38.0	38.0	43.5	43.5	43.5	43.5	43.5
2009 Costs % Recurrent Budget	2.0	2.1	2.1	2.3	2.2	2.1	2.3	2.2	2.1	2.0	2.0
Quality-Enhanced % Recurrent Budget	3.0	3.3	3.1	3.5	3.4	3.2	3.5	3.4	3.2	3.1	3.0

CHAPTER 7

MEETING HUMAN RESOURCE NEEDS: OPTIONS AND RECOMMENDATIONS TO ENHANCE HEALTH HUMAN RESOURCE SUPPLY RESPONSES TO MEET NEEDS

7.1. Introduction

This chapter presents the core recommendations of the report:

(i) **future priorities for data system development** for health human resources planning and management;

(ii) **institutionalization of the documentation of the existing supply capacity for health human resources;**

(iii) **curriculum issues for core health service-delivery staff** (including for emergency obstetric care);

(iv) **the core training system expansion recommendations** arising from Scenario 5 for the future development of health service-delivery staffing and the implications of the health human resource crisis which will arise from taking no action on increasing preservice training capacity;

(v) **the establishment of a "Whole-of-Government" Task Force to manage implementation of the key agreed recommendations from the report;** and

(vi) **an extensive consultation process** on the key results of the report in order to establish a national consensus on the way forward.

7.2. Critical Need for Improved Data on Health Human Resources

7.2.1 The Stock of Health Human Resources: Public and Private

The data presented in Chapter 2 on the total existing stock of human resources working for the publicly financed component of the health system has been derived from a special survey of the health workforce undertaken by the Human Resources Division of the NDoH for the NHP. This head count survey collected data on: (i) the broad occupations employed in the health system (based on a list of occupations agreed for the definition of minimum standards); (ii) their sex; and (iii) their location by province and district for health staff working in all health facilities—government and mission run—except for staff working for open aid posts and for the NDoH in Port Moresby. This survey also has a number of potential flaws for which it is hard to crosscheck for accuracy—nevertheless, it is the best available.

This special survey was undertaken for the NHP because the five existing systems which gather informa-

tion on health human resources are in a state of utter confusion and/or lack any reliability or credibility in their current form because they have been allowed to decay and/or are not maintained to any semblance of professional standards for reliability and scope. A key problem is that efforts across both government and within the NDoH to collect data on human resources are duplicative—often the same data is collected with slightly different details (see Annex 2.1 to Chapter 2). In addition, each system requires specialized systems, including computer systems and databases, which need to be maintained, notwithstanding that the key skills required for maintaining such a system are all but completely lacking. The result is that no system is complete and/or easy to access. Standard tables are very rarely produced as a matter of course.

The five existing systems which could/should provide reliable data are:

(i) **The Payroll Systems: In 2004 this was the best source for numbers employed in the health sector, although as reported by the World Bank (2007) it was clear that in 2004 there were significant numbers of ghost workers on the payroll.** At this time (and for earlier periods) the payroll was the single best source of data on key characteristics of the health workforce. This is no longer the case. While some effort has been made to reform the payroll and introduce a new system (Concept) it would seem that other data on staff which used to be part of the system have not been maintained (for example age, sex and occupation) and there are large gaps in the database.

The NDoH has also been in the process of decentralizing the payroll to both hospitals and to provinces—without updating the data on each individual prior to its devolution. This appears to have been a mistake because, as efforts are made to establish PHAs, these will need to be recentralized, at least at the provincial level, and major efforts will need to be made to update the files and information collected on all employees. An interim report of this study suggested in early 2010 that the decentralization not be proceeded with until these issues had been resolved.[33] This report had planned to use the payroll as the principal source of data for the study but the decay in data made this unfeasible. It should be the major source of personnel data on the government-employed workers and the mission payroll(s) should be the basis for much of this type of reporting for the church sector of the health system.

(ii) **The Annual Census of Health Workers undertaken by Human Resource Division of NDoH: While this is an annual exercise in theory, in practice it is not updated annually because the capacity to do this and report it is not present in NDoH.** It is not clear that the system for data collection is sufficiently formally codified with checks on the quality of data being supplied by PHAs and hospitals. The reporting systems are in Microsoft Excel with different coding structures for many of the provinces and hospitals (41 spreadsheets in total). The data for 2009 had been put into Microsoft Access and a set of complex programs written (using Crystal Report Writer) to enable the data to processed. A consultant had been hired to do this, however, the system files and data were not backed up and all system and data files were lost except for the original spreadsheets. This confirmed that the systems are simply not robust enough or adequately managed technically.

This report gained access to the original 2009 files and recreated some of the national crosstabs for the data used in this report. These have been used, as described in Annex 2.1 to Chapter 2, to generate (estimate) information on the characteristics of the workforce for the current stock of the workforce. If the payroll system was working, this data set would not be necessary (at least for most purposes and certainly for medium-term human resource planning). Nevertheless, in the short term, it was critical to the information needs of this report and until the payroll is fixed another data source will be needed.

[33] The recommendation made was as follows: The NDoH should stop the current efforts to decentralize the payroll system to hospitals and provinces as has been initiated in late 2009, pending agreement on: (i) how the missing information on the payroll is to be updated and maintained; and (ii) a detailed plan is reached to ensure its decentralization is appropriate and manageable. The payroll is fragile at best and the systems developed to decentralize it need to be very robust to prevent over expenditures and corruption. The legal issues surrounding the payroll (as with all decentralization issues in PNG) are both complex and it is not immediately clear that the role, responsibilities and duties of the Secretary of Health with respect to control of expenditures and a range of other issues are well served by rapid decentralization.

(iii) **The NDoH Health Information System: This generates information on the health system operations.** As noted in the health plan, it is not always able to gather data from all facilities—including quite often major hospitals. The system is also cumbersome for NDoH staff to interrogate. It gathers some data on health staff. It would be appropriate to consider what additional staff information could/should be generated on/by this system and whether it is possible for it to replace the annual survey. This system needs to be overhauled so that available information can be accessed and analysis carried out on the database easily and on demand.

(iv) **The Health Professionals Registration Systems: These are the only systems that, in theory, collect any information on health professionals working in the private sector.** The database for these systems (doctors, nurses, and pharmacy) is not maintained to an adequate technical standard. It is not clear that the database even separates the numbers on it by year or registration renewal. This should be looked at as a matter of urgency and resources devoted to ensuring it is adequately maintained and the information made available to policymakers. All health professionals currently pay a registration fee to the NDoH. Part of this should be devoted to ensuring the database is managed effectively. Perhaps it should be contracted out. The professional registration fees could be used to finance this database management.

(v) **The Establishment Register held by the Department of Personnel Management: The Establishment Register should contain a database for all public service positions and the qualifications and experience required, as well as location, occupation, and pay level.** This is not currently available but it is also not within the remit of the NDoH to manage—being the responsibility of the Department of Personnel Management.

Recommendation 1. Establish a committee of NDoH management with appropriate support from qualified technical NDoH staff. The committee will have the remit to review human resource data requirements for management and planning purposes and to decide how best to rationalize current data system arrangements (within the control of NDoH). It would need to be supported by a database and information expert able to consider and advise how: (i) the agreed minimum set of human resource data can be best collected, managed, analyzed and updated; (ii) the above set of information systems can be rationalized; and (iii) data for health human resource planning as outlined in this report can best be generated annually and as required.

Recommendation 2. An immediate first step should be to re-establish the Health Professionals Database(s) and to make it operational. This is critical to get further insight to the scale of the private sector and how it is tracking over time. This will need immediate technical support (systems development and database development and management) and can be undertaken while other actions related to Recommendation 1 are implemented.

7.2.2 Documentation of Current National Training Capacity of Health Workers

In December 2009 an extensive survey instrument of health training institutions was developed with NDoH staff and the vast majority of principals/heads of each health-related training institution from across the country. This survey gathered all the information presented in Chapter 3 on the capacity of the training system and Chapter 4 on the operations and state of health training facilities. The survey provides key information on student numbers, unit costs, staff and staff qualifications, training and experience, as well as qualitative information on aspects of their programs, student intakes, and the state of infrastructure. This had to be done as a one-off exercise for this report.

There was enthusiastic support for the consultative approach adopted for the design of the questionnaire. It is acknowledged that principals/heads of training institutions made a major contribution to the definition of problems they wanted analyzed. The Bank team, NDoH staff and the secretariat staff from the Australia-PNG joint study of University and Post-Secondary Education conducted by Sir Rabbie Namaliu and Professor Ross Garnaut worked jointly to develop this questionnaire and all information was mutually shared. The secretariat was located in OHE. Despite this effort and with considerable follow-up by secretariat staff in the OHE and by both NDoH staff and a World Bank consultant, little information was forthcoming from the universities. This is a gap in this study and one which needs to be rectified.

Recommendation 3. NDoH management together with OHE management form an ad hoc committee to determine how best to generate the key information required on health training program enrollment policies (including all universities), institution throughputs by program, costs and other related key information. This needs to be agreed at a high level, perhaps with an "all of government approach" to reaching agreement on how best to collect this critical data. This exercise would also need to involve the mission training facilities, particularly the CHW training institutions as these are currently all outside of government and are under the oversight of NDoH—not the OHE.

7.3. Health Training Program Curriculum Issues

A range of critical curriculum issues are identified throughout the report—not the least of which is a wide range of previous reports which have either failed to generate a consensus on what to do and/or they have not been followed up and implemented.

The range of key curriculum issues has included, but is not limited to:

(i) **the appropriate level of training on birth complications and emergency obstetric care that should be included in general nurse and CHW training programs**. At present this is very minimal—notwithstanding that the vast majority of pregnant mothers only see a CHW and perhaps a nurse prior to giving birth and this is not expected to change radically over the coming 10 to 20 years in rural areas;

(ii) **how and whether to monitor and ensure the full agreed curriculum on family planning, STIs, and HIV prevention are taught to nurses and CHWs training in church-run (and government) training facilities.** Chapter 4 notes that there is very little systematic professional standards reviews undertaken of training facilities of NDoH despite their mandate in this area with respect to professional standards;

(iii) **the fact that NDoH is the major employer and financier of health workers but there is little accountability of the universities to meet nationally set curriculum standards.** No midwives, for example, have been registered for almost a decade because university-trained graduates have inadequate practical experience. It is not clear that the universities had an adequate internal or external quality-assurance program (a point also made by the Garnaut-Namaliu Review of Universities).

(iv) **what in-service training programs should contain.** There are, for example, proposals for special modules on emergency obstetric care for the in-service training CHWs and nurses—see also below.

Recommendation 4. These curriculum issues should be considered by the Executive of the NDoH and serious consideration given to how to proceed to deal with these "all-of-government" issues which arise. The evolving institutional structures for health worker training have not been kept in sync. Clearly a solution to these problems needs to involve NDoH, OHE, universities and representatives of other health-related training institutions. A solution will also need to involve the central agencies of government including the Treasury and its Budgets Division and the DNP&M.

7.4. Health Service-Delivery Cadre Issues

It is beyond the scope of this report to make firm specific suggestions about the need or otherwise to alter significantly the structure of health cadres in operation in PNG. The NHP makes no suggestions in this regard—although it implicitly suggests there should be a higher proportion of doctors—and in particular that "rural doctors" are needed in the workforce. A discussion on the need for particular cadres (such as HEOs) and on the relative mix of health cadres should be led by a set of decisions on what the key objectives of the health system are. Dialogue with senior health managers within NDoH, including with the NDoH Executive, were only tentative on this issue. The recommendations for a bottom-up planning process province-by-province (see below) would assist with this. When considering this report it would be appropriate for there to be an extensive discussion on this issue prior to finalizing the recommended human resource strategy for direct service-delivery staff (see below).

This report has not directly dealt with: (i) non direct service-delivery staff; and (ii) postgraduate training (for

example the proportion of general nurses who should do a postgraduate specialty such as midwifery) that are key issues which need to be addressed in the near future. The crisis in just sustaining the existing service-delivery workforce needs primary attention—as Scenario 1 in Chapter 5 and 6 so clearly demonstrates. However, these issues need to be considered in the context of the mix of cadres and how they are trained. For instance, important decisions need to be considered on how best to meet the needs of the crisis in maternal mortality in PNG. A key question is "what mix of the following do we implement": (i) rapidly expand the number midwives; and/or (ii) increase the number of doctors in rural areas; and/or (iii) focus on basic level training in this area for nurses and CHWs (discussed above) and make sure the referral system is working. This report also has not considered the needs of hospitals in any depth. The specific need of hospitals requires much further analysis. Apart from how hospital needs might grow over the next two decades (and thus absorb staff) it is not clear that current cadres meet their real needs. For instance, CHWs were primarily trained to provide services in rural areas. Is there a need for different training for positions in hospitals that are currently filled by CHWs.

Recommendation 5. The NDoH management needs to consider and make decisions on the issues raised in this report following extensive consultation with key stakeholders. Specifically, NDoH management needs to decide: (i) the key immediate steps that need to be taken to respond to the impending crisis in direct service-delivery staff facing the health system in PNG (expand general nurse and CHW preservice training); and (ii) which broad scenario discussed in this report (or another arising from further dialogue) should underpin the "emergency response" to human resources for the health sector.

"No change" on the training supply side is not a feasible option and it is critical that decisions are made immediately as the recommendations in this report require critical investment decisions to reinvigorate and, in most cases, expand the training of existing cadres. A specific set of decisions need to be made on: (i) the mix of cadres; (ii) the future of HEOs (and the use of specialty nurses or nurse practitioners); (iii) the relative balance of pre- and in-service training of nurses and CHWs; and (iv) how to deal with emergency obstetric care knowledge in the health workforce. This report suggests that the response to the current human resource crisis facing the health sector needs to deal with: (i) the immediate supply-side crisis (quantity); (ii) the qualitative side, including the development of a significant in-service training program (including emergency obstetric care for the existing staff); and curriculum issues for the preservice training programs so that emerging staff have appropriate skills; and (iii) incentives to ensure staff are able to be deployed where needed, particularly in rural areas.

7.5. Health Service-Delivery Staffing (Demand) and Training (Supply) Scenarios: The Implications

This report presents five scenarios (options) for the future development of first line direct service-delivery staff. The demand scenarios are discussed in detail in Chapter 5 and the implications for expansion of the training system are discussed in Chapter 6. In summary, the five scenarios are as follows:

- ***Scenario 1*: *No Change in Human Resource Supply Capacity 2010–2030.* This scenario is designed to show the implications of a "Do Nothing" Strategy on the supply side** (that is no change in the current throughputs of the health training system) given the expected retirements of the workforce due to its aging and the sustained growth in the population. It demonstrates clearly the current crisis facing the human resource requirements of the health sector in PNG.
- ***Scenario 2: Aspirational Targets Envisioned by PNGDSP 2010–2030. The* second set of projections is based on the number of staff and/or population-to-staff ratios posited in the PNGDSP 2010–2030.** These are in the form of absolute staff numbers for each of medical officers, nurses and CHWs. The report argues that this scenario: (i) is not affordable on current likely resource envelope projections; and (ii) does not adequately reflect the likely needed composition of cadres in the future health workforce.
- ***Scenario 3: Maintaining Existing Population to Service-Delivery Staff Ratios.* The third scenario assumes the core direct service-delivery health cadres maintain both their current share of the workforce and the current (2009) population-to-staff ratios over the period 2009–2030.** The fundamental driver of

the demand for health staff in this example is growth of the population. This scenario is probably affordable but it is also probably not the right mix of cadres required for the health workforce.

- ***Scenario 4: WHO "Threshold" Service-Delivery Staff Density Targets.*** **The fourth scenario is based on the WHO "threshold" density of 2.28 per 1,000 population (or a population-to-staff ratio of 439 to one) of doctors, nurses (registered and enrolled) and midwives.** According to WHO, at ratios less than this, coverage of essential interventions, including those necessary to reach the health-related MDGs, is not likely.[34] This scenario is not affordable—particularly in the outer years—and recommends a doctor-to-population ratio which is probably not feasible from a supply constraint perspective and which is lower than is need to meet the health needs of the population.
- ***Scenario 5: A Suggested Preservice Training Scenario.*** **The fifth scenario—which is the broadly recommended scenario—is one which envisages: (i) a gradual reduction in the population-to-doctor ratio (from 17,512 to one in 2009, to 7,380 to one in 2030); (ii) a reduction in the population-to-nurse ratio (from 2,041 to one in 2009 to 1,414 to one in 2030); (iii) allowing a modest decline in the population-to-CHW ratio from 1,509 in 2009 to 1,372 in 2030; and (iv) no expansion in the number of HEOs produced annually which will see the population to HEO ratio increase.** This preservice strategy is affordable, responds to the demand requirements for staff from the health system and leaves space for recurrent health resources to be allocated to a significant expansion of training—both preservice and in-service.

The NDoH management should consider each of the scenarios posited in this report and decide if the one proposed as Scenario 5–A Suggested Preservice Training Scenario—is broadly appropriate. It still needs further exploration with NDoH officials but is suggested as the broadly recommended scenario. It is feasible, at a stretch, from a supply capacity constraint perspective assuming decisive immediate action and it leaves space in the health recurrent budget to finance: (i) expanded training (particularly of CHWs); (ii) a significant ramp-up of in-service training; and (iii) expanded quality-enhancing nonsalary budget expenditures.

If the key assumptions are accepted, the scenario recommends that:

(i) ***Medical Officers*****: The number of graduates required from medical school(s) would need to increase from the current 49 per year in 2009 to 100 in 2019 (this would entail first year enrollments for medical school rising to 111 in 2013) and increasing graduate numbers to 150 by 2023 and 200 by 2028.**

(ii) ***Nurses:*** **The number of nurses graduating in 2012 of 165 would need to increase to 250 by 2015, to 350 by 2016 and to about 500 by 2018.** In the following decade the scenario envisages supply rising to around 600 by 2021; to 700 by 2023 and stabilizing at 800 per year from 2026. The feasibility of achieving this is possible but only with difficulty—at least in the early years. It implies entry to nurse training schools to be up to 260 as soon as 2012–an increase of over 50 percent over current (2011) entry.

(iii) ***Community Health Workers:*** **The number of graduates from the CHW training schools would need to increase from the expected numbers graduating in 2009 of 209 to around 300 by 2014.** Intakes to CHW training schools would need to expand to about 310 by 2013 given assumed dropout rates—an increase in graduations in 2014 over current output capacity of 44 percent. The number of graduates would need to further expand to 500 by 2016 and to 600 by 2020. In the subsequent decade capacity would need to expand to 800 by 2026.

(iv) ***Health Extension Officers:*** **The number of graduates from the DWU training program for HEOs under this scenario is maintained at current capacity.** There would be room to increase HEO numbers (by say 100 percent) without major changes to other cadres. A policy decision, as discussed, is needed on HEOs.

One important implication of the analyses (in all scenarios) is that there will be a serious drop in the number of nurses and CHWs over the period of the

34 WHO. 2006. This report notes specifically that countries with densities of doctors nurses, and midwives below 2.28 per 1,000 population fail, on average, to achieve 80 percent coverage for live deliveries by skilled birth attendants.

current NHP and extending into the next NHP period. This depends on how decisive is the action taken to adjust the supply side because attrition from the health workforce, due to age and other reasons, will exceed the numbers being trained and entering the workforce.[35] In the short run this may not be so much of a crisis because the "Monash Study" shows that there is excess staffing capacity relative to existing demand for services in rural areas. The NHP has an objective of constraining staff numbers and budgets for the hospital sector. However, as also discussed in this report, the NHP and the Health MTEF, the objective of the current policy settings in health is to dramatically turn the declining demand for services around. This may take time so there may be a little breathing space. This holds true at the national level but there is no current mechanism to adjust staffing at facility level according to workloads within and between provinces (or between mission and government services).

There is also no operational process through the budget for the health sector (provinces) to request and have funded additional staff—an issue which needs to redressed at a "whole-of-government" level as this is outside the control on the NDoH. Further, it is not clear how long hospital services can be constrained in subsequent NHP periods after 2015 and the private health sector is now significant (probably at least 15 percent of doctors and 10 percent of nurses) and growing and is likely to expand dramatically if some of the economic projections come to fruition. This will draw staff from the public sector and is an emerging major challenge.

Recommendation 6. The exercise of matching supply and demand or building scenarios for human resource development needs to be done annually—from the top down and from the bottom up. This could be linked to the MTEF process (it gathers a lot of the information required to do the scenarios already) and to the process of expanding and redeveloping the health system province-by-province. Each province should prepare a plan for the deployment of current and planned future staff and facilities district-by-district showing how staff are to be deployed and how workloads can be expected to demand the need for additional staff. This process should be driven by the Policy Division of the NDoH but with the active participation of the Human Resources Division. Both the MTEF and Human Resource planning exercises need to be done in close consultation with the central agencies—particularly Treasury and DNP&M. The National NDoH Executive should consider and make decisions on such a report annually at an agreed point in its policy consideration cycle. The next report needs to consider more explicitly the implications of the private sector and its likely growth over the coming 20 years. To this end the need to fix the health professional registration system is critical (see Recommendations 1 and 2).

Recommendation 7. Establishment of a Whole-of-Government Taskforce. The implications of the recommendations for the expansion of the health training system are significant in that they imply a rapid and immediate expansion of the medical officer, general nursing and CHW training. This will require a "Whole-of-Government Approach".

A "Whole-of-Government Taskforce" should be established immediately[36] to review options to:

(i) **develop a costed plan to expand training capacity as agreed.** This should also explore with training institutions short-term options to expand supply capacity;

(ii) **explore options and incentives to encourage existing staff retention** through: (i) incentives to reduce early retirement; and (ii) incentives to postpone retirement;

(iii) **explore options to encourage redeployment of staff to rural areas** and for new graduates to deploy to rural areas—particularly areas now with staff shortages; and

(iv) **as part of the short-term options plan to expand training of nurses and CHWs there is a need to significantly refurbish existing training facilities** (see information presented in Chapter 4 derived from the survey of institutions).

This taskforce should also become responsible for addressing the set of "Whole-of-Government" implementation issues outlined below.

35 The assumptions used for workforce attrition are conservative compared to those used by the 2000 report on health human resources. The workforce has subsequently aged considerably so this will lead to increasing retirements over time. The lack of data on this is a critical issue.

36 This should consist of at least NDoH, Church Health Agencies, OHE, relevant universities, DNP&M, Budgets Division of Treasury, Economic Policy Division of Treasury, National Department of Education, Prime Minister's Department and Department of Personnel Management.

7.6. Implementing the Human Resource Plan: Need for "Whole-of-Government" Approach

A central theme throughout this report is that the NDoH has responsibility for ensuring that the health system is functioning and adequately staffed but it does not have the ability to directly control many of the key facets required to make things happen. This means the NDoH needs information with which to advocate and engage other agencies of government and its key partners. In the past this has been inadequate, but a lot of effort is currently going into being clear on what policy priorities are and their financial implications. This is a major step—and it is reflected in the new NHP and the health MTEF.

NDoH management has to lead and advocate for a whole-of-government process which is required to implement key aspects of this human resource strategy including:

(i) **how to distribute both existing staff across provinces (and with mission partners) as demand for services evolve and as new graduates become available from training institutions.** This involves provinces, new PHAs, Department of Personnel Management, and Budgets Division of Treasury;

(ii) **ensuring effective demand for new staff positions.** The process of increasing the budgeted health workforce establishment for provinces and hospitals is not clear and transparent. Staff need to be allocated according to health service needs—through a combination of bottom-up and top-down planning;

(iii) **engagement with the Commission/Office of Higher Education.** There is a need to ensure that scholarships for student places in training institutions are adjusted to the emerging staffing needs of the health sector. The NDoH does not make these decisions except for CHWs—which are all currently provided by church health authorities;

(iv) **the relationship between the Commission of Higher Education/OHE, universities and the NDoH.** This is currently fraught with institutional fragmentation, unclear responsibilities and accountabilities (for example for curriculum, eligibility for professional registration and for setting the size of courses) and no mechanism to deal with these problems; and

(v) **the role of church agencies: nurses and CHWs.** The partnership between NDoH and church health agencies is critical to both service delivery and the training of core service-delivery staff. The training of health staff (scholarships) for nursing schools is largely supplied/determined by the OHE and most are publicly financed. The OHE has a policy of encouraging the abolition of single-stream training colleges and their affiliation/amalgamation with a university. Consensus needs to be reached immediately, as part of the development of a training program expansion plan discussed above, on how to proceed with the development of training capacity.

7.7. The Role of Development Partners

Development partners have recognized the need for this study and have been concerned for some time about the impending crisis in human resources for health based on the fragmentary evidence that was previously available. This report clearly demonstrates that decisive actions on the health human resource front are needed. It is recommended that NDoH involve development partners in the review of this report. There is a need to fully review the findings of this report across government and there will be considerable scope for immediate development partner support to upgrade training and invest in the institutional developments required to generate information required to both improve this report and to ensure subsequent analysis of human resource needs are better informed.

In providing support it is critical that development partners support government systems and do not undermine the needed institutional reforms required, or the long-term sustainability of training institutions (for example by temporary supply of scholarships to specific training institutions outside of the human resource framework set by the OHE and DNP&M). One option would be to establish a contestable fund that requires training institutions to bid for resources from an appropriate group of government agencies.

Recommendation 8. This draft report should be widely discussed and disseminated—throughout NDoH, government, and church agencies. It is suggested that presentations are made by the World Bank initially to: (i) the National Executive of NDoH; (ii) core related agen-

cies including DNP&M, Treasury and OHE; (iii) a special meeting of church agencies; (iv) development partners accompanied by senior NDoH staff who will have responsibility for driving the implementation of the report's recommendations in order to elicit the unique perspectives these agencies might have on the report. This could be followed by a one to two day conference where the results are discussed collectively. This could then lead to the development of a strategic plan to respond to the call for action to redress the health workforce crisis.

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