

WOSERA DSS, PAPUA NEW GUINEA

1. Physical Geography of the Wosera DSA

Figure 1L Locations of Wosera DSS

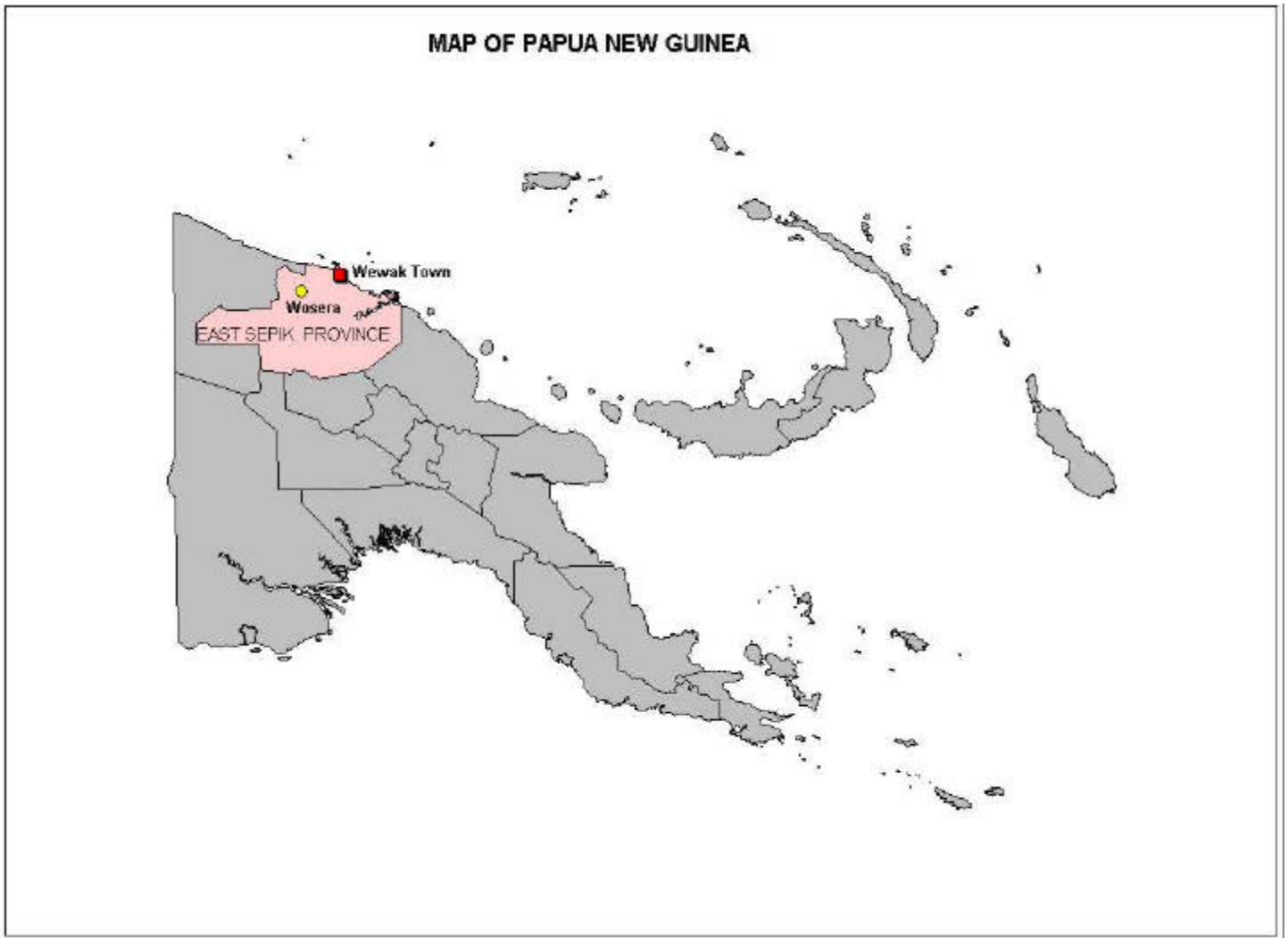


Figure 1b: Location Map of Wosera Villages

The Wosera DSA is part of the Wosera – Gawi district in the East Sepik Province of Papua New Guinea. It lies approximately 75 km WSW of the provincial capital Wewak and 15-20 km S of the local administration centre in Maprik (Figure 1 a).

The DSA is situated at 50-100m above sea level on the large alluvial plain situated between the Torricelli Mountains in the North and the flood plain of the Sepik River in the South. The area consists of large expanse of grassland transected by the Amagu and Nanu rivers and their minor tributaries. Most settlements and garden areas are situated in the lightly forested areas that line the rivers and streams (see Figure 1 b). Road access to the area is either from the unsealed Maprik – Pagwi road that traverses the DSA or the Maprik – Drikikir road. A number of smaller, drivable roads link villages within the DSA. The DSA contains a total of 30 villages each consisting of several distinct hamlets. The hamlets are surrounded by subsistence garden and small cash crop plantings (mainly vanilla and cocoa)

2. Wosera DSS procedures

2.1 Introduction to the Wosera DSS Site

- a) ***History of Wosera DSS:*** The Wosera DSS was set up in 1990 as part of a larger research program for Malaria Vaccine Epidemiology and Evaluation in Papua New Guinea^{1, 2}. It started with baseline investigation into malaria epidemiology and immunology investigations in 9 villages surrounding the Kunjigini Health Centre^{3, 4}, leading to a phase IIb trial of a 3 component malaria vaccine in 1999^{5, 6}. The enormous value of the DSS for malaria and other health research was quickly realised and in order to have capacity to concurrently run several studies in the area, the DSS area rapidly expanded to 30 villages in 1995. The expansion went in hand with the building of extensive facilities both in the Wosera DSA and at the IMR field base in Maprik.

Set-up of the Wosera DSS: The PNGIMR maintains an extensive field base in Maprik, 15 km north of the Wosera DSS, as well as two field station within the DSS. The Maprik base contains the entire DSS administration, a laboratory building, offices with phone, fax and internet connections as well as housing for visiting scientist and local IMR staff. In total the IMR employs over 100 staff at Maprik. In the vicinity of the two health centres within the Wosera DSS, Kunjigini and Kaugia, the IMR has built basic field laboratories and accommodation for visiting scientist and local IMR staff. Demographic reporters and supervisors were chosen from the local population and reside in their respective villages. In order provide logistic support for the DSS the IMR also has a branch office in the provincial capital Wewak. Wewak is site of a major domestic airport and the Wewak branch handles transport arrangements, supplies and sample shipments to and from the DSS and also provides accommodation for transiting staff.

2.2 Wosera DSS data collection and processing

Demographic and routine data collected consists of:

- b) **Yearly complete population censuses:** Planned by demography supervisor at IMR Maprik and carried by IMR staff in order to cross-check regular reporting of village based demography reporters. The annual census will also record newly built houses, GPS their locations and assign new house numbers if necessary.
- c) **Fortnightly updates:** 40 Village based demography reporter controlled by 4 specially trained reporter supervisor record any demographic events such as in- & out-migration, births, deaths and pregnancies. The data collected are sent to the demography supervisor at IMR Maprik fortnightly.
- d) **Verbal autopsies:** Verbal autopsies are conducted following every death reported by medically trained IMR staff
- e) **Morbidity surveillance:** A morbidity surveillance system is maintained at both health centres within the DSA. All patients seen by the health centre staff and their diagnosis are recorded. From patients with symptoms of presumptive malaria, the patient is physically examined by the IMR surveillance nurse, blood slides are collected and haemoglobin levels measured.

Other data is collected as required by individual studies.

The PNGIMR is very conscious of the value of good community relations for the success of research projects and has put into place an elaborate system of community information, consultation and development⁷.

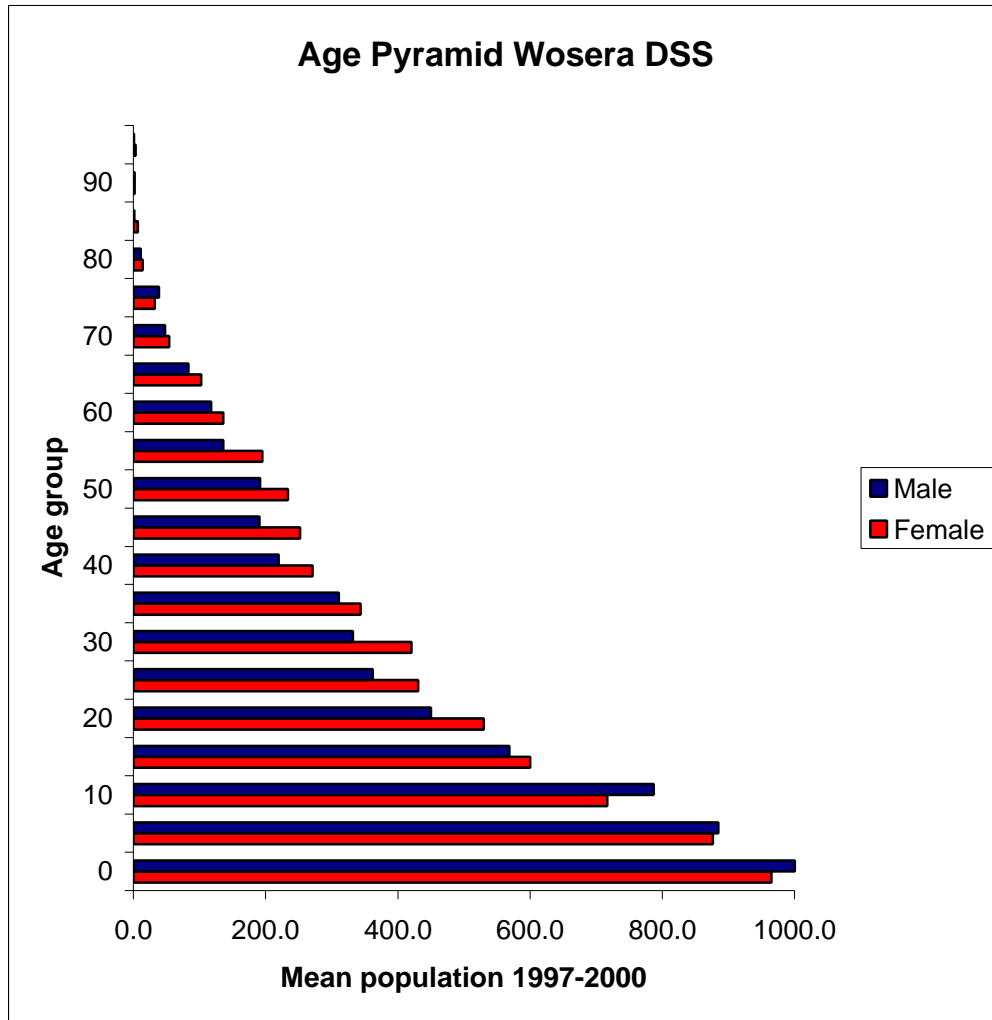
Data from yearly censuses are double-entered at the IMR in Madang in a specifically designed FoxPro database. Fortnightly updates are entered at the demographic surveillance office at the IMR in Maprik. Hard copies of all demographic & routine data collected are archived at the PNGIMR in Madang. Back-up copies of all demographic databases are made fortnightly and 3 monthly back ups are archived on CD-ROM at the IMR in Madang.

3. Wosera DSS Basic Output

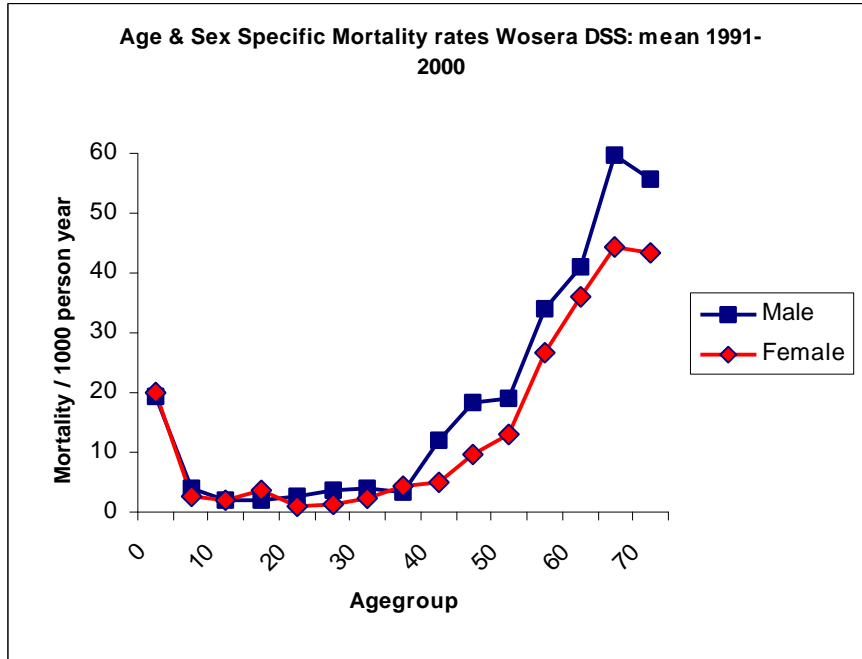
3.1 Demographic Indicators

Up to now the main purpose of the Wosera DSS was to support our ongoing malaria research program, to date no thorough demographic analyses of the data base has been done. We data presented here are based on preliminary analyses. Other demographic parameters such migration or age-specific fecundity rates have yet to be calculated

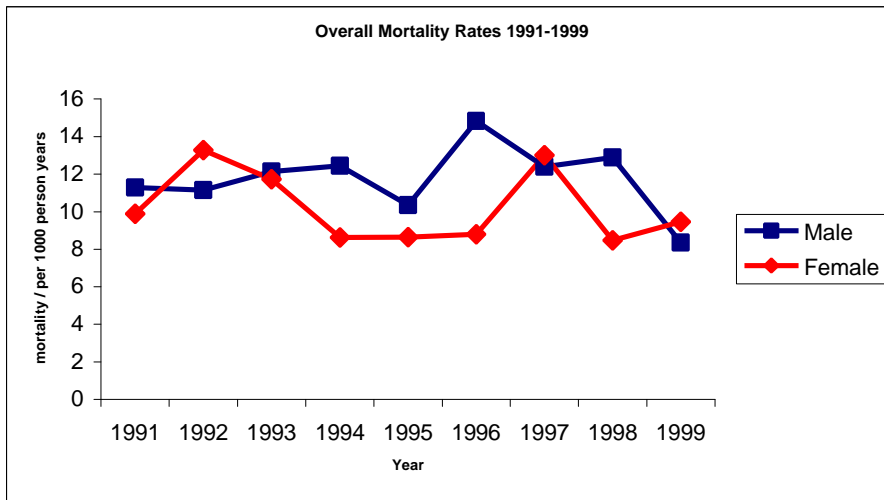
a) Age pyramid



b) Age specific mortality rates:

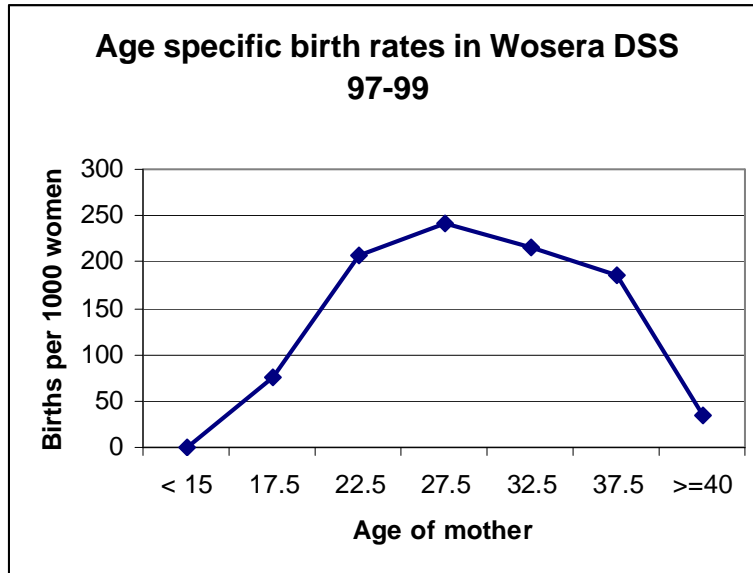


c) Mortality trend over time



Comments: 1994-1996: Major extension of DSS with the inclusion of North Wosera; 1997: El niño related drought

c) Age specific birth rates



4. Capacity for Conducting Clinical Trials

4.1 Ethics: The Institutional Review Board

All medical studies done in PNG need ethical approval from the PNG Medical Research Advisory Council. The director of PNG IMR is an ex-officio member of MRAC and the deputy director is currently the secretary of the MRAC. Because of the close association of the IMR with the MRAC all IMR project are reviewed by the MRAC and no internal review board is currently in place. Project with international collaborators are also reviewed by their respective institutional review boards.

The MRAC is registered with the Office of Human Research Protection & the PNGIMR has in place a Federal Wide Assurance (FWA00000123)

4.2 Description of Laboratory Facilities

Field laboratories in Maprik: The PNGIMR buildings in Maprik contain two field laboratories equipped for microscopy as well as basic molecular and immunological analyses of field samples.

Laboratories at the PNGIMR in Madang: The PNGIMR in Madang has fully equipped laboratories for molecular and immunological analyses including culturing facilities for malaria parasites. The Madang site is also hosts our expert microscopy and medical entomology units. Transport of fresh or frozen samples from the Wosera DSS to Madang is a routine practice and very reliable.

Laboratories at the PNGIMR in Goroka: The PNGIMR in Goroka has facilities for molecular and immunological analyses as well as specialised laboratories for culturing of bacteria and viruses. A special safety laboratory for HIV work has recently been established.

4.3 Description of Clinical Facilities

Health Centres in Wosera DSS: There are two main health centres that service the Wosera DSS: Kunjigini and Kaugia HC (see map). They are both run and staffed by the Catholic Mission Health Services and have outpatient facilities, labour and a small inpatient wards. According to PNG practice health centres of this size are staffed with nurses & community health workers and have no laboratory facilities on their own. The inpatient wards are used mainly for patient that need frequent medication or fluids, more complicated cases are referred to either Maprik district hospital or the tertiary referral hospital in Wewak (3 hrs drive). The PNGIMR staff maintains routine morbidity surveillance at both health centres and offer basic diagnostic services to the health centres. There is a third government run health centre south-west of the DSA, but due to a shortage of funds and staffing levels at this health centre the DSA population hardly makes use this health centre.

District Hospital in Maprik: The district hospital in Maprik is situation in the vicinity of the IMR compound. The hospital has all outpatients, in-patient and labour wards and has a resident medical officer / physician. Laboratory facilities are limited. The IMR has good collaborating links with the hospital and has e.g. run an antimalarial drug trial there.

The PNGIMR has currently no (trial) physician permanently on site at the Wosera DSS. However, an experienced trial physician, Dr. Inoni Betuela is employed in Goroka. Dr. Betuela physician is transferred to the DSA whenever needed for a specific clinical research project. If necessary, additional physicians are hired by individual projects.

4.4 List of scientists

Prof. John Reeder, director, molecular parasitologist with wide ranging public health interests. Overall responsibility for PNGIMR branched. Based at IMR in Goroka

Dr. Peter Siba, deputy director, virologist with special interest in polio and arboviruses. Based at IMR in Goroka

Dr. Moses Bockarie, head vector born disease unit, medical entomologist with special interest in lymphatic filariasis and the biology of PNG anopheline mosquitoes. Dr. Bockarie carries the responsibility for the overall scientific supervision of the DSS and is based at IMR in Madang

Dr. Ivo Mueller, malaria epidemiologist and statistician. Site Leader Wosera DSS. Responsible for epidemiological and data analysis aspects of different research activities within the DSS, including clinical trials, drug resistance monitoring and studies on severe malarial anaemia. Responsible for facilitating and overseeing possible external demographic analyses of the DSS databases. Based at IMR in Goroka, but visiting all sites at regular intervals.

Dr. Pascal Michon, molecular parasitologist focussing on malaria and host genetics. Based at IMR in Madang

Dr. Suparat Phuankoonnon, public health epidemiologist with primary interest in respiratory illnesses. Responsible for recently started conjugated pneumococcal vaccine trial and research agenda on TB. Based at IMR in Goroka

Dr. Lawrence Hammar, medical anthropologist with long standing research interests in sexually transmitted diseases and HIV. Based at IMR in Goroka

Dr. Inoni Betuela. Trial physician. Based at IMR in Goroka.

Mr Willie Pomat, immunologist, currently finishing his PhD at Curtin University, Perth, Australia.

Ms. Rachel Hinton, MA, medical anthropologist based within the Wosera DSS.

Ms Geraldine Maibawa, MTH / public health specialist. Based at IMR in Goroka

Mr Tony Lupiwa, MSc molecular biologist specialising on STI's. Based at IMR in Goroka

Mr Dagwin Suarkia, MSc molecular biologist / virologist specialising on arboviruses. Based at IMR in Goroka

Mr Ged Casey, MSc molecular parasitologist specialising in molecular markers of drug resistance. Based at IMR in Madang

Dr. Harin Karunajeewa, clinical epidemiologist / pharmacologist employed by the University of Western Australia, but currently based at the PNGIMR in Madang

5. Catalogue of completed and ongoing projects

5.1 Completed Research Projects

- Baseline epidemiological^{1, 3, 4, 8, 9, 10, 11}, immunological^{12, 13, 14, 15, 16, 17, 18, 19, 20, 21} and entomological studies^{22, 23, 24} in preparation for malaria vaccine trials
- Safety and immunogenicity trial for a three-component blood-stage malaria vaccine in adults²⁵
- Safety and pilot efficacy trial of a three-component blood-stage malaria vaccine in children 5-9 yrs old^{5, 6}
- Randomized control trials of the effect of Vitamin A^{26, 27} and Zinc supplementation²⁸ on incidence of malaria
- Randomized control trial of novel treatment for treatment failure malaria (Genton et al, in prep.)
- Studies on the effect of untreated bed nets on morbidity, mortality and vector biology^{24, 29, 30, 31}
- Genetic diversity *P. falciparum* parasites using MSP-2^{32, 33, 34} and AMA-1 typing³⁵
- Evaluation of new treatment protocol for early childhood illness as part of an Integrated Management of Childhood Illnesses (IMCI) approach
- Clinical trial of 3 antimalarial drugs (Cotrifacid, Mefloquine, Quinine-SP) for treatment for drug resistant malaria.
- Trial of mass drug administration with diethylcarbamazine with or without ivermectin for the elimination of lymphatic filariasis^{36, 37}

5.2 Ongoing Research Projects

Within Wosera DSA

- Trial of Artesunate suppositories for treatment of childhood malaria, incl. Studies on social acceptability of rectal mode of drug delivery.
- Studies on host genetic adaptations (alpha-thalassaemia, gerbich blood group and duffy negativity) to malaria infections (^{38, 39, 40, 41})
- Biology of *P. vivax* infection in relation to Duffy negativity
- Studies on mixed species interactions in Plasmodium infections⁴²
- Immunity to liver stage antigen-1²¹
- In-vivo monitoring of resistance to chloroquine (CQ) + sulphadoxine / pyrimethamine (SP) treatment⁴³
- Studies on molecular markers for Cq and SP resistance^{44, 45, 46}
- Association of parvovirus B19 with severe anaemia
- Studies on health impact of vanilla related economic boom

At other PNGIMR sites:

- Clinical trial of conjugated pneumococcal vaccine trial
- Clinical trial of Artekin (dihydroartemisinin-piperaquine) as antimalarial treatment
- 2nd trial of mass drug administration with diethylcarbamazine and albendazole for elimination of lymphatic filariasis
- National HIV/STI serosurveillance program.
- Antibiotic resistance monitoring

5.3 IMR Projects that have directly influenced national health policy

- Development of ten step check list for neonatal diagnosis
- IMCI evaluation
- Antimalarial drug resistance monitoring
- Malaria Mapping and Control in PNG Highlands
- Pig Bell vaccine
- Bed net trials
- VitA supplementation trials
- HIV risk reduction
- HiB vaccine introduction
- Filariasis elimination
- Measles vaccination schedule

6. Publications

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7. General human resource capacity

a) Field site Management

Mr John Taime, Project Manager Wosera field site, responsible for overall project management and financial controlling of the Wosera DSS. Based at the PNGIMR in Goroka.

Mr. Andrew Raiko, Field Site Manager Maprik, responsible for administration and accounting of all Maprik based field studies including the DSS. Reports directly to Mr. John Taime. Based at the PNGIMR in Maprik.

b) Surveillance Operations

Mr Lawrence Rare, Demography Supervisor, responsible for day-to-day operation of the DSS. Supervises demographic reporters, organizes yearly full surveys and conducts verbal autopsies. Reports directly to Mr. John Taime. Based at the PNGIMR in Maprik.

Ms Olive Oa, Community Development Officer, responsible for community relations, community development and health education. She is also involved in different operational research projects. Reports directly to Mr. John Taime and Mr Andrew Raiko. Based at the PNGIMR in Maprik.

40 Demography reporters, 4 reporter supervisor, record all demographic events in their respective areas and report fortnightly to the Demography supervisor.

2 community relations officer, 1 public relations officer, build the bridge between the Wosera DSS and the communities under surveillance. They are instrumental in information of and consultation with communities about the running of the DSS, new research to be carried out, informed consent issues at community and individual bases, and the communication of study results back to the communities.

c) Data Management

Mr Thomas Adiguma, Database Manager, responsible for programming of databases, supervision of data entry and data cleaning

3 data entry clerks, 2 based in Madang and 1 based in Maprik

Additional data management and entry capacity at IMR headquarters in Goroka