

SECTOR DEVELOPMENT PROGRAM IMPACT ASSESSMENT

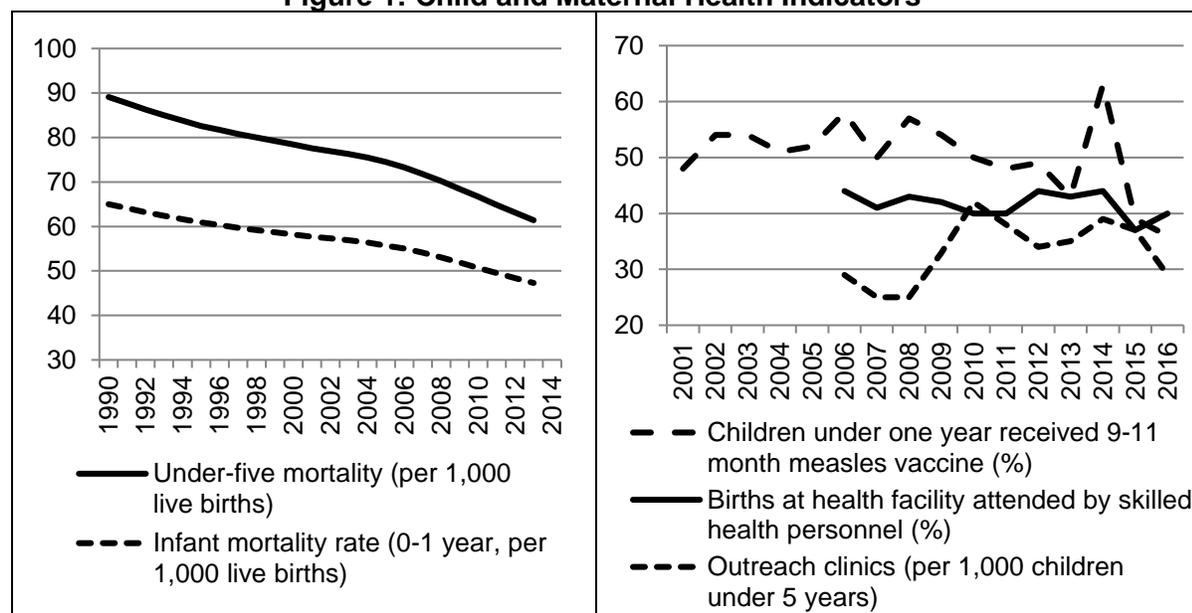
I. Introduction

1. This sector development program impact assessment summarizes expected impact of the Health Services Sector Development Program on the economy of Papua New Guinea (PNG), focusing on reforms supported under Subprogram 1 of the policy-based operation and activities of the sector investment over the entire project period. It documents the formulation of the Program and reviews existing empirical data related to the outputs under the Program to understand its potential impact.

II. Definition of the Problem

2. Despite high rates of economic growth and large budget allocations to social sectors in the past, PNG has the lowest health expenditure per capita and life expectancy in the Pacific region, at US\$92 per capita and 67 years in 2014, respectively.¹ The relatively low life expectancy is linked to high child and maternal mortality rates. The child and maternal health landscape in PNG has shown improvement for the most part since 1990, but the degree of improvement was not enough for the country to achieve its Millennium Development Goals (MDGs) for child and maternal health, covered under MDGs 4 and 5 (Figure 1).

Figure 1: Child and Maternal Health Indicators



Sources: Government of PNG. 2010. *National Health Plan 2011–2020 Volume 2 (Part A) Reference Data and national Health Profile*. Port Moresby; Government of PNG. 2011, 2012, 2013, 2015, and 2016. *Sector Performance Annual Review*. Port Moresby; United Nations. Millennium Development Goals Indicators. <http://mdgs.un.org/unsd/mdg/Data.aspx> (Accessed in December 2017)

3. **Child Health.** Over the period 1990–2015, the under-five mortality rate improved from 89 per 1,000 live births in 1990 to 78 in 2000 and 61 in 2013, but it was still short of the target

¹ Government of Papua New Guinea. 2015. *Papua New Guinea – Millennium Development Goals Final Summary Report 2015*. Port Moresby; Twelfth Pacific Health Ministers Meeting. 2017. *Report on the progress of the Healthy Islands Monitoring Framework*. Rarotonga.

under MDG 4, *the under-five mortality rate reduced by two-thirds between 1990 and 2015*.² Similarly, the infant (0–1 year) mortality rate decreased from 65 per 1,000 live births in 1990 to 58 in 2000 and 47 in 2013, but further improvement is still greatly needed if it was to meet the Sustainable Development Goals (SDGs) of 12 per 1,000 live births for neonatal mortality and 25 per 1,000 live births for under-5 mortality by 2030.

4. **Measles.** Although confirmed measles had not been reported in PNG for several years, the country experienced a nationwide outbreak in 2014, in which more than 2,500 measles cases were confirmed. (Table 1) The proportion of one-year-old children vaccinated against measles stagnated at around 50% between 2001 and 2013, temporarily rose to 63% in 2014 following the outbreak vaccination campaign, and dropped to less than 40% in 2015 and 2016. The slow increase in the vaccine coverage is closely linked with a lagging growth of the number of outreach clinics. As shown in Figure 1, the ratio of rural outreach clinics per 1,000 children under five years has been flat since 2010, which suggests the limited capacity of the health system to provide the rural populations with accessible health services.

Table 1: Measles Incidences in PNG (2011–2015)

Year	Suspected measles cases	Confirmed measles cases	Discarded as non-measles or pending classification
2011	50	0	50
2012	42	0	42
2013	124	9	115
2014	4660	2589	2071
2015	158	53	105

Note: One case was confirmed in 2008 and no case was confirmed in 2009–2012.

Source: World Health Organization. 2012 and 2016. *Country Profile: Measles Elimination Papua New Guinea*.

http://www.wpro.who.int/immunization/documents/measles_country_profile_apr2012_PNG.pdf

http://www.wpro.who.int/immunization/documents/measles_country_profile_may2016_png.pdf

5. **Maternal Health.** PNG's maternal mortality rate (MMR) is one of the highest in the Asia and Pacific region. While positive gains were observed between 1990 and 2015, from 470 to 220 per 100,000 live births, the target for MDG 5, *the maternal mortality ratio reduced by three-quarters between 1990 and 2015*, was not achieved. The low MMR is partially caused by low level of skilled birth attendance with just about 40% of births attended, as compared to above 90% for most countries in the Pacific region. High levels of fertility and teenage pregnancy are also likely contributing factors, and much improvement is needed to reach the SDG target of less than 70 per 100,000 live births by 2030.

6. **Provincial Variability.** The data on child and maternal health shows significant degree of regional variability. It reflects differences across provinces in the availability and quality of health services provided. For instance, the measles vaccine coverage for children under one year old in 2016 is ranging from the highest at 67% in Manus Province to the lowest at 16% in Jiwaka Province.³ By examining the percentage of the supervised births at health facilities, a proxy for maternal mortality, the gap between the National Capital District and other provinces are even more considerable with most of the

² United Nations. *Millennium Development Goals Indicators*. <http://mdgs.un.org/unsd/mdg/Data.aspx> (accessed December 2017).

³ Government of Papua New Guinea. 2017. *Sector Performance Annual Review for 2016*. Port Moresby.

provinces in the Highlands and Momase regions reporting lower than the national average of 40% in 2016. In ensuring every citizen has access to quality healthcare, as stated in the Alotau Accord II, it is imperative to increase the number of health care facilities with skilled birth attendant in rural areas.

7. The government of PNG has developed various health policies and strategies which emphasize the importance of primary healthcare, improving quality of care, disease prevention, and improving human resources for health.⁴ To successfully implement the strategies and translate them into improved health outcome, however, the sector needs to reprioritize on the high impact and cost effective interventions, and further technical and financial supports are required.

III. Impact, Outcome, and Outputs of the Sector Development Program

8. The impact of the Program is affordable, accessible, equitable, and high-quality health services for all citizens of Papua New Guinea. The Program is expected to achieve a more sustainable and efficient healthcare system as its outcome. It will be reflected in the increase in (i) the average annual provincial health expenditure as a proportion of estimated need to at least 80% for 2021–2022, (ii) the proportion of children at one year of age who are immunized against measles to at least 70% in 2021–2022, and (iii) the proportion of births attended by a skilled health personnel at health facilities to at least 64% by the end of 2022. The three major outputs of the Program are (i) enhanced national frameworks and public financial management, (ii) strengthened subnational health system management, and (iii) strengthened health service delivery components.

IV. Impact Analysis

9. The Program addresses the aforementioned problem with a multi-sector approach. To improve the effectiveness and quality of public expenditures and provide the foundation for sustainability of health financing, the Program supports national level fiscal policy and public financial management (PFM) reforms (output 1). More directly, it supports decentralized health service delivery and investments in health care infrastructure at subnational and district level (outputs 2 and 3). Each of the elements complements the others toward the achievement of a sustainable and efficient healthcare system.

a. Impact of Output 1: Enhanced National Frameworks and Public Financial Management

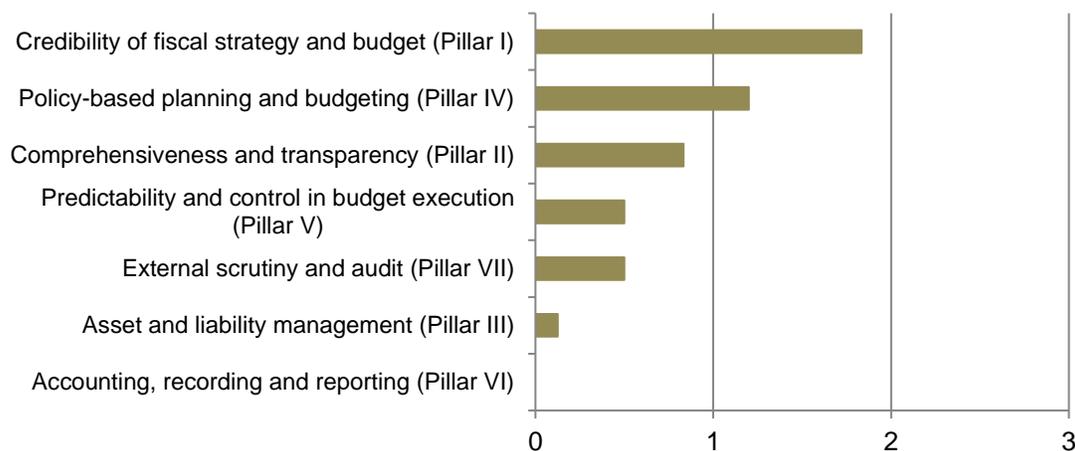
10. The reform actions to enhance national public expenditure management system include: the Cabinet approval of the Medium Term Fiscal Strategy (MTFS) 2017–2021, the Parliament approval of the FY2018 budget, the Parliament approval of an amendment to the Public Finance (Management) Act that extends and defines the Act's coverage to public and statutory bodies, release of the FY2018 Budget Estimate of Revenue and Expenditure by the Department of Transport and Infrastructure using the IMF's Government Finance Statistics Manual (GFSM) 2014, implementation of the new government Integrated Financial Management System (IFMS), and the submission by the Department of Finance (DOF) of the proposed Procurement Policy to National Executive Council (NEC) for approval.

⁴ Government of Papua New Guinea. 2010. *National Health Plan 2011–2020*. Port Moresby; Government of Papua New Guinea. 2013. *Free Primary Health Care and Subsidized Specialist Services Policy*. Port Moresby; and Government of Papua New Guinea. 2013. *Health Workforce "Enhancement Plan"*. Port Moresby.

11. **MTFS 2017–2021.** The MTFS 2017–2021 targets a balanced budget over the term of the Government based on a deficit reduction plan. The FY2018 budget, which is in line with the MTFS, will introduce strong financial management control mechanisms over personnel emoluments to ensure that amounts spent are within the budgeted allocation.⁵ At the same time, the 2018 budget implements greater expenditure prioritization and reallocation of spending from non-essential projects to those effectively promote economic growth. In that spirit, essential health service delivery will be safeguarded, as free primary health care is one of the high priority expenditure projects of the Government. These measures are expected to ensure adequate domestic health financing within a sustainable overall resource envelope.

12. **PEFA Assessment.** Along with the improvement in the fiscal framework and aggregate budget allocations, the Government is carrying out public financial management (PFM) reforms for better expenditure productivity. In 2014–2015, the IMF and DOF conducted an assessment of PNG's PFM, based on the Public Expenditure and Financial Accountability (PEFA) framework.^{6,7} Key areas for improvement and proposed reform measures are summarized in the Public Expenditure and Financial Accountability Road Map 2015-2018 and Assessment report.⁸

Figure 2: Average Performance of PNG's PFM System by Seven Pillars



Note: In calculating the average performance of pillars, a score "A" was considered equal to 3 and score "D" equal to 0. The step between A and D scores is 0.5.

Source: International Monetary Fund. 2015. *Papua New Guinea: Public Expenditure and Financial Accountability Assessment*. Washington, DC.

⁵ Government of Papua New Guinea. 2017. *2018 Budget Strategy Paper*. Port Moresby.

⁶ PEFA is a methodology for assessing public financial management performance. It provides the foundation for evidence-based measurement of countries' PFM systems. It identifies 94 characteristics (dimensions) across 31 key components of public financial management (indicators) in 7 broad areas of activity (pillars). <https://pefa.org/>

⁷ The IMF undertook a PFM assessment in 2015 after the government's self-assessment in 2014–2015. The outcome of the self-assessment was used to inform the external assessment by the IMF. International Monetary Fund. 2015. *Papua New Guinea: Public Expenditure and Financial Accountability Assessment*. Washington, DC.

⁸ Government of Papua New Guinea. 2015. *Public Expenditure and Financial Accountability (PEFA) Road Map 2015–2018 and Assessment*. Port Moresby.

13. In the 2015 PEFA assessment, PNG scored relatively well on credibility of fiscal strategy and budget (Pillar I of the PEFA framework) and policy-based planning and budgeting (Pillar IV). (Figure 2) However, in the areas of the quality, availability, comprehensiveness, and timeliness of fiscal accounts (Pillar VI), management of public assets and associated fiscal risks (Pillar III), accountability (Pillars V and VII), and comprehensiveness and transparency (Pillar II), the assessment report suggests that there is considerable scope for improvement.

14. **Pillar III: Asset and liability management.** Public asset and liability management is one of the weakest areas in the PFM system of PNG. There are various statutory bodies, fulfilling a range of commercial and social functions, and many of them are several years behind in submitting their annual financial statements and have received audit disclaimers or adverse opinions. PNG scored D on a Pillar III indicator for fiscal risk management (performance indicator [PI]-10).⁹ The indicator assesses the extent to which the government collects information on the fiscal risks that arise from its policies and operations, quantifies those risks and makes information available to the public, and has developed effective strategies to manage the risks. In PNG, as of 2015, there were 138 statutory bodies and 12 state-owned enterprises (SOEs), and they have created substantial fiscal risks due to weak financial management practices. To improve the quality of governance and accountability mechanisms of those entities, one of the key recommendations of the PEFA report was the amendment of the PFM law. Responding to the recommendation, the Parliament has approved an amendment of the Public Finances (Management) Act (PFMA) in August 2016, which replaces the PFMA 1995. This is one of policy actions supported under Subprogram 1 of the Program. The coverage of the Act was extended to public and statutory bodies, and those institutions are obliged to manage their resources following the DOF guidelines and provide the services they were intended to deliver as specified in their establishment legislation.

15. **Pillar V. Predictability and Control in Budget Execution.** PNG scored D for its *transparency, competition and complaints mechanism in procurement* (PI-23). The indicator assesses how well the procurement system ensures that money is used efficiently and effectively. At the time of assessment, there was neither central monitoring of procurement and nor independent administrative procurement complaint system. To remedy this problem, the DOF has submitted the proposed Procurement Policy to the NEC for approval. This action is also supported under Subprogram 1 of the Program. The Procurement Policy addresses critical gaps in the legislative framework for procurement, including the establishment of an independent regulatory function and complaint redress mechanism.

16. **New IFMS.** As emphasized in the PEFA Road Map 2015–2018 and Assessment report, much of the weak performance identified over multiple PEFA pillars can be attributed to the poor quality of management and recording of various transactions. For improved information quality and consistency, more disciplined commitment and expenditure controls, and timely reporting, expanded coverage by an Integrated Financial Management System (IFMS) is required. Subprogram 1 supports the implementation of the new IFMS as the sole system for budgeting, accounting, and financial reporting of all public funds in 43 national government entities and five statutory authorities. The IFMS expansion will improve the overall quality of PFM, but in particular, comprehensiveness and transparency in the budget and avail more comprehensive and timely reporting on the operations of statutory bodies

⁹ From seven possible ratings of A, A-, B, B-, C, C-, and D, from high to low.

(Pillar II), asset and liability management (Pillar III), and accounting, recording, and reporting (Pillar VI).

17. All these reforms are intended to ensure the long-term fiscal sustainability, which is important in maintaining the adequate level of domestic health financing. There are a growing number of empirical studies on the relationship between the quality of PFM and fiscal outcomes, though there are not many studies directly using the PEFA ratings due to the relatively young history of the methodology. Prakash and Cabezon (2008) analyzed the link between the quality of PFM and fiscal outcomes in Sub-Saharan African countries using data from the PFM assessments for the highly indebted poor countries (HIPC) countries conducted by the IMF and World Bank.^{10,11} They presented empirical evidence that there is a significant correlation between PFM quality and fiscal balances, after controlling for important macroeconomic effects. Especially, the overall balance, both including and excluding grants, is positively and significantly related to the PFM overall score in the HIPC assessments.

18. Some of the 16 indicators in the HIPC assessments are closely related to the expected outcome of the action plans under Subprogram 1, such as composition of the budget entity (indicator 1), use of expenditure tracking surveys (indicator 10), and timeliness of internal budget reports (indicator 12). Reform actions within Subprogram 1, therefore, have potential to positively impact on the overall fiscal balance in PNG.

19. Similarly, Dabla-Norris et al. (2010) constructed multi-dimensional indices of the quality of budget institutions, using several sources of data including PEFA, and investigated whether the quality of budget institutions is associated with desirable fiscal outcomes.¹² Their analysis suggests that strong budget institutions help improve fiscal balances and public external debt outcomes. The results also support that the reform actions under Subprogram 1 on fiscal management are expected to improve the fiscal balance.

b. Impact of Output 2: Strengthened Subnational Health System Management and Output 3: Strengthened Health Service Delivery Components

20. Output 2 will support decentralized health service delivery in PNG with capacity building in management, PFM, and reporting. Under Subprogram 1, reform actions will support: (i) establishing one Provincial Health Authority (PHA), (ii) sustaining and increasing health financing, and its direct transfer to PHAs, and (iii) strengthening processes, systems, and management ability in PHAs.¹³ Planned project activities to achieve the output include: (i) development of a model PHA manual, training approach, and course materials, (ii) capacity building for PHA and facility staff in integrated suite of development (training) programs (ISDP), (iii) development of a PHA monitoring and support framework for Department of Health (DOH), and (iv) capacity building for DOH staff in governance and

¹⁰ T. Prakash and E. Cabezon. 2008. Public Financial Management and Fiscal Outcomes in Sub-Saharan African Heavily-Indebted Poor Countries. IMF Working Paper. No. 08/217. Washington, DC: International Monetary Fund.

¹¹ The IMF and World Bank developed a detailed methodology to test PFM systems in countries qualifying for debt relief under the Highly Indebted Poor Countries (HIPC) initiative. HIPC assessments were carried out in 2001 and 2004 in 23 countries.

¹² E. Dabla-Norris, R. Allen, L. F. Zanna, T. Prakash, E. Kvintradze, V. Lledo, I. Yackovlev, and S. Gollwitzer. 2010. Budget Institutions and Fiscal Performance in Low-Income Countries. IMF Working Paper. No. 10/80. Washington, DC: International Monetary Fund.

¹³ The National Executive Council has approved the direct transfers of Health Function Grants to PHAs submitted by the Department of Health in 2017.

management and PHA monitoring and support. In each PHA, at least 50 staff members are expected to participate in the integrated suite of development programs annually in 2019–2022.¹⁴

21. Output 3 supports effective delivery of quality health services through rehabilitation of health care infrastructure at the district level, improved availability of medical supplies, building capacity in clinical governance, supporting new partnerships, and strengthening information systems through digitalization. Under subprogram 1, policy actions will support: (i) streamlining the extensive medical catalogue to facilitate procurement and inventory management, and (ii) mandating use of a pharmaceutical logistics management system, mSupply, to support procurement and payment approvals. The project investment will (i) support implementation of recommendations on improving medical supplies availability, (ii) the development of health sector partnerships with PHAs, district development authorities, churches and private sector, (iii) national rollout of the digital health information system and the use of data for decision making and (iii) based on a defined selection criteria the project will implement facility upgrades, including at least two district hospitals (level 4), and five health centers (level 3).

22. The economic rationale for investing in primary health care is strong for several reasons. The major direct costs of disease that could be saved by provision of health care services include: (i) the loss of healthy life expectancy and adult earning power due to the combination of premature and preventable deaths and chronic disability; (ii) the costs of medical treatment contributing to potential catastrophic out-of-pocket expenditures, which can significantly impact the consumption of other necessities and push families into poverty; and (iii) the opportunity costs of caretakers for sick family members.¹⁵ Broader benefits of public health interventions are also discussed in the literature, such as increased productivity from improved physical and cognitive development during childhood development. To estimate the potential impact of the Program, we can assess the economic benefits that would accrue from reducing these disease-induced losses. Focusing on the costs associated with loss of healthy life expectancy, the economic losses are calculated as the summation of losses associated with each year of life lost due to disease, in the form of Disability-adjusted life year (DALY).

23. Disability-adjusted life year (DALY) is a measure to quantify the burden of disease from associated morbidities and mortalities. DALYs for a disease or health condition are calculated as the sum of the years of life lost due to premature mortality and the years lost due to disability in the population. Table 2 summarizes the estimated deaths, under-five deaths, and DALYs lost attributed to communicable diseases, maternal, perinatal, and nutritional conditions in PNG in 2015.¹⁶

24. One way to illustrate the costs of disease is to convert DALYs into monetary terms to approximate the aggregate economic cost to the society. An estimate of the monetary value of one DALY is usually equal to at least one times the average national income per capita,

¹⁴ In each program, at least 50% of participants should be women.

¹⁵ See, for example, the following studies; D. E. Bloom, D. Canning, and M. Weston. 2005. *World Economics*. Vol.6. No.3. pp.15–39; T. Barnighausen, et al. 2011. Rethinking the benefits and costs of childhood vaccination: The example of the *Haemophilus influenzae* type b vaccine. *Vaccine* 29, pp. 2371–2380.

¹⁶ World Health Organization. Global Health Estimates 2016 Summary Tables. Geneva. http://www.who.int/healthinfo/global_burden_disease/en/ (accessed December 2017).

and often its multiple is used.¹⁷ The WHO's Commission on Macroeconomics and Health suggests that, "each DALY would be valued at a multiple of annual income, perhaps three times current income."¹⁸ To be conservative, one times and two times the average national income are used in this document. The annual number of lost DALYs due to each disease are multiplied by per capita income to get a conservative estimate of the aggregate economic loss. For instance, WHO estimates that 71,500 DALYs were lost due to neonatal sepsis and infections in PNG in 2015, thus using the gross national income (GNI) per capita of approximately \$2,700 (in 2015 US Dollars), the total cost of neonatal sepsis and infections would be valued at about \$194 million or equivalent to 0.94 percent of the GNI of PNG.¹⁹ Assuming we value each DALY at twice the per capita income, the total cost would be equivalent to 1.9 percent of the GNI.

Table 2: Estimated Deaths, Years of Life Lost, Years Lost Due to Disability, and DALYs by Communicable Diseases, Maternal, Perinatal and Nutritional Conditions, 2015 ('000)

Cause	Deaths	Deaths under age five	Years of life lost	Years lost due to disability	DALYs
A. Infectious and parasitic diseases, total ^a	9.6	2.9	552.1	114.0	666.1
Of which: Tuberculosis	3.0	0.2	120.7	1.4	122.1
Of which: Childhood-cluster diseases	0.6	0.5	56.4	0.5	56.9
i. Whooping cough	0.2	0.2	20.8	0.4	21.2
ii. Diphtheria	0	0	0.2	0.0	0.2
iii. Measles	0.3	0.2	30.2	0.1	30.3
iv. Tetanus	0.1	0.1	5.2	0.0	5.2
Of which: Malaria	1.3	0.5	88.2	17.1	105.3
B. Respiratory Infectious	4.9	2.2	294.4	8.7	303.1
C. Maternal conditions	0.5	.	27.2	1	28.1
D. Neonatal conditions	4.4	4.4	406	15.2	421.2
1. Preterm birth complications	1.8	1.8	167.2	7.9	175.1
2. Birth asphyxia and birth trauma	1.5	1.5	141	3.1	144
3. Neonatal sepsis and infections	0.8	0.8	71.5	0	71.5
4. Other neonatal conditions	0.3	0.3	26.4	4.2	30.6
E. Nutritional deficiencies	0.4	0.2	23.1	86.2	109.4
Communicable, maternal, perinatal and nutritional conditions (Total of A-E)	19.8	9.7	1302.8	225.1	1527.9
Population	7,619	996			

DALY = Disability-adjusted life year.

^a *Infectious and parasitic diseases, total* contains numbers associated with the following diseases: (1) tuberculosis, (2) STDs excluding HIV, (3) HIV/AIDS, (4) diarrhoeal diseases, (5) childhood-cluster diseases (whooping cough, diphtheria, measles, and tetanus), (6) meningitis, (7) encephalitis, (8) hepatitis, (9) parasitic and vector diseases, (10) intestinal nematode infections, (11) leprosy, and (12) other infectious diseases.

Source: World Health Organization. Global Health Estimates 2016 Summary Tables. Geneva. http://www.who.int/healthinfo/global_burden_disease/en/ (accessed in December 2017)

¹⁷ H. G. Eichler, S. X. Kong, W. C. Gerth, P. Mavros, and B. Jönsson. 2004. "Use of Cost-Effectiveness Analysis in Health-Care Resource Allocation Decision-Making: How Are Cost-Effectiveness Thresholds Expected to Emerge?" *Value in Health* 7 (5): 518–528; A. J. Stein. 2013. Rethinking the Measurement of Undernutrition in a Broader Health Context: Should We Look at Possible Causes Actual Effects? IPFRI Discussion Paper 01298. Washington, DC: International Food Policy Research Institute.

¹⁸ J. Sachs, et al. 2001. *Macroeconomics and Health: Investing in Health for Economic Development*, Report of the Commission on Macroeconomics and Health. Geneva: World Health Organization.

¹⁹ Nominal GNI of Papua New Guinea in 2015 was approximately \$20.7 billion. World Bank. World Development Indicators. <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators> (accessed December 2017)

25. In this way, the economic losses from other communicable, maternal, perinatal and nutritional conditions can be estimated. Table 3 summarizes the estimated costs of (i) tuberculosis, (ii) childhood-cluster infectious and parasitic diseases, including measles, (iii) malaria, (iv) maternal conditions, and (v) neonatal conditions, expressed in percentage of GNI in 2015. This Table highlights the health conditions that the Program will potentially have the greatest effects, although not discounting its potential impact on other health conditions. The table shows the estimated upper limits of the impacts of the Program through the improvement of communicable, maternal, perinatal and nutritional conditions, and does not imply the total elimination of each condition through the Program.

26. Sensitivity analysis showed that if the total DALYs lost by these conditions had been lowered by 20 percent, the total economic cost of 1.3–2.7 percent of the GNI could have been saved in 2015.²⁰ Note that these cost estimates do not consider the effects of the disease other than the loss of healthy life expectancy, such as medical and non-medical cost savings, or opportunity costs of caretaking activities. Non-communicable disease (NCD) burden are also not included in the estimates, although the longer term effects of established health infrastructures and strengthen health systems can also be beneficial for the treatment and prevention of common NCDs such as cardiovascular diseases, diabetes mellitus, respiratory diseases and injuries.

27. Disaggregated data on average length of stay (ALOS) in hospital by specific conditions are unavailable, however, we can approximate productivity loss by examining ALOS for all causes against lost days of work proxied by gross national income per capita. Based on the estimates for ALOS for acute care conditions reported in public hospitals of 6.0 days, GNI per capita of US\$2,600, and incidence of communicable, maternal, perinatal and nutritional conditions described above, the estimated economic cost for caregiving activities is approximately US\$272 million, or equivalent to 1.63% of the GNI of PNG.²¹ Given the comparatively low hospital discharge rate and lack of hospital beds, the above estimate is likely to be an underestimate of the total opportunity costs of caretaking activities.

Table 3: Estimated Costs of Communicable, Maternal, Perinatal and Nutritional Conditions, 2015 (% of GNI)

Cause	DALYs ('000)	Multiplier applied to per capita income = 1	Multiplier applied to per capita income = 2
A. Infectious and parasitic diseases			
Tuberculosis	122.1	1.60%	3.21%
Childhood-cluster diseases	56.9	0.75%	1.49%
i. Whooping cough	21.2	0.28%	0.56%
ii. Diphtheria	0.2	0.00%	0.01%

²⁰ Equivalent to 20% of 6.64% and 13.29%.

²¹ OECD. 2010. *Health at a Glance: Asia/ Pacific 2010*. Paris.

Cause	DALYs ('000)	Multiplier applied to per capita income = 1	Multiplier applied to per capita income = 2
iii. Measles	30.3	0.40%	0.80%
iv. Tetanus	5.2	0.07%	0.14%
Malari a	105.3	1.38%	2.76%
C. Maternal conditions	28.1	0.37%	0.74%
D. Neonatal conditions	421.2	5.53%	11.06%
1. Preterm birth complications	175.1	2.30%	4.60%
2. Birth asphyxia and birth trauma	144	1.89%	3.78%
3. Neonatal sepsis and infections	71.5	0.94%	1.88%
4. Other neonatal conditions	30.6	0.40%	0.80%
Total	733.6	9.63%	19.3%

DALY = Disability-adjusted life year.

Sources: ADB estimates and World Health Organization. Global Health Estimates 2016 Summary Tables. Geneva. http://www.who.int/healthinfo/global_burden_disease/en/ (accessed in December 2017)