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ORIGINAL ARTICLE

Millennium development goals in Papua New Guinea: towards universal education

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Abstract

Globally, about 175 million children have no access to universal education in 2017. Nearly, 16 million young children in East Asia and Pacific Region are not enrolled into school, accounting for 19% of children in pre- and primary school age. This paper analyses surveillance data, extracted from the integrated Health and Demographic Surveillance System (iHDSS) database, developed by Papua New Guinea Institute of Medical Research in the period 2011–2017 to assess the implementation of Millennium Development Goals associated with universal education in Papua New Guinea (PNG). Net enrolment rate in primary education was 58%. Only 28% of children aged 7 were enrolled in Grade 1, and only 7% of children aged 15 years reached Grade 8 in the school year 2015. Late enrolment into Grade 1 among children aged 7 years was identified as the main cause of low net enrolment rate, leading to low completion rate of primary education in the following years and affecting the overall quality of universal education. Despite the improvement in gender equality, males had better access to education services than females as reflected in high male-to-female student ratios among the schooling age population, 5–24 years, which increased from 108 at primary to 132 at secondary and 181 at tertiary education. Educational policy-makers and practitioners should take immediate actions to improve net enrolment in Grade 1 and completion rate at primary education, as well as gender equality in education in PNG.

Keywords Millennium development goals · Sustainable Development Goals · Papua New Guinea · Health and demographic surveillance system · Universal education · Gender equality

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1 Introduction

1.1 International development frameworks for education

The Millennium Declaration, signed by 189 member countries of the United Nations (UN) in September 2000, set out eight Millennium Development Goals (MDGs) to be achieved by 2015. Of which, MDG 2 relates to universal education (The United Nations 2000). Also at the World Education Forum held in Dakar, Senegal, in April 2000, countries across the world made a commitment to Education for All (EFA) and identified six goals to be achieved in low- and middle-income countries (LMICs) by 2015. Since then, Governments have worked closely with international and national organisations and development partners under regional and national initiatives to address education challenges at the regional and national levels (UNESCO 2015).

Despite great progress made towards achieving universal access to education over the last two decades, there are still nearly 16 million children in East Asia and Pacific Region (around 19% of pre-primary school age children) not enrolled in pre-primary education today, contributing to the 175 million children of pre-primary school age not enrolled globally (UNICEF 2019).

1.2 Pacific Island Countries and Territories

The Pacific region is sometimes referred to as Oceania, including 12 Pacific Island Countries and Territories (PICTs). PICTs are highly heterogeneous, with wide differences across demographic and geographical characteristics, developmental histories, governmental structures, and socio-economic development statuses. These countries can be divided into three groups: (1) Melanesia which includes four countries: Fiji, Papua New Guinea, Solomon, and Vanuatu; (2) Micronesia comprising five countries: Kiribati, Marshall, Micronesia, Nauru, and Palau; and (3) Polynesia which includes three countries: Samoa, Tonga, and Tuvalu. Each country is home to hundreds of languages, dialects, and sociocultural groups, making the Pacific one of the most diverse regions in the world. The South Pacific region has a population of around 9.7 million, with 90% of the inhabitants living in three countries: Fiji, Papua New Guinea, and the Solomon Islands. PICTs are also highly susceptible to natural disasters and face a number of concerns relating to fragile environments. The structures of national economies have undergone significant changes recently, with an increase in share of the services sector and tourism, while agriculture and fisheries remain the main economic industries in the region.

The performance of the PICTs in terms of the progress towards the achievement of MDGs has been patchy and inconsistent. According to the Pacific Regional MDGs Report, only the Cook Islands and Niue were on track to achieve all of the eight MDGs, while Fiji, Palau, and Tonga were on track to achieve at least four. Samoa and Tuvalu were on track to achieve three of the MDGs, while Nauru, Marshall, and Vanuatu were on track to achieve two. Micronesia was likely to achieve one of the MDGs, while Kiribati, Solomon, and PNG were not on track to achieve any (The Pacific Islands Forum Secretariat 2015). PICTs were doing well in progressing towards achieving MDG 2 on universal education, with better gender equality in access to primary education.

The review of EFA conducted in the Pacific in 2015 revealed that countries in the Pacific made strong progress under EFA goal 2 on universal primary education, with the majority

of primary school-aged students being enrolled in school. Progress was also evident for EFA goal 3, with more students participating in secondary education. Some progress was made under EFA goal 4 on young adult literacy, predominantly due to the improvement in access to primary schools rather than a result of targeted adult education programmes. Progress under EFA goal 5 on gender equality in education was mixed across countries and levels of education, with more favourable outcomes for boys in some countries. The progress under EFA goal 6 on quality of education could be seen in some instances (UNESCO 2015).

1.3 Papua New Guinea

Papua New Guinea (PNG), located in the South Pacific, is the most populous country in the region, with about 8.22 million people, but widely dispersed over the main land area of about 450,000 km^2. PNG face increased concerns about developmental issues. The Human Development Index of PNG was 0.544, positioning the country at 154 out of 185 countries and territories in 2015. Poor maintenance of road, traffic, and transportation infrastructures make the provision of education services inadequate. Geographical barriers to access to remote terrains and isolated islands pose additional challenges to the quality delivery of education services to the population, particularly those live in rural areas. These challenges have significant implications for the education sector highlighting the need to make efficient and effective use of the scared resources available.

The present formal education system in PNG was initiated in 1991 and commenced transitioning in the 2000s–2010s to the new structure, called outcome-based education (National Executive Council 2009). In this structure, basic education has two levels: elementary and primary. Elementary education consists of preparatory for children aged 6 years and Grades 1 and 2 for children aged 7–8 years, with instruction mainly in *Tok Pisin*, the most commonly used local language of PNG. Primary education comprises 6 years, from Grades 3–8 for children aged 9–14 years, with formal instruction in English. The secondary education offers 4 years of schooling, divided into two stages: lower secondary from Grade 9 through Grade 10 for young adults, aged 15–16 years, and upper secondary from Grade 11 to Grade 12 for young adults aged 17–18 years. Vocational training recruits young adults aged 15 years or above, who have completed primary education. Universal education in PNG as defined in the National Education Plan 2015–2019 includes 13 years of education for all children, including the first year of school at the age of 6 years as an internationally recognised early childhood year, focusing on transition to school. National selection examinations are conducted at the ends of Grades 8 and 10 with standards-based assessment. The national examination is accessible to all students at the end of Grade 12 for the purpose of controlling access to tertiary education (Department of Education 2016).

The Government of Papua New Guinea committed to achieving the MDGs. To realise these goals, the Department of National Planning and Monitoring (DNPM) developed a set of national indicators. These indicators were then integrated into the country's Medium Term Development Strategy 2005–2010 and then the Medium Term Development Plan 2011–2015 (PNG Government 2010). Many of these indicators, however, were process indicators, which were not applicable for measuring and reporting the MDG education-related indicators, which were designed as outcome and impact indicators (Department of National Planning and Monitoring 2009). In the 2010 MDG Country Report, the PNG Government noted that the country lacked adequate data for reporting the country's progress

towards achieving the MDGs targets. According to the 2015 MDG Country Report, the primary school gross enrolment rate had improved to the level of 85.6%, achieving the national target of 85%. This was largely attributed to the abolishment of school fees at the primary education level in 2010 (PNG Government and The United Nations 2015).

There has been a growing body of literatures on progress of PICTs in achieving universal education available at the regional and national levels. PNG Government called for development partners, international and national stakeholders, and research institutions to provide further assistance to the Government in collecting and reporting data to inform policy (Department of National Planning and Monitoring 2009; Tran et al. 2010). As a result, there has been an increase in the reporting of data for development in PNG. Much of this work was financially and technically supported by multilateral and bilateral donors, who have track records of supporting the PNG Government in development over the last decades. Many documents are published by international development partners and the UN agencies such as UNDP, UNICEF, and UNESCO, including financial institutions such as the World Bank and the Asian Development Bank.

However, little attention has been given to the implementation of the international and national development goals and targets at the sub-national level. Little is known about the achievement of the set educational targets in localities as well as its variations across urban–rural sectors, geographical regions, and provinces in PNG. A literature review, conducted by the International Network for the Demographic Evaluation of Population and Their Health (INDEPTH) in 2015, found that there had been a large gap in the literature on children's school access at the national and sub-national levels and recommended that this data gap could be addressed by using surveillance data available from integrated Health and Demographic Surveillance Systems (iHDSS) operating in LMICs within the network (Kamanda and Sankoh 2015). Papua New Guinea Institute of Medical Research (PNG IMR) is a full member of the INDEPTH since 2013.

In this study, we assessed the PNG's progress towards the achievement of MDGs from a national research institution's perspective, with focus on universal access to primary education at the sub-national level.

2 Methods and materials

We use surveillance data generated by the iHDSS, operated by PNG IMR under the Partnership in Health Programme (PiHP) to report on the implementation of MDGs at the locality, by measuring education and relevant indicators of the population living in four surveillance sites: Asaro in the Eastern Highlands Province, Hides in Hela Province, Hiri in Central Province, and Karkar in Madang Province. Figure 1 shows the location of these surveillance sites in PNG. Methodology of the health surveillance systems in PNG has been published elsewhere (Pham et al. 2017).

Household socio-economic data were collected by data collectors, who were based in the villages within the surveillance sites from January to June 2015. A total of 8389 households, including 1608 in Hiri, 2747 in Asaro, 3112 in Karkar and 922 in Hides, were approached by the data collection team. Of which, 8105 households gave consent to participate in the interviews, resulting in participation rate of 96.6% for all sites, with the highest rate reported in Hides (100%), followed by Hiri and Karkar (98%), and the lowest in Asaro (92%). 7888 household interviews were completed, accounting for 94% of all interviews conducted across the four sites. The highest interview completed rate was in Hides (99%),

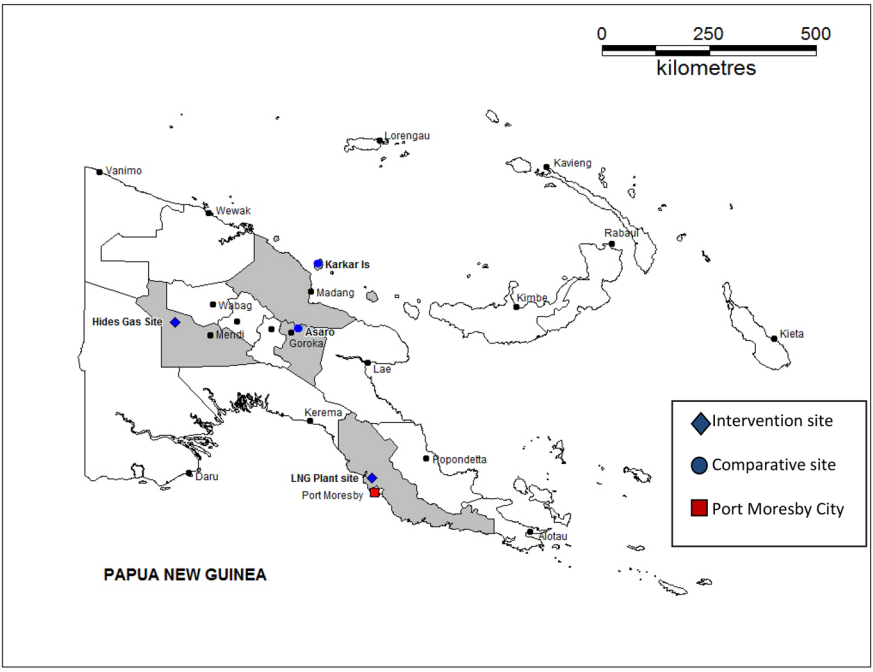

Fig. 1 Location of the integrated Health and Demographic Surveillance System, 2013–2017

followed by Karkar and Hiri (96% and 94%, respectively), and the lowest in Asaro (89%). A total population of 41,364 were recorded in these interviews, including 8820 in Asaro (21.3%), 4389 in Hides (10.5%), 12,385 in Hiri (29.9%), and 12,770 in Karkar (30.8%).

The quality of data was controlled in accordance with the standard operating procedures for quality control and quality assurance of the INDEPTH. All data collection forms were consolidated and verified before submitting to data management team, based in the PNG IMR main office in Goroka, Eastern Highlands Province, for entering into the database. 'Missing information' meant data that were missing from the database, either because the data collectors did not ask the question or record the information, or participants did not respond to the question for whatever reason. 'Don't know' (DK) was defined as the participants responding with 'I don't know' to the particular question. Distinguishing between 'missing information' and 'DK' responses is important because interpretations of these data are different. While the proportion of 'missing information' can suggest the quality of collected data, 'DK' responses reflects the knowledge of the respondents on particular questions and/or a courteous response as they may not want to provide the information. For that reason, both 'missing values' and 'DK' responses were considered as valid information and presented as findings of the study, where applicable. Individual age and sex information are the most important variables for cross-table analysis of the surveillance population. Missing information on sex was 1.8% and only 0.1% on age, across all the four sites. The quality of data was published elsewhere (PNG Institute of Medical Research 2015).

Data used in this study were extracted mostly from two data modules of the iHDSS database on Education and Employment, which were designed as part of the household socio-economic data. The Education module was applied to all household members aged 5 years or above at the time of interview. Respondents were divided into two age groups:

(1) people of school age, 5–24 years and (2) people aged 25 years or more. Adult participants (aged 15–24) and child caregivers (for children aged 5–14) were asked about their enrolment status in the school year 2015. Participants aged 25 years or above were asked about their highest educational attainment.

The Employment module was administered to all household members, who were of working age, 15–64 years and living in the households for 6 months or more by the time of interview. Eligible participants were asked questions about their employment history and detailed information on the current employment. If eligible participants were not available at time of interview, data collectors asked if they could visit the households for a second time. Otherwise, other household members, who knew about the details, for instance, spouse and household head, responded on their behalf.

The iHDSS data are capable to report 7 out of 15 indicators for MDGs on education, employment and gender as shown in Table 1. In this paper, the education and employment data together with the individual background information such as date of birth, sex, and age of participants were adequately used to calculate five MDG education-related indicators.

2.1 Net enrolment rate in primary education (indicator 2.1)

A sub-population of children in the age group 9–14 years were selected to calculate the net enrolment rate at different school grades of primary education in the school year 2015. Data were disaggregated by sex of children and surveillance site.

2.2 Proportion of pupils starting Grade 1 who reach the last grade of primary education (indicator 2.2)

Since the data were not available for calculating of this indicator, school attendance rate among children aged 15 years in the year 2015 was used as a proxy indicator.

2.3 Literacy rate of young adults aged 15–24 years (indicator 2.3)

Data on 'ever attended primary education' among this population were used as an alternative for reporting literacy rate of this young adult population. This alternative measurement is based on the assumption that these young adults are able to read and write in *Tok Pisin* when they have completed elementary education (National Statistics Office 2012). Participants aged 15–24 were considered as 'ever attended primary education' if they: (1) currently attend primary education in the school year 2015; (2) do not currently attend school, but attended primary education in the past; or (3) currently attend secondary (lower or upper), tertiary (college and university) or vocational training. In contrast, those people, who currently attend preschool or elementary school or have never attended any class, were considered as 'never attended primary school'.

2.4 Ratios of boys to girls in primary, secondary, and tertiary education (indicator 3.1)

Data on the highest educational attainment and sex of the participants were used to calculate these ratios. Sex ratio analysis was conducted for two separate age groups: (1) 5–24 years which is defined as current school attendance age (from elementary to tertiary

Table 1 MDG 1–3 targets and indicators and PNG IMR's iHDSS reporting capacity, 2015

MDG targets	MDG indicators	PNG IMR's iHDSS		
		Data component	Data module	Capacity to report
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	Proportion of population below $1.25 (PPP) per day	NA	NA	No
	1.2 Poverty gap ratio	NA	NA	No
	1.3 Share of the poorest quintile in national consumption	NA	NA	No
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed	NA	NA	No
	1.5 Employment-to-population ratio	Household	Employment	Yes
	1.6 Proportion of employed people living below $1.25 (PPP) per day	NA	NA	No
	1.7 Proportion of own account and contributing family workers in total employment	NA	NA	No
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under five years of age	Child health	Anthropometry	Yes
	1.9 Proportion of population below minimum level of dietary energy consumption	NA	NA	No
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment rate in primary education	Household	Education	Yes
	2.2 Proportion of pupils starting grade 1 who reach last grade of primary education	Household	Education	Yes
	2.3 Literacy rate of 15–24 years old, women and men	Household	Employment	Yes
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of boys to girls in primary, secondary, and tertiary education	Household	Education	Yes
	3.2 Share of women in wage employment in the non-agricultural sector	Household	Employment	Yes
	3.3 Proportion of seats held by women in national parliament	NA	NA	No

NA non-applicable as the iHDSS does not support to collect these data

education); and (2) 25 years or older, which is considered as post-school attendance age (UNICEF and GSO 2012).

2.5 Share of women in waged, non-agricultural sector employment (indicator 3.2)

According to ILO classification of occupation, employments are grouped into four sectors: (1) waged non-agricultural employment includes professionals, managers, leaders, skilled salespersons, service workers, skilled handicrafts, workers in mining, construction, and transportation industries, assemblers and machine operators, and military personnel; (2) waged agricultural sector includes employment of skilled labourers in agriculture, animal, forestry, and fishery sectors; (3) unwaged agricultural employment includes subsistence farming and fishing; and (4) other jobs such as home duties and housework (Kant et al. 2013). The proportion of women's employment in the waged non-agricultural sector was computed, using data on main occupation and current employment status of the female participants.

Ethical applications of this study were approved by PNG IMR Internal Review Board and the PNG Medical Research Advisory Committee as part of the approval of the iHDSS/PiHP.

Data were analysed using Statistics Package for Social Sciences version 20 (SPSS®). For all analyses, differences between proportions were assessed by p value, using Chi-square tests.

3 Results

Table 2 shows net enrolment rates at the primary education (from Grade 3 through Grade 8) among 5111 children aged 9–14 years by surveillance site and sex of the children. The net enrolment rate was 58.4% across four surveillance sites, with the highest rate in Hiri (77.8%), followed by Asaro (72.4%), Hides (54.9% for both sexes), and the lowest in Karkar (40.1%).

There was no significant gender difference in enrolments at primary education, 57.8% of males versus 59.0% of female children across all sites; in Hiri: 77.0% for males versus 78.6% for females; in Asaro: 72.5% for male versus 72.6% for female children; in Hides: 56.0% for male versus 53.7% for female children; and in Karkar: 40.0% for male versus 40.0% for female children. However, 35.1% of children of this age group were still attending elementary school and even 4.8% at preschool across the four surveillance sites. To better understand the causes possibly underlying this observation, school enrolment status among children aged 7 years was further examined for the school year 2015.

As shown in Table 3, the net enrolment in Grade 1 among 1383 children aged 7 years was 28.0% for all sites, but varied widely among the sites, with the highest level reported in Asaro and Hides of (36.0%), followed by Karkar (24.9%), and lowest level found in Hiri (15.5%). Unlike the overall net enrolment rate at the primary education, gender differentials were observed in the highlands region, i.e. in Asaro, more male children than female children were enrolled into Grade 1, 38.7% compared to 33.6%, and in Hides, 39.5% compared to 33.1%, respectively ($p < 0.05$). The gender differential was not significant in the coastal region, i.e. Hiri (14.2% of males vs. 17.0% of females) and Karkar (25.1% males vs. 24.7% females) ($p > 0.05$). There was also no significant difference between the two sexes for 'no schooling' category across all

Table 2 Enrolment of children aged 9–14 years at different educational levels for the school year 2015 by sex and surveillance site, PNG IMR's iHDSS, 2015

iHDSS site	Educational level	Male		Female		Both sexes	
		N	%	*N*	%	*N*	%
Hiri	Preschool	6	0.9	4	0.5	10	0.7
	Elementary	127	18.0	128	17.1	255	17.5
	Primary	543	77.0	588	78.6	1131	77.8
	Lower secondary	17	2.4	14	1.9	31	2.1
	Upper secondary	0	0.0	2	0.3	2	0.1
	Vocational training	1	0.1	1	0.1	2	0.1
	Don't know	11	1.6	11	1.5	22	1.5
	Total	705	100.0	748	100.0	1453	100.0
Asaro	Preschool	8	1.6	13	2.5	21	2.1
	Elementary	123	25.1	123	23.4	246	24.2
	Primary	356	72.5	380	72.4	736	72.4
	Lower secondary	4	0.8	8	1.5	12	1.2
	Don't know	0	0.0	1	0.2	1	0.1
	Total	491	100.0	525	100.0	1016	100.0
Karkar	Preschool	112	9.6	89	8.3	201	9.0
	Elementary	578	49.8	548	51.1	1126	50.4
	Primary	467	40.2	429	40.0	896	40.1
	Lower secondary	2	0.2	3	0.3	5	0.2
	Don't know	2	0.2	4	0.4	6	0.3
	Total	1161	100.0	1073	100.0	2234	100.0
Hides	Preschool	6	2.8	7	3.7	13	3.2
	Elementary	88	40.4	77	40.5	165	40.4
	Primary	122	56.0	102	53.7	224	54.9
	Lower secondary	2	0.9	4	2.1	6	1.5
	Total	218	100.0	190	100.0	408	100.0
All sites	Preschool	132	5.1	113	4.5	245	4.8
	Elementary	916	35.6	876	34.5	1792	35.1
	Primary	1488	57.8	1499	59.1	2987	58.4
	Lower secondary	25	1.0	29	1.1	54	1.1
	Upper secondary	0	0.0	2	0.1	2	0.0
	Vocational training	1	0.0	1	0.0	2	0.0
	Don't know	13	0.5	16	0.6	29	0.6
	Total	2575	100.0	2536	100.0	5111	100.0

the sites ($p > 0.05$). However, there were 856 responses as 'Don't Know' from parents/guardians to the question of what school grade their child was attending in the school year 2015, accounting for 62% of all children aged 7 years. When these responses were excluded from the data analysis, the net enrolment of children aged 7 years in Grade 1 was increased to 73.6%, similar to the official figure reported by the educational sector.

Among 1108 children aged 15 years, only 7.2% were attending Grade 8 in the school year 2015, (6.3% of males and 8.4% of females) as shown in Table 4. This figure varied widely across the surveillance sites, i.e. from the highest level of 24.2% in Hiri, down to 10.0% in Asaro, 2.08% in Karkar, and only 1.4% in Hides. Even if the 'Don't Know'

Table 3 Enrolment status of children aged 7 years at primary education in school year 2015 by sex and surveillance site, PNG IMR's iHDSS, 2015

iHDSS site	Male		Female		Both sexes	
	N	%	*N*	%	*N*	%
Asaro						
Not enrolled	2	1.6	3	2.4	5	2.0
Grade 1	48	38.7	42	33.6	90	36.4
Grade 2	19	15.3	26	21.3	45	18.2
Grade 3	4	3.2	8	6.5	12	4.8
Don't know	51	41.1	44	36.1	95	38.5
Total	124	100.0	123	100.0	247	100.0
Hides						
Not enrolled	10	5.3	10	5.9	20	5.5
Grade 1	74	39.6	57	33.1	131	36.5
Grade 2	1	0.5	2	1.2	3	0.8
Grade 3	0	0.0	2	1.2	2	0.5
Don't know	102	54.5	101	58.7	203	56.5
Total	187	100.0	172	100.0	359	100.0
Hiri						
Not enrolled	5	3.4	4	2.9	9	3.2
Grade 1	21	14.2	23	17.0	44	15.5
Grade 2	14	9.5	6	4.4	20	7.1
Grade 3	3	2.1	3	2.2	6	2.1
Don't know	104	71.3	99	73.3	203	71.7
Total	148	100.0	135	100.0	283	100.0
Karkar						
Not enrolled	0	0.0	0	0.0	0	0.0
Grade 1	68	25.1	55	24.7	123	24.9
Grade 2	5	1.8	5	2.2	10	2.0
Grade 3	3	1.1	4	1.8	7	1.4
Don't know	196	70.5	159	71.2	355	71.9
Total	271	100.0	223	100.0	494	100.0
All sites						
Not enrolled	17	2.3	17	2.6	34	2.4
Grade 1	211	28.9	177	27.1	388	28.0
Grade 2	39	5.3	39	5.9	78	5.6
Grade 3	10	1.4	17	2.6	27	1.9
Don't know	453	62.0	403	61.7	856	61.9
Total	730	100.0	653	100.0	1383	100.0

responses (30 values) were excluded from the data analysis, the primary education completion rate slightly increased to 7.4% for both sexes, (6.5% of male and 8.5% of female children). It is a particular concern as 44.9% of children aged 15 years in Hides reported as 'not attending any class' in the school year 2015, significantly higher than the other sites, i.e. 4.5% in Asaro, 0.6% in Hiri, and none in Karkar ($p < 0.01$).

A total of 11,741 young adults aged 15–24 years were included in the analysis of proportion of population who had 'ever attended primary education'. As shown in Table 5, it

Table 4 Current school grade attendance among children aged 15 years in school year 2015 by sex and surveillance site, PNG IMR's iHDSS

	Male		Female		Both sexes	
	N	%	*N*	%	*N*	%
Asaro						
Not attending any class	7	5.2	3	3.5	10	4.5
Grade 1	0	0.0	1	1.2	1	0.5
Grade 2	3	2.2	4	4.7	7	3.2
Grade 3	12	8.9	5	5.9	17	7.7
Grade 4	20	14.8	9	10.6	29	13.2
Grade 5	25	18.5	13	15.3	38	17.3
Grade 6	31	22.9	25	29.4	56	25.5
Grade 7	21	15.5	15	17.6	36	16.4
Grade 8	13	9.6	9	10.6	22	10.0
Don't know	3	2.2	1	1.2	4	1.8
Total	135	100.0	85	100.0	220	100.0
Hides						
Not attending any class	69	43.1	56	47.5	125	44.9
Grade 1	7	4.4	9	7.6	16	5.7
Grade 2	15	9.4	8	6.8	23	8.3
Grade 3	21	13.1	13	11.0	34	12.2
Grade 4	20	12.5	12	10.2	32	11.5
Grade 5	8	5.0	5	4.2	13	4.7
Grade 6	8	5.0	2	1.7	10	3.6
Grade 7	4	2.5	2	1.7	6	2.2
Grade 8	4	2.5	2	1.7	4	1.4
Don't know	4	2.5	9	7.6	13	4.7
Total	160	100.0	118	100.0	278	100.0
Hiri						
Not attending any class	0	0.0	1	1.1	1	0.6
Grade 1	0	0.0	0	0.0	0	0.0
Grade 2	2	2.2	2	2.3	4	2.2
Grade 3	2	2.2	8	9.1	10	5.6
Grade 4	12	13.3	8	9.1	20	11.2
Grade 5	18	20.0	16	18.2	34	19.1
Grade 6	20	22.2	16	18.2	36	20.2
Grade 7	15	16.7	11	12.5	26	14.6
Grade 8	17	18.9	26	29.5	43	24.5
Don't know	4	4.4	0	0.0	4	2.3
Total	90	100.0	88	100.0	178	100.0
Karkar						
Not attending any class	0	0.0	0	0.0	0	0.0
Grade 1	4	1.8	7	3.3	11	2.5
Grade 2	25	11.4	20	9.4	45	10.4
Grade 3	53	24.1	47	22.2	100	23.6
Grade 4	56	25.5	41	19.3	97	22.5

Table 4 (continued)

	Male		Female		Both sexes	
	N	%	*N*	%	*N*	%
Grade 5	46	20.9	45	21.2	91	21.1
Grade 6	21	9.5	34	16.0	55	12.7
Grade 7	5	2.3	10	4.7	15	3.5
Grade 8	4	1.8	5	2.4	9	2.1
Don't know	6	2.7	3	1.4	9	2.1
Total	220	100.0	212	100.0	432	100.0
All sites						
Not attending any class	76	12.6	60	11.9	136	12.3
Grade 1	11	1.8	17	3.4	28	2.5
Grade 2	45	7.4	34	6.7	79	7.1
Grade 3	88	14.5	73	14.5	161	14.5
Grade 4	108	17.8	70	13.9	178	16.0
Grade 5	97	16.0	79	15.7	176	15.9
Grade 6	80	13.2	77	15.3	157	14.2
Grade 7	45	7.4	38	7.5	83	7.5
Grade 8	38	6.3	42	8.4	80	7.2
Don't know	17	2.8	13	2.5	30	2.7
Total	605	100.0	503	100.0	1108	100.0

was 83.4% for all four sites, with the highest proportion reported in Karkar (98.0%) followed by Hiri (95.3%) and Asaro (89.4%), and the lowest in Hides (50.6%). More males than females ever attended primary education, but the differences were not statistically significant, 84.6% of males versus 82.1% of females across the sites, 91.2% versus 87.3%, and 52.5% versus 48.6% in Asaro and Hides, respectively ($p > 0.05$). The same observations were seen in Hiri and Karkar. When 'DK' responses (283 values) were excluded from the analysis, the primary education ever attendance rate among young adult population increased to 85.8% (86.9% for males and 84.6% for females) for all sites.

Data of 17,411 population aged 5–24 and 22,373 population aged 25 or above were included in the analysis of sex ratio at different educational levels as shown in Table 6. Male-to-female student ratios of 5–24 years old increased from the normal level of 102.5 among those reported as 'no schooling' to 107.9 at primary education, and extremely high, 132 at lower secondary education. The trend of increased male-to-female ratios by educational levels was consistently observed across all the sites. The increase in sex ratios by educational level was even more profound in the population aged 25 years or more, from very low level (74.6) among 'no schooling' category to normal level (105) at primary education, very high (159.5) at lower secondary, and extremely high (208.5) at tertiary education ($p < 0.01$).

A total of 30,130 population of working age 15–64 was included in the analysis of employment sector. As shown in Table 7, the proportion of female workers working in the waged non-agricultural sector was only 7.9%, compared with 26.2% among male counterparts ($p < 0.01$). This gender bias was more profound in Hides, where only 6.4% of females compared with 42.5% of males reported working in this sector ($p < 0.01$). By contrast, the proportion of women, who reported doing housework, was almost double than that of men, 57.3% versus 28.5% across all four sites ($p < 0.01$). This gender differential was even larger in Hiri, 72.5% of females versus 27.7% of males.

Table 5 Primary school attendance among young adult population aged 15–24 years by sex and surveillance site, PNG IMR's iHDSS, 2015

iHDSS site	Male		Female		Both sexes	
	N	%	*N*	%	*N*	%
Asaro						
Never attended primary school	74	7.8	92	11.6	166	9.6
Ever attended primary school	860	91.2	690	87.3	1550	89.4
Don't know	9	0.9	8	1.0	17	0.9
Total	943	100	790	100.0	1733	100.0
Hides						
Never attended primary school	586	42.7	602	46.6	1188	44.6
Ever attended primary school	720	52.5	627	48.6	1347	50.6
Don't know	65	4.7	62	4.8	127	4.8
Total	1371	100	1291	100.0	2662	100.0
Hiri						
Never attended primary school	14	1.4	12	1.4	26	1.4
Ever attended primary school	965	94.9	851	95.7	1816	95.3
Don't know	37	3.6	26	2.9	63	3.3
Total	1016	100.0	889	100.0	1905	100.0
Karkar						
Never attended primary school	0	0.0	0	0.0	0	0.0
Ever attended primary school	1937	98.5	1718	97.4	3655	97.9
Don't know	30	1.5	46	2.6	76	2.0
Total	1967	100.0	1764	100.0	3731	100.0
All sites						
Never attended primary school	674	12.7	706	14.9	1380	13.7
Ever attended primary school	4482	84.6	3886	82.1	8368	83.4
Don't know	141	2.7	142	3.0	283	2.8
Total[a]	5297	100.0	4734	100.0	10,031	100.0

[a]Total number of the population aged 15–24 may vary across analyses due to 'missing values'

4 Discussion

This study examined three important aspects of education in PNG: (1) the progress of PNG towards achieving universal education in the period 2000–2015, in comparison with other data sources available in the Pacific region; (2) the role of education as a platform to foster the implementation of national socio-economic development plans in the context of the Sustainable Development Goals, 2015–2030; and (3) a call to action to enhance equal access to primary education and improve the quality of primary education in PNG.

4.1 Progressing towards universal education in PNG

An important outcome of universal education is the ability to read and write among the young adult population aged 15–24 years. The progress of PNG towards the achievement

Table 6 Male-to-female student ratios at primary, secondary and tertiary educations among population aged 5–24 years versus population aged 25+ years, PNG IMR's iHDSS, 2015

Site	Educational level	Population of school aged 5–24							Population finished school aged 25 or above						
		Male		Female		Both sexes		M:F ratio	Male		Female		Both sexes		M:F ratio
		N	%	*N*	%	*N*	%		*N*	%	*N*	%	*N*	%	
Asaro	No schooling	92	5.1	112	6.8	204	5.9	82.1	750	32.6	1185	51.3	1935	42.0	63.3
	Primary education	1410	78.8	1378	83.2	2788	80.9	102.3	1104	48.0	900	39.0	2004	43.5	122.7
	Lower secondary	276	15.4	159	9.6	435	12.6	173.6	376	16.3	199	8.6	575	12.5	188.9
	Upper secondary	5	0.3	2	0.1	7	0.2	NA	10	0.4	1	0.0	11	0.2	NA
	Tertiary education	7	0.4	5	0.3	12	0.3	NA	61	2.7	24	1.0	85	1.8	NA
	Total	1790	100.0	1656	100.0	3446	100.0	108.1	2301	100.0	2309	100.0	4610	100.0	99.7
Hides	No schooling	1063	49.7	1035	53.2	2098	51.3	102.7	1650	54.5	2027	70.9	3677	62.5	81.4
	Primary education	959	44.8	830	42.6	1789	43.8	115.5	899	29.7	679	23.7	1578	26.8	132.4
	Lower secondary	110	5.1	78	4.0	188	4.6	141	414	13.7	138	4.8	552	9.4	300
	Upper secondary	2	0.1	2	0.1	4	0.1	NA	6	0.2	3	0.1	9	0.2	NA
	Tertiary education	6	0.3	2	0.1	8	0.2	NA	56	1.9	12	0.4	68	1.2	NA
	Total	2140	100.0	1947	100.0	4087	100.0	109.9	3025	100.0	2859	100.0	5884	100.0	105.8
Hiri	No schooling	43	2.6	35	2.3	78	2.5	122.9	14	0.6	26	1.3	40	0.9	53.8
	Primary education	1051	64.2	1037	68.8	2088	66.4	101.4	585	25.7	760	37.8	1345	31.4	77
	Lower secondary	466	28.4	388	25.7	854	27.2	120.1	1044	45.8	862	42.9	1906	44.5	121.1
	Upper secondary	34	2.1	23	1.5	57	1.8	NA	81	3.6	45	2.2	126	2.9	NA
	Tertiary education	44	2.7	24	1.6	68	2.2	NA	553	24.3	317	15.8	870	20.3	NA
	Total	1638	100.0	1507	100.0	3145	100.0	108.7	2277	100.0	2010	100.0	4287	100.0	113.3

Table 6 (continued)

Site	Educational level	Population of school aged 5–24							Population finished school aged 25 or above						
		Male		Female		Both sexes		M:F ratio	Male		Female		Both sexes		M:F ratio
		N	%	*N*	%	*N*	%		*N*	%	*N*	%	*N*	%	
Karkar	No schooling	155	4.4	138	4.3	293	4.4	112.3	192	4.8	257	7.2	449	5.9	74.7
	Primary education	3089	86.9	2787	87.7	5876	87.3	110.8	2829	70.4	2813	78.7	5642	74.3	100.6
	Lower secondary	271	7.6	223	7.0	494	7.3	121.5	797	19.8	451	12.6	1248	16.4	176.7
	Upper secondary	9	0.3	14	0.4	23	0.3	NA	34	0.8	8	0.2	42	0.6	NA
	Tertiary education	30	0.8	17	0.5	47	0.7	NA	164	4.1	47	1.3	211	2.8	NA
	Total	3554	100.0	3179	100.0	6733	100.0	111.8	4016	100.0	3576	100.0	7592	100.0	112.3
All sites	No schooling	1353	14.8	1320	15.9	2673	15.4	102.5	2606	22.4	3495	32.5	6101	27.3	74.6
	Primary education	6509	71.4	6032	72.8	12,541	72.0	107.9	5417	46.6	5152	47.9	10,569	47.2	105.1
	Lower secondary	1123	12.3	848	10.2	1971	11.3	132.4	2631	22.6	1650	15.3	4281	19.1	159.5
	Upper secondary	50	0.5	41	0.5	91	0.5	NA	131	1.1	57	0.5	188	0.8	NA
	Tertiary education	87	1.0	48	0.6	135	0.8	NA	834	7.2	400	3.7	1234	5.5	208.5
	Total	9122	100.0	8289	100.0	17,411	100.0	110	11,619	100.0	10,754	100.0	22,373	100.0	108.0

NA non-applicable as the small numbers of observations, which does not allow provide reliable estimates of male-to-female ratios

Table 7 Proportion of population of working age 15–64 years working in the waged, non-agricultural employment[a] by sex and surveillance site, PNG IMR's iHDSS, 2015

Site	Employment sector	Male		Female		Both sexes	
		N	%	*N*	%	*N*	%
Asaro	Waged in non-agriculture	315	10.58	107	3.69	422	7.18
	Waged in agriculture	535	17.98	299	10.30	834	14.19
	Unwaged in agriculture	1368	45.97	1702	58.65	3070	52.23
	Home duties and house work	754	25.34	790	27.22	1544	26.27
	Don't know	4	0.13	4	0.14	8	0.14
	Total	2976	100.00	2902	100.00	5878	100.00
Hides	Waged in non-agriculture	1855	42.51	271	6.42	2126	24.77
	Waged in agriculture	117	2.68	86	2.04	203	2.37
	Unwaged in agriculture	1184	27.13	1268	30.05	2452	28.57
	Home duties and house work	1166	26.72	2558	60.63	3724	43.39
	Don't know	42	0.96	36	0.85	78	0.91
	Total	4364	100.00	4219	100.00	8583	100.00
Hiri	Waged in non-agriculture	1460	57.41	651	24.05	2111	40.21
	Waged in agriculture	4	0.16	3	0.11	7	0.13
	Unwaged in agriculture	355	13.96	56	2.07	411	7.83
	Home duties and house work	704	27.68	1962	72.48	2666	50.78
	Don't know	20	0.79	35	1.29	55	1.05
	Total	2543	100.00	2707	100.00	5250	100.00
Karkar	Waged in non-agriculture	395	7.26	147	2.95	542	5.20
	Waged in agriculture	713	13.10	289	5.81	1002	9.62
	Unwaged in agriculture	2577	47.34	1365	27.44	3942	37.83
	Home duties and house work	1748	32.11	3168	63.68	4916	47.18
	Don't know	11	0.20	6	0.12	17	0.16
	Total	5444	100.00	4975	100.00	10,419	100.00
All sites	Waged in non-agriculture	4025	26.26	1176	7.94	5201	17.26
	Waged in agriculture	1369	8.93	677	4.57	2046	6.79
	Unwaged in agriculture	5484	35.78	4391	29.66	9875	32.77
	Home duties and house work	4372	28.52	8478	57.27	12,850	42.65
	Don't know	77	0.50	81	0.55	158	0.52
	Total	15,327	100.00	14,803	100.00	30,130	100.00

[a]Waged non-agricultural sector includes office clerks, professional, manager, technician, skilled craft, trader, assembler, machine operator, sales and services staff, mining, construction, transportation worker, and military personnel

of universal education led by the education sector over the last two decades has been reflected in the primary school attendance rate of 83% among the young population. This is a reasonable proxy indicator of literacy among young adults in PNG context. This figure is consistent with those reported in other studies. The assessment of ability to read and write conducted by PNG IMR in 2016–2017, using surveillance data available from the iHDSS, showed that 63% among women of reproductive age, 15–49 years (PNG Institute of Medical Research 2016) and 72% among men of working age, 15–64 years (PNG Institute of Medical Research 2017). The literacy rate was reported at 70% among the general

population in 2009 (World Bank and United Nations 2013) and 61% among the adult population aged 15 or above in 2011 (National Statistics Office 2012). Another indicator of the improvement in access to universal education is the decline of the proportion of the population, who 'never attended primary school', as shown in this study, from 13% among young adults aged 15–24 years (Table 5) to 12% among children aged 15 (Table 4), and 2.5% among children aged 7 (Table 3), suggesting that the younger generation has better access to education than the older generation. Furthermore, the proportion of the population who reported 'no schooling' has halved, from 27% among the population aged 25 or above to about 15% among the population aged 5–24 (Table 6), suggesting an improvement to enhance access to education in PNG over the last two decades.

Findings from this study show there is room for improvement in the education data for reporting universal access to primary education in PNG. Although, the education sector was able to report national education indicators, i.e. gross enrolment rate at primary education, it failed to report the MDG indicator on net enrolment rate. While gross enrolment rate only considers the school enrolment status of children, i.e. whether or not children are enrolled, net enrolment rate takes into account not only enrolment status, but also what school grade children are enrolled in and the child age at that enrolment. In other words, the MDG education indicator captures if the children are enrolled at their right age.

The surveillance data point to a relatively high net enrolment rate in primary education among children aged 9–14 years (60%), but very low net enrolment into Grade 1 among children aged 7 years (30%). Although primary schools are available and accessible in the surveillance sites where most of the children live, some children of school age never go to school. The reasons for this could be poverty and disability. However, a lack of interest from some traditional families in the necessity of primary education and the misperception in some rural communities about the importance of primary education need to be addressed. Our more recent data suggest that, as the national economy comes under stress, growing poverty and hunger may reverse the gains, with primary school attendance falling in some surveillance sites. For example, in Hiri site in Central Province, about 40% of parents/caregivers of children under 5 years reported food shortage experience in the past 12 months (PNG Institute of Medical Research 2019).

It is noteworthy that 35% of children in the age group of 9–14 years were still attending elementary school, suggesting that late enrolment in primary education is common across all the surveillance sites. Even after taking into account the 5.6% of children at 7 years of age enrolled in Grade 3, the gross enrolment rate of children aged 7 years in any school grade of primary education would still only be about 35%. This figure is comparable with data reported in the 2010 PNG Household Income and Expenditure Survey, according to which, the gross enrolment rate at primary education was of 35.9% (World Bank 2010). This figure is much lower than 75.0% reported by the Department of Education in 2014, using school administrative data (PNG Government 2004). Also according to this department, there were 1,276,030 children aged 7 in PNG in the period 2000–2007 and there were 1,180,557 children enrolled in Grade 1 in 2007 nationwide, resulting in the gross enrolment rate of 92.5% (National Executive Council 2009). However, these data probably included many children, aged 8 or above being enrolled in Grade 1 in the school year 2007.

The large difference between the net enrolment rate of children aged 7 years in Grade 1 (28%) in 2015 as identified by this study and the gross enrolment rate of children of all ages in Grade 1 (75%) in 2014 as reported by the Department of Education affirms the common trend of laterenrolment in Grade 1. The general late enrolment of children into Grade 1 would increase the backlog of un-enrolled children, resulting in a higher number of children aged 8 or above entering Grade 1 in the following years, increasing

the burden on the 7-year-old cohort starting Grade 1, and hence further lowering the net enrolment rate in Grade 1. Over the longer term, it will further decrease the completion rate of primary education, meaning that many children would not be able to complete Grade 8 by the age of 15.

Late enrolment in primary education has a negative association with primary completion in PNG. Nearly, 85% of children aged 15 years reported attending primary school (between Grades 1 and 7), but only 7.2% of them were enrolled in Grade 8, the final Grade of primary education in PNG, suggesting that a very low proportion of children would be able to complete primary education by the age of 15. These figures indicate the negative impact of late enrolment and high repetition, which is associated with low quality services at primary schools. The national data also indicated the same issues when only 62% of children, who were enrolled at Grade 1 in 2002, completed Grade 6 in 2007 (National Executive Council 2009).

The late enrolment issue requires immediate intervention, and it must be addressed systematically to improve the quality and outcome of education services in PNG. Improving the net enrolment rate in Grade 1 would be the first step towards improving the net enrolment rate in primary education. Net enrolment of children in Grade 1 and the completion of primary education need to be closely monitored as part of the implementation of the national education plans. The causes for late enrolment, interruptions to school enrolment, high rate of repeating grades, and poor completion rate of primary education must be further investigated to develop suitable approaches to further improvement in universal primary education in PNG. As observed in the surveillance sites, there is likely local variation in the causes of these educational experiences which must be identified and addressed. The reasons for the delay in enrolment in locality must be addressed, and parents and carers of young children need to be encouraged and supported to enrol their children into Grade 1 at 7 years of age. Tarabini et al. (2010) argued that education policies should balance between educational priorities, placing the completion of secondary education in the forefront. However, given the above findings, we argue that access to and coverage of primary education must be prioritised in PNG to achieve the national and international set targets of universal education.

There is a need for policy improvements to achieve equal access to universal education and close the gender gap in education. The sex ratios of students attending primary, secondary, and tertiary education are good indications of gender equality in access to education services. Findings of the study showed that the male-to-female student ratio at the lower secondary school declined from the very high level of 160 among the population aged 25+ years to 130 in those aged 5–24 years. By contrast, the male-to-female student ratio among those reported as 'no schooling' increased from the very low level of 75 among the older population aged 25+ years to the normal level of 102 among the younger population aged 5–24 years (Table 6). These findings are clear evidence of the improvement in gender equality in access to education services over the last two decades. However, gender inequality remains across all surveillance sites, particularly at the tertiary education, where the male-to-female ratio was well above the level of 200 among the population aged 25+, meaning only one woman per every two men attaining this educational level. These observations are consistent with the previous study (World Bank and United Nations 2013).

A long-term outcome of education is the participation of the labour force in the skilled employment sector. Women's empowerment and gender equality are priorities across national socio-economic development programmes in PNG. However, our findings showed that gender inequality in employment is evident. The proportion of men of working age

15–64 years engaged in the waged non-agricultural sector was threefold higher than women (Table 7). The present situation in PNG, with low levels of women participating in the waged non-agricultural sector, requires attention to develop women's capacity and increase opportunities for women to take part in such employment. Vocational training and tertiary education need to receive more attention from policy-makers and require more investment to develop the labour market with more skilled occupations for young people. Longitudinal data series are necessary to monitor the implementation of SDGs and to evaluate the impact of education programmes and policies at the national and local levels (Faul 2014; Kamanda and Sankoh 2015).

4.2 Comparison with enrolment rates in primary education in Pacific countries

Other PICTs have mixed records of attainment in education, with substantially increased enrolment rate in primary education between 2005 and 2015. According to UNESCO, the net enrolment rate for primary education in PICTs was 89% in 2012, suggesting that the majority of children in the Pacific region were currently enrolled in primary school. However, the Pacific has the greatest differential between gross and net enrolment rates in the world (UNESCO 2015). Some countries had a gross enrolment rate as high as 115% in 2012, indicating that the enrolments of many children are not age-appropriate or at least 15% of children who were enrolled in primary school in that school year were not in the age group specified for primary education. It can be assumed that most of these children were enrolled over age or were late enrolments. A closer examination of the PNG data will help identify the drivers of this regional trend.

According to the World Bank's estimates, all PICTs, except for Nauru and Tuvalu, recorded a gross enrolment rate above 100% in 2015 (see Fig. 2). PNG is the country with the gross enrolment rate increased most rapidly, by 50%, from the level of below 60% in 2005 to above 110% in 2015, suggesting a significant increase in the number of children enrolled in primary education over the period 2000–2015. All PICTs reported net enrolment rates above the level of 70% in 2015, with the highest rates of above 90% recorded in Fiji, Samoa, and Kiribati (see Fig. 3). However, six countries including Tonga, Vanuatu, Tuvalu, Micronesia, Marshall Islands, and Salomon Islands experienced a decline (about 10%) in their net enrolment rates over the last decade.

The performance of the PNG education sector appears exceptional, with a significant increase in the net enrolment rate at primary education, from 50% in the 2000s to 85% in 2015. Compared with our finding (58%), the data show a large differential between data reported at the national and sub-national levels. As shown in Fig. 4, the completion rates at primary education varied widely across the PICTs in 2015. While five countries, including Fiji, Tuvalu, Tonga, Samoa, and Kiribati, were able to attain the rates above 90%, four other countries: Micronesia, Marshall Islands, Solomon Islands, and Vanuatu reported completion rates of above 70%. PNG reported the lowest completion rate in primary education (55%), with no improvement recorded over the period 2000–2015 (World Bank 2018). These data also highlight the consequence of late enrolment in primary education in PNG, as discussed above.

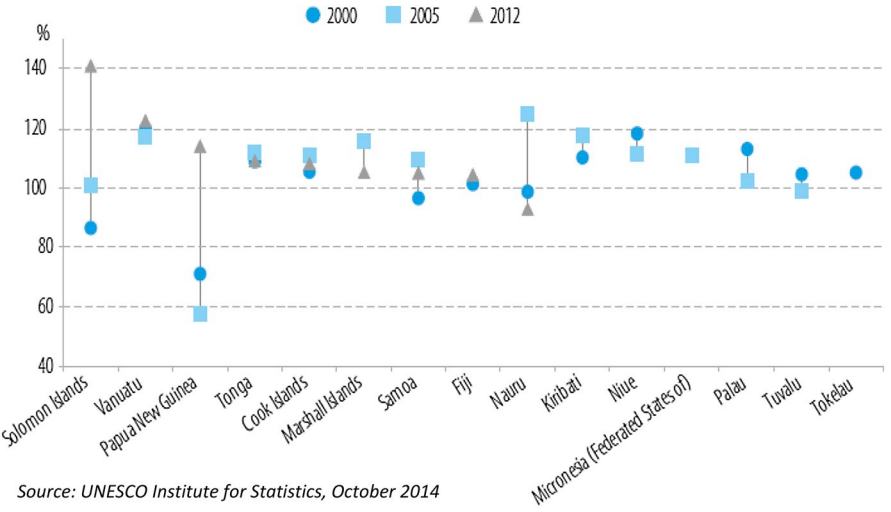

Fig. 2 Gross enrolment rates at primary school in Pacific Island Countries and Territories, 2000–2012

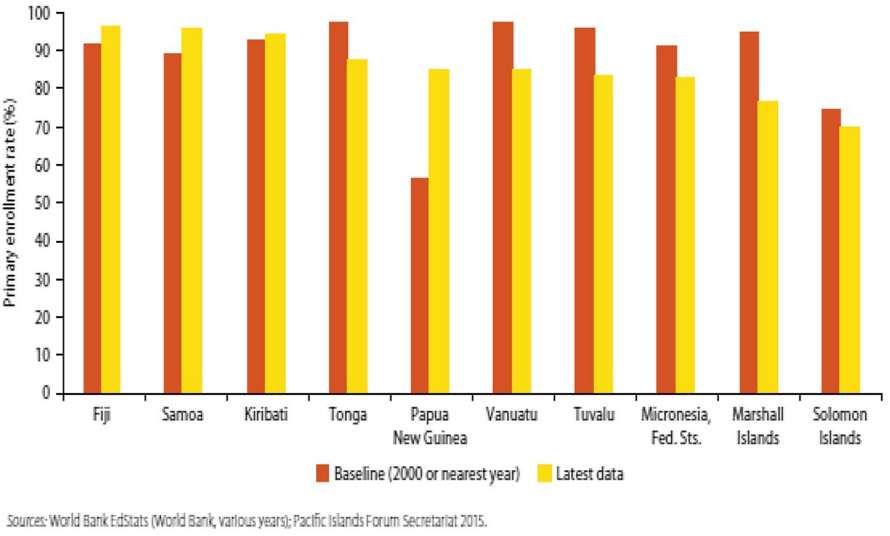

Fig. 3 Net enrolment rates at primary education in Pacific Island Countries and Territories, 2015

4.3 Understanding the challenges to universal education in PNG

Despite the cultural diversity and the differences across geographical regions, PNG faces several challenges with regard to universal education that require thorough understanding to work out practical and possible solutions. From the data above, there are five key challenges in PNG. The first is to ensure enrolment, retention, and completion of primary education is above 90% (ensuring less (ensuring less than 10% children out of primary school). Second, equal access to primary education, particularly for children in

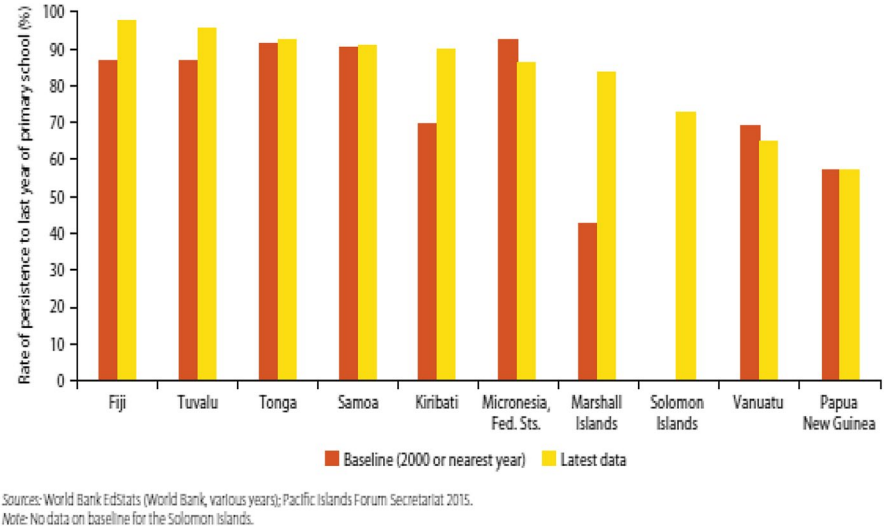

Fig. 4 Completion rate at primary education in Pacific Islands Countries and Territories, 2015

rural remote areas, from poor families, with disabilities (gender gaps at secondary and tertiary education), needs to be prioritised. Third, there is a need to improve **e**fficiency in the primary education system, especially around late enrolment, high repetition, overload classrooms, high dropouts, and re-illiteracy after leaving primary school. Four, improving the quality of primary education, in particular low performance in literacy and numeracy, irrelevance of curricula, and the high turnover of staff. And five, securing funds and skilled staff, including trained teachers and educational managers.

To overcome these challenges, there is a need to understand the socio-economic determinants of primary education in PNG. There is a wide range of socio-economic, environmental, and political challenges, plus the vulnerability to natural disasters. These have affected the achievement of the MDGs in PNG that continues to present challenges to sustainable development of PNG. Lessons learned from global educational programmes of the UN indicate that three social determinants of primary education among children are: (1) Household wealth: across 64 LMICs, children from the poorest household quintile were seven times less likely than children from the wealthiest quintile to attend primary education. For some countries in East Asia and Pacific, children from the wealthiest households were five times more likely to attend primary education than those from the poorest; (2) Mother' education: children born to mothers who completed secondary education were five times more likely to attend early childhood education programmes than those whose mothers completed only primary education or never attended school; and (3) Social stability: more than two-thirds of children living in 33 countries affected by conflicts or natural disasters were not enrolled in preschools or primary schools (UNICEF 2019). Our observations from the operation of the health surveillance systems in PNG also support these findings.

4.4 Education as a platform for sustainable development of PNG

Education is an important platform for sustainable development of many LMICs. PNG needs concerted efforts to secure universal access to education for all children by 2030, including the country's progress in the implementation of the Sustainable Development Goal (SDG) 4: 'Ensure inclusive and equitable quality education and promote life learning opportunities for all' by 2030. The SDG target 4.1 states that: 'By 2030, ensure that all girls and boys complete free, equitable, and quality primary and secondary education, leading to relevant and effective learning outcomes' (Inter-Agency and Expert Group on SDG Indicators 2017). The SDG 4 offers a compelling opportunity to amplify international support and national resource in PNG to meet the goal of universal education.

PNG has a vision and opportunity to foster change. The perspectives and aspirations of the new SDGs are of much interest to the PNG government, development partners, and local communities. The PNG government needs to bring all its efforts together to continue this 'unfinished development agenda'. While universal education has been recently integrated into the Medium Term Development Plan 2018–2022, the PNG government also prioritise gender equality and social inclusion in access to vocational training and employment to support young women and girls in other development plans. It is important to recognise that the social instability, further constrained by limited human resources at the local level, could jeopardise the success of these plans. More importantly, the PNG government need to replace short-term targets with long-term sustained benefits, taking into account the variations in geographical regions, and urban and rural circumstances while considering the diversity of demographic characteristics of the population, to ensure not only the improvement in education at the national level, but also flexibility in implementation of the universal education polices at the sub-national level (ADB, UN ESCAP and UNDP 2012–2013). This also requires revisiting educational indicators at the national and sub-national level over time to investigate whether and to what extent the provincial and local government's commitments are implemented, the impacts of public policies, and the outcomes of socio-economic programmes they are supposed to deliver. This is another important aspect that will help realise educational targets, contributing towards sustainable development of PNG.

Universal education can be only sustained if gender inequality in education is addressed. Lessons learned from Asia and Pacific countries show that partnerships between government agencies and development partners are necessary to have an equal education policy (Cassity 2010). Effective education policy must tackle gender inequalities (Tarabini and Jacovkis 2012). The current discussions on public policy in PNG suggest that more efforts are needed to develop new partnerships in education. Sector-wide approaches and gender equality are mainstreamed in education policies in many countries in the Pacific region, including PNG, but local practices indicate that little progress has been made (McCormick 2014). While universal education alone cannot achieve sustainable development agendas, the education sector can play a more important role in coordinating socio-economic development initiatives to reinforce the implementation of equal education policy at the local level.

The improvement in education for PNG women has important implications, not only for advancing the roles of women in PNG society, but also for improving the child health status in PNG. Previous studies have showed that mothers' education has an influence on child health, reinforcing the link between parental education and the survival of children

under 5 years of age (Gakidou et al. 2010). In this review, the authors assessed the contribution of improvements in women's education to reduction in global child mortality. They found that among 8.2 million fewer deaths in children under 5 years of age, 4.2 million (51.2%) could be attributed to increased educational attainment in women of reproductive age (15–44 years) over the period 1970 and 2010. Given the high child mortality in PNG, improving the education of PNG women and girls could contribute to improving child survival in the long term (Crossley and Sprague 2014). Our findings showed that PNG women and girls still face gender inequality in education, which tends to accelerate gender inequalities in health. As observed in previous studies across Asia and the Pacific region, people with higher education levels tend to have better health because they have greater access to health resource, resulting in better knowledge of health prevention, nutrition, and diet. Importantly, women's participation in the labour force has positive effects on their health. The links between women's education levels, employment, and maternal health, among other development indicators have been well established in PNG (PNG Government and The United Nations 2015).

5 Call for actions

In this paper, we call for immediate actions to be taken and driven by a long-term vision towards achievement of SDG and the goal of universal education in PNG by 2030.

5.1 Improving quality of education

After rapid increases in enrolment under the MDGs, it has remained challenging to improve the quality of education. Efforts to improve students' completion of the primary education have been hampered by high rates of late enrolment, repetition, and dropout. The results from national examinations as well as from the Pacific Islands Literacy and Numeracy Assessment indicate that many PICTs may not be equipping students with the necessary foundational skills for leading prosperous and fulfilling lives (UNESCO 2015). Like many PICTs, the quality of education remains a public concern in PNG, despite the government's emphasis on improving the quality of education services. Although development partners are working closely with the PNG government to improve education quality, overall performance of students remains low at all education levels. Challenges in the PNG education sector persist in the shortage of qualified teachers, educational managers and other professional staff, and the lack of adequate curricula, needed for students to prepare for future employment, livelihoods, and life-long learning to become a useful member of the society and good citizen of the country. The PNG education system has made efforts to scale up the provision of basic education, i.e. the free education policy, but there is little investment for improving the quality of primary education services, particularly in rural and remote areas. Like most of all PICTs, the PNG education sector spent more than 90% of their recurrent cost at primary schools on salaries, leaving little for investment elsewhere (World Bank 2018). As a result, there have been an increased number of children attending primary education, as reflected in the high gross enrolment rate, but a low net enrolment rate at primary schools, overloaded classrooms, particularly in urban areas, further hinders the quality of the primary education system as a whole. The PNG government need

to reprioritise to ensure budgets is adequately allocated to improve the quality of services across the primary education systems. Demographic characteristics, distribution, and projection of the child population by rural–urban sector, age groups, i.e. preschool, primary, and secondary should be taken into account when planning programmes and policies for educational infrastructure and human resource development.

Languages of instruction have put further constraint on improving the quality of primary education in PNG. By educational law and policy, all instructions in the formal education system, from elementary to primary education and upward, are in English. However, most children learn and speak a local language such as Tok Pisin, Topples, and Motu at home and are only exposed to English when they start elementary schooling. PNG teachers, particularly those who work in rural areas, often use a local language to assist students to understand basic educational concepts in English curricula at elementary and primary schools. The use of different languages at the same time in elementary and primary schools may have made education services more difficult to deliver and harder for PNG children to learn new knowledge and skills, limiting the quality of education.

Improving the quality of elementary–primary education will require a broad coalition of partners supporting multiple service providers—including public, private, and non-profit providers such as religious and civil society organisations. Putting in place an effective quality assurance framework for the elementary–primary education programmes across all education providers and building national capacity to use data for monitoring and evaluation of educational quality are important, rather than having many parallel educational quality assurance systems. The Department of Education plays a critical role in this process, with greater emphasis on quality assurance and implementation of policies and practices that enables education service providers to produce better education outcomes. As universal education programmes are scaling up across PNG, the department needs to develop a monitoring and evaluation framework, with the focus on quality, ensuring that schools that are most in need of improving the quality of education services have access to public funding. Families and communities need to be engaged in the process, as they support children's learning at home and drive the mandate for quality programmes for their children. The support of parents and caregivers is vital for reaching this objective.

5.2 Focusing on elementary and primary education

Children who are now in the age range of 5–14 years would become young adults, aged 15–24, by 2030. These children are now completing their elementary–primary education. This highlights the importance of elementary–primary education and suggests that the investment in elementary–primary education today is one of the best investments for PNG, to ensure the future generations acquire the knowledge and skills necessary for them to succeed and lead the country in the future. This is a crucial moment for PNG to scale up national resources and mobilise international support to increase the financial investment, political will, and human capacity needed to expand equitable access to quality elementary–primary education programmes. Elementary and primary educations should be a routine part of every child's education, an indispensable component of the education system, as an instrument for closing achievement gaps and driving progress on SDG 4 in PNG (WHO West Pacific Region 2014).

Elementary–primary schooling offers a vital foundation for children's learning and sets a strong foundation for children. The investment in elementary–primary education would yield strong returns for all levels of education. If the PNG government today aspire to have

a competitive workforce tomorrow, they need to invest in elementary–primary education. All children should start elementary school by enrolling into Grade 1 at 7 years old, when most of them are ready to learn. This will reduce late enrolment and overload enrolment, contributing to improving quality of primary education, reducing grade repetition and school dropout, increasing the primary education completion rate, and retaining competencies in reading and maths after primary school. Efforts should be made to reduce or remove financial burden on the poorest families to ensure that all children are enrolled at right time.

Lesson learned from successful education systems in other East Asia and Pacific countries show that universal education is an effective strategy for promoting economic growth, as it builds essential knowledge and skills for future employment, closing gender gaps and socio-economic inequities, and contributing to the growth of national economies. Countries with high numbers of children not in primary education are missing a critical investment opportunity and are at risk of suffering deep inequalities. Studies in these countries suggest that children enrolled in at least one year of primary education were more likely to develop the critical skills for success in school. They were less likely to repeat grades or dropout of school and therefore more able to contribute to peaceful societies and prosperous economies when they reach adulthood. A high-quality elementary–primary education will not solve all problems, but it can make a change to some extent, by providing a solid platform for realising the potential of all children (United Nations 2017).

5.3 Increasing effectiveness and efficiency of funds for elementary–primary education

Universal access to elementary–primary education in PNG is a reachable target, but it requires practical and possible solutions to overcome the five key challenges discussed above while setting a long-term vision. It is recommended that funding be provided for intervention in critical points that can help address barriers to quality and equitable universal primary education. By prioritising and allocating adequate financial resources, the PNG government will be able to build an effective and efficient elementary–primary education system that can place more than two millions of children aged 5–14 years on the path to fulfilling their potential.

Globally, about 6.6% of domestic education budgets were dedicated to pre-primary education, and 40% of countries allocated less than 2% of their education budgets to this sub-sector in 2017. Across East Asia and Pacific, the financial investment varied, with an average of 5.3% of education budgets allocated to pre-primary education. In many PICTs, spending on education is high, with the education sector consistently receiving the largest share of national budgets. Many PICTs spend nearly twice as much of their budgets on education as other low-income countries. Their expenditures on primary education per capita are much greater than those of many low-income countries in Africa. In the recent report, UNICEF urge governments to make at least one year of quality pre-primary universal education compulsory for all children and commit at least 10% of their national education budgets to scale up early childhood education (UNICEF 2019).

In PNG, the education sector got the biggest allocation of the 2018 national budget, with a budget of approximately 3.1 billion Kinas, including more than 860 million Kinas for elementary and 2.23 billion Kinas for primary education. However, the use of this funding is a key factor in producing good education outcomes. More than 65% of the PNG education budgets for elementary in 2018 was for personnel employment (Department of

Education 2016). Tuition-free education policies have been successful in expanding access to universal education, attracting more children to go to primary schools in PNG. However, this was achieved at the cost of downgrading in the quality of education services. A shortage of qualified teachers, inadequate infrastructure, overload of students, and poor education materials are often seen in primary schools, particularly those in urban areas. Poor education services at the elementary–primary education are further hampered by the poor coordination of financing flows, weak governance, and inefficient administration at the sub-national level. These issues need to be addressed.

In addition, external funding for education is dependent on bilateral aid, which has declined significantly in recent years or skewed away from areas of education. For example, more than half of the education assistance from Australia's Department of Foreign Affairs and Trade goes to scholarships (World Bank 2018). The education sector needs to diversify funding to boost financial aid to elementary–primary education to at least 10% of international education investments, complementing the public resource for universal education. The PNG government and the ministry of education should consider fostering partnerships with non-state education providers, including civil society, the private sector, families, and communities, to maximise learning opportunities for all children at elementary–primary education.

New funding mechanisms such as South–South Cooperation (SSC) can be considered to enhance access to innovative and affordable education initiatives and programmes. SSC is one of the various forms of financial assistance, technical assistance, and knowledge sharing and much of it comes from other countries within the region. Many PICTs have included SSC in their national development frameworks, including indicators for measuring the developmental outcomes and impacts of SSC as a new modality of international cooperation. Like many PICTs, PNG has experienced growing resources to boost socio-economic development. The SSC in PNG is growing and brings greater access to financial resource for development, i.e. Chinese financial assistance to PNG has increased almost threefolds in the period 2005–2017 and China was estimated as the fifth largest provider of grants to PNG in 2012. However, the experience of PNG has also highlighted some issues such as the differences in programming, operation, and disbursement, adding further complexity to PNG's development cooperation management systems (Asia-Pacific Development Effectiveness Facility 2014). Capacity building, training, and other technical assistance should be the keys of SSC in education, with commitment to work with local institutions and ensure the transfer of knowledge and expertise to the elementary–primary education.

The allocation and utilisation of available resources need to be more equitable, by improving the coordination of national and sub-national budgeting while building accountability and capacity for the effective implementation of elementary–primary education programmes. Regular tracking expenditures to pinpoint programme areas that need the most improvement while closely monitoring of financial gaps is crucial to ensure the effective and efficient use of the fund. Building effective coordination at the national and sub-national levels to ensure resources is efficiently utilised and the yield greatest impact to universal education (Global Steering Committee: SDG4/Education 2018). The PNG government needs to secure 10% of the national education budgets to elementary–primary education to enhance the education services in this sub-sector. The education sector should commit at least 25% of their recurrent costs for operation of the elementary–primary systems for non-salary expenditures such as training for teachers, curriculum development, teaching, and learning materials to ensure the quality of education services at this level.

6 Conclusion

There has been considerable improvement in access to universal education and gender equality in PNG over the last two decades. However, males still have better access to education services and attain higher education levels than females. Furthermore, women of working age (15–64) are still less likely engaged in waged non-agricultural employment than male counterparts. The next 15-year period of the SDG allows further opportunities for PNG to address these gaps in achieving universal education, gender equality, and poverty reduction. While the current PNG government is reprioritising efforts to carry out this global development agenda, the international community can learn from lessons and experiences of PNG.

The iHDSS provided data for monitoring and evaluation of the implementation of the MDGs in PNG at the sub-national level, particularly for tracking the country's progress in three important development areas: employment, universal education, and gender equality in the surveillance sites. The results provided insights into the implementation of this global development at localities of PNG. The study also demonstrated the utility of the surveillance data for monitoring and evaluation of the impact of national socio-economic development programmes, a business case for improving data collection, and reporting data in PNG. Using this data source, there have been reflections on its effectiveness in the last 15 years to refine the socio-economic development strategies and address the variations between the national and sub-national levels, and across the different geographical regions of the country.

The health and demographic surveillance system is a valuable investment in PNG. The PNG government has scaled up the system nationwide to collect more intensive and comprehensive data on health, epidemiology, and demography (CHESS programme) to meet the country's data needs to inform sustainable development. This need has been heightened in the context of SDG 2030 and underpins the implementation of PNG's Vision 2050. A high level of political support and long-term funding commitment of the PNG Government are crucial to sustain the surveillance system.

Further strengthening the national capacity and human resources of PNG IMR in data collection, analysis, and reporting is crucial to sustain the surveillance system. PNG IMR's strategic partnership with government agencies and development partners need to be further strengthened. The institute's research collaboration with international and local institutions and the private sector needs to be more diversified. This will allow the surveillance system to play a more active role in tracking and reporting the country's progress towards achieving the international and national development targets in PNG.

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