

MEDLARS BIBLIOGRAPHY

PUBLICATIONS OF RELEVANCE TO PAPUA NEW GUINEA AND MELANESIA

Bibliographic Citation List generated from MEDLARS

- 1 **Ambrose L, Riginos C, Cooper RD, Leow KS, Ong W, Beebe NW.**
Population structure, mitochondrial polyphyly and the repeated loss of human biting ability in anopheline mosquitoes from the southwest Pacific.
Mol Ecol 2012 Sep;21(17):4327-4343. Epub 2012 Jul 2.
Australia and New Guinea contain high levels of endemism and biodiversity, yet there have been few evaluations of population-level genetic diversity in fauna occurring throughout the Australo-Papuan region. Using extensive geographical sampling, we examined and compared the phylogenetic relationships, phylogeography and population structure of *Anopheles farauti*, *An. hinesorum* and *An. irenicus* throughout their ranges in the southwest Pacific using mitochondrial (mtDNA COI) and nuclear (ribosomal protein S9 and ribosomal DNA ITS2) loci. Phylogenetic analyses suggest that the ability to utilize humans as hosts has been lost repeatedly, coincident with independent colonizations of the Solomon Islands. As some of the species under investigation transmit malaria in the region, this is a medically important finding. Maximum likelihood and Bayesian phylogenetic analyses of nuclear loci also showed that the three species are monophyletic. However, putative introgression of *An. hinesorum* mtDNA onto a nuclear background of *An. farauti* was evident in populations from Queensland, Torres Strait and southern New Guinea. Haplotype networks and pairwise F_{ST} values show that there is significant genetic structure within New Guinea and Australia in both *An. farauti* and *An. hinesorum*, consistent with a long-term history of low gene flow among populations.
- 2 **Asa I, de Costa C, Mola G.**
A prospective survey of cases of complications of induced abortion presenting to Goroka Hospital, Papua New Guinea, 2011.
Aust NZ J Obstet Gynaecol 2012 Oct;52(5):491-493. Epub 2012 Jun 14.
Induced abortion on demand or for socio-economic indications is illegal in Papua New Guinea under the 1974 Criminal Code. Nevertheless, the procedure is known to be widely practised. This prospective study examines the demographic and medical features of women presenting with complications of induced abortion to Goroka Hospital in a 6-month period. It was noted that abortion was most commonly induced using the synthetic prostaglandin analogue misoprostol. Although illegal induced abortion cannot be condoned, it appears that misoprostol, much safer in this context than mechanical or traditional herbal methods, is now being widely used for the purpose of induced abortion in Papua New Guinea, as it is in other developing countries.
- 3 **Baddam R, Thong KL, Avasthi TS, Shaik S, Yap KP, Teh CS, Chai LC, Kumar N, Ahmed N.**
Whole-genome sequences and comparative genomics of *Salmonella enterica* serovar Typhi isolates from patients with fatal and nonfatal typhoid fever in Papua New Guinea.
J Bacteriol 2012 Sep;194(18):5122-5123.
Many of the developing countries of the Southeast Asian region are significantly affected by endemic typhoid fever, possibly as a result of marginal living standards. It is an important public health problem in countries such as Papua New Guinea, which is geographically close to some of the foci of endemicity in Asia. The severity of the disease varies in different regions, and this may be attributable to genetic diversity among the native strains. Genome sequence data on strains from different countries are needed to clearly understand their genetic makeup and virulence potential. We describe the genomes of two *Salmonella typhi* isolates from patients with fatal and nonfatal cases of typhoid fever in Papua New Guinea. We discuss in brief the underlying sequencing methodology, assembly, genome statistics, and important features of the two draft genomes, which form an essential step in our functional molecular infection epidemiology program centering on typhoid fever. The comparative genomics of these and other isolates would enable us to identify genetic rearrangements and mechanisms responsible for endemicity and the differential severity of pathogenic salmonellae in Papua New Guinea and elsewhere.
- 4 **Ballantyne KN, van Oven M, Ralf A, Stoneking M, Mitchell RJ, van Oorschot RA, Kayser M.**
MtDNA SNP multiplexes for efficient inference of matrilineal genetic ancestry within Oceania.
Forensic Sci Int Genet 2012 Jul;6(4):425-436. Epub 2011 Sep 22.
Human mitochondrial DNA (mtDNA) is a convenient marker for tracing matrilineal biogeographic ancestry and is widely applied in forensic, genealogical and anthropological studies. In forensic applications, DNA-based ancestry inference can be useful for finding unknown suspects by concentrating police investigations in cases where autosomal STR profiling was unable to provide a match, or can help provide clues in missing person identification. Although multiplexed mtDNA single nucleotide polymorphism (SNP) assays to infer matrilineal ancestry at a (near) continental level are already available, such tools are lacking for the Oceania region. Here, we have developed a hierarchical system of three SNaPshot multiplexes for genotyping 26 SNPs defining all major mtDNA haplogroups for Oceania (including Australia, Near Oceania and Remote Oceania). With this system, it was possible to conclusively assign 74% of Oceanian individuals to their Oceanian matrilineal ancestry in an established literature database (after correcting for obvious external admixture). Furthermore, in a set of 161 genotyped individuals collected in Australia, Papua New Guinea and Fiji, 87.6% were conclusively assigned an Oceanian matrilineal origin. For the remaining 12.4% of the genotyped samples either a Eurasian origin was detected indicating likely European admixture (1.9%),

the identified haplogroups are shared between Oceania and S/SE-Asia (5%), or the SNPs applied did not allow a geographic inference to be assigned (5.6%). Sub-regional assignment within Oceania was possible for 32.9% of the individuals genotyped: 49.5% of Australians were assigned an Australian origin and 13.7% of the Papua New Guineans were assigned a Near Oceanian origin, although none of the Fijians could be assigned a specific Remote Oceanian origin. The low assignment rates of Near and Remote Oceania are explained by recent migrations from Asia via Near Oceania into Remote Oceania. Combining the mtDNA multiplexes for Oceania introduced here with those we developed earlier for all other continental regions, global matrilineal bio-geographic ancestry assignment from DNA is now achievable in a highly efficient way that is also suitable for applications with limited material such as forensic case work.

- 5 **Ballif M, Harino P, Ley S, Coscolla M, Niemann S, Carter R, Coulter C, Borrell S, Siba P, Phuanukoonnon S, Gagneux S, Beck HP.**

Drug resistance-conferring mutations in *Mycobacterium tuberculosis* from Madang, Papua New Guinea.

BMC Microbiol 2012 Sep 4;12:191.

BACKGROUND: Monitoring drug resistance in *Mycobacterium tuberculosis* is essential to curb the spread of tuberculosis (TB). Unfortunately, drug susceptibility testing is currently not available in Papua New Guinea (PNG) and that impairs TB control in this country. We report for the first time *M. tuberculosis* mutations associated with resistance to first- and second-line anti-TB drugs in Madang, PNG. A molecular cluster analysis was performed to identify *M. tuberculosis* transmission in that region. **RESULTS:** Phenotypic drug susceptibility tests showed 15.7% resistance to at least one drug and 5.2% multidrug resistant (MDR) TB. Rifampicin resistant strains had the *rpoB* mutations D516F, D516Y or S531L; isoniazid resistant strains had the mutations *katG* S315T or *inhA* promoter C15T; streptomycin resistant strains had the mutations *rpsL* K43R, K88Q, K88R, *rrs* A514C or *gidB* V77G. The molecular cluster analysis indicated evidence for transmission of resistant strains. **CONCLUSIONS:** We observed a substantial rate of MDR-TB in the Madang area of PNG associated with mutations in specific genes. A close monitoring of drug resistance is therefore urgently required, particularly in the presence of drug-resistant *M. tuberculosis* transmission. In the absence of phenotypic drug susceptibility testing in PNG, molecular assays for drug resistance monitoring would be of advantage.

- 6 **Ballif M, Harino P, Ley S, Carter R, Coulter C, Niemann S, Borrell S, Fenner L, Siba P, Phuanukoonnon S, Gagneux S, Beck HP.**

Genetic diversity of *Mycobacterium tuberculosis* in Madang, Papua New Guinea.

Int J Tuberc Lung Dis 2012 Aug;16(8):1100-1107. Epub 2012 Jun 14.

SETTING: Madang and surroundings, Papua New Guinea (PNG). **OBJECTIVE:** To characterise the genetic diversity and drug susceptibility of *Mycobacterium tuberculosis* isolates collected in Madang and surroundings. **DESIGN:** *M. tuberculosis* was isolated from sputum samples from active pulmonary tuberculosis cases. Drug resistance profiles were obtained by drug susceptibility testing.

M. tuberculosis lineages were identified by single nucleotide polymorphisms and sub-typing was performed by spoligotyping. Spoligotyping and 24 locus mycobacterial interspersed repetitive units with variable number of tandem repeats were combined to identify clustered isolates. **RESULTS:** The 173 *M. tuberculosis* isolates collected belonged predominantly to the Euro-American lineage (Lineage 4) and the East-Asian lineage (Lineage 2). Multidrug-resistant *M. tuberculosis* was observed in 5.2% of isolates. Lineage 2 *M. tuberculosis*, which includes the 'Beijing' genotype, was significantly associated with any drug resistance (OR 5.2, 95%CI 1.8-15.1). Cluster analyses showed 44% molecularly clustered isolates, suggesting transmission of *M. tuberculosis* in the community, including transmission of primary drug-resistant *M. tuberculosis*. **CONCLUSION:** These data provide the first insight into the molecular characteristics of *M. tuberculosis* in the Madang area of PNG, and indicate substantial drug resistance with evidence of ongoing transmission.

- 7 **Betuela I, Rosanas-Urgell A, Kiniboro B, Stanisic DI, Samol L, de Lazzari E, Del Portillo HA, Siba P, Alonso PL, Bassat Q, Mueller I.**

Relapses contribute significantly to the risk of *Plasmodium vivax* infection and disease in Papua New Guinean children 1-5 years of age.

J Infect Dis 2012 Dec 1;206(11):1771-1780. Epub 2012 Sep 10.

BACKGROUND: *Plasmodium vivax* forms long-lasting hypnozoites in the liver. How much they contribute to the burden of *P. vivax* malaria in children living in highly endemic areas is unknown. **METHODS:** In this study, 433 Papua New Guinean children aged 1-5 years were randomized to receive artesunate (7 days) plus primaquine (14 days), artesunate alone or no treatment and followed up actively for recurrent *Plasmodium* infections and disease for 40 weeks. **RESULTS:** Treatment with artesunate-primaquine reduced the risk of *P. vivax* episodes by 28% ($p = 0.042$) and 33% ($p = 0.015$) compared with the artesunate and control arms, respectively. A significant reduction was observed only in the first 3 months of follow-up (artesunate-primaquine vs control, -58% [$p = 0.004$]; artesunate-primaquine vs artesunate, -49% [$p = 0.031$]) with little difference thereafter. Primaquine treatment also reduced the risk of quantitative real-time polymerase chain reaction- and light microscopy-positive *P. vivax* reinfections by 44% ($p < 0.001$) and 67% ($p < 0.001$), respectively. Whereas primaquine treatment did not change the risk of reinfection with *Plasmodium falciparum*, fewer *P. falciparum* clinical episodes were observed in the artesunate-primaquine arm. **CONCLUSIONS:** Hypnozoites are an important source of *P. vivax* infection and contribute substantially to the high burden of *P. vivax* disease observed in young Papua New Guinean children. Even in highly endemic areas with a high risk of reinfection, antihypnozoite treatment should be given to all cases with parasitologically confirmed *P. vivax* infections.

- 8 **Brown A, Gilbert B.**

The Vanuatu medical supply system - documenting opportunities and challenges to meet the Millennium Development Goals.

South Med Rev 2012 Jul;5(1):14-21. Epub 2012 Jul 23.

OBJECTIVES: Limited human resources are widely recognised as a barrier to achieve health-

related Millennium Development Goals. Availability of medical supplies and suitably trained health personnel are crucial to ensuring a well-functioning medical supply system. The objective of this paper is to identify the factors which influence the availability of medical supplies within the health facilities of Vanuatu. **METHODS:** A qualitative triangulated strategy using semi-structured interviews, observational workplace surveys and semi-structured focus groups was developed. This research was approved by the Human Ethics Committee of the University of Canberra and was funded through a direct grant from the United Nations Population Fund Suva, Pacific subregional office. **RESULTS:** During two weeks of data collection, 21 interviews were conducted, observational workplace surveys were completed in 19 facilities and 22 personnel participated in three focus groups across three provinces. The interviewees had a wide range of primary professional groupings and were representative of the Vanuatu health workforce. A complex array of medical supply issues are described from within the three tiered structure of the medical supply system. **CONCLUSION:** The results of this research have further informed our understanding of the competencies required by healthcare personnel to conduct medical supply management activities effectively in Pacific Island countries. As a result of this research, a platform is provided for the government of Vanuatu to engage development partners to work toward a sustainable medical supply system.

9 Camathias C, Valderrabano V, Oberli H.

Routine pin tract care in external fixation is unnecessary: a randomised, prospective, blinded controlled study. *Injury* 2012 Nov;43(11):1969-1973. Epub 2012 Aug 16.

INTRODUCTION: Pin site infections are seen in up to 40% of external fixators (ExFix) and are therefore the most common complication with this device. There is no consensus in the literature as to the appropriate regimen for pin tract care and infection prevention. This study is the first intra-subject, randomised, prospective controlled trial comparing daily pin tract care to no pin tract care at all. **METHOD:** Consecutive patients series (56 patients, 16 female, age 4-68 y, mean 24 y, in total 204 pins) recruited in the National Referral Hospital in Honiara in the Solomon Islands over a 2 year period. Exclusion criteria were application of ExFix for less than two weeks or a non-standard ExFix. Pin treatment was allocated into groups anatomically, proximal and distal. Randomisation was intra-subject and intra-group: 101 pins had daily pin site care and 103 had no treatment at all. **ENDPOINTS:** Soft-tissue interface, stability of the pins, torsional stability as determined with a torque metre, osteolysis and pain. Assessment of pin sites blinded. Statistical analysis using the paired t test for parametric data and the Wilcoxon rank test for non-parametric data (Stat View). **RESULTS:** No significant difference between the two groups. Soft-tissue interface 36% vs 35% (granulation/secretion), stability 20 vs 25 pins with loosening. No significant osteolysis (7 vs 6 pins). Torque: mean 0.75 Nm, max.: 3.05 Nm vs 0.60 Nm, max.: 3.55 Nm, no significant difference. No differences in demographics (age, localisation, sex, time of fixation). **CONCLUSION:** This study shows that routine pin tract care is unnecessary in external fixation treatment of injuries.

10 Chiang TY, Lin WC, Kuo MC, Ji DD, Fang CT.

Relapse of imported vivax malaria despite standard-dose primaquine therapy: an investigation with molecular genotyping analyses.

Clin Microbiol Infect 2012 Jul;18(7):E232-E234. Epub 2012 Mar 27.

Taiwan CDC investigated four cases of recurrent imported vivax malaria during 2003-2010. Molecular genotyping results and the lack of inter-episodes travel history indicated that two of the patients, who acquired vivax malaria in Indonesia and the Solomon Islands, respectively, suffered relapses after an interval of 3-4 months, despite completing standard-dose primaquine therapy (30 mg/day for 14 days) for the first episode. Treatment with a higher dose of primaquine (60 mg/day for 14 days) prevented further relapse in both patients. This finding calls for further monitoring of the therapeutic efficacy of primaquine in treating *Plasmodium vivax* acquired in southeast Asia and Oceania.

11 Chidlow GR, Laing IA, Harnett GB, Greenhill AR, Phuanukoannon S, Siba PM, Pomat WS, Shellam GR, Smith DW, Lehmann D.

Respiratory viral pathogens associated with lower respiratory tract disease among young children in the highlands of Papua New Guinea.

J Clin Virol 2012 Jul;54(3):235-239. Epub 2012 May 16.

BACKGROUND: Acute lower respiratory tract infections (ALRI) commonly result in fatal outcomes in the young children of Papua New Guinea (PNG). However, comprehensive studies of the viral aetiology of ALRI have not been conducted in PNG for almost 30 years. **OBJECTIVES:** To determine the viruses associated with ALRI among children living in the PNG highlands using sensitive molecular detection techniques. **STUDY DESIGN:** Pernal swabs were collected routinely between 1 week and 18 months of age and also during episodes of ALRI, as part of a neonatal pneumococcal conjugate vaccine trial. A tandem multiplex real-time PCR assay was used to test for a comprehensive range of respiratory viruses in samples collected from 221 young children. Picornavirus typing was supported by DNA sequence analysis. **RESULTS:** Recognized pathogenic respiratory viruses were detected in 198/273 (73%) samples collected from children with no evidence of ALRI and 69/80 (86%) samples collected during ALRI episodes. Human rhinoviruses (HRV) species A, B and C were detected in 152 (56%) samples from non-ALRI children and 50 (63%) samples collected during ALRI episodes. Partial structural region sequences for two new species C rhinoviruses were added to the GenBank database. ALRI was associated with detection of adenovirus species B ($p < 0.01$) or C ($p < 0.05$), influenza A ($p < 0.0001$) or respiratory syncytial virus ($p < 0.0001$). Multiple viruses were detected more often during ALRI episodes (49%) than when children displayed no symptoms of ALRI (18%) ($p < 0.0001$). **CONCLUSIONS:** The burden of infection with respiratory viruses remains significant in young children living in the PNG highlands.

12 Colquhoun S, Ogaoga D, Tamou M, Nasi T, Subhi R, Duke T.

Child health nurses in the Solomon Islands: lessons for the Pacific and other developing countries.

Hum Resour Health 2012 Nov 21;10(1):45.

OBJECTIVES: To understand the roles of nurses with advanced training in paediatrics in the Solomon

Islands, and the importance of these roles to child health. To understand how adequately equipped child health nurses feel for these roles, to identify the training needs, difficulties and future opportunities. DESIGN: Semi-structured interviews. SETTINGS: Tertiary hospital, district hospitals and health clinics in the Solomon Islands. PARTICIPANTS: Twenty-one paediatric nurses were interviewed out of a total of 27 in the country. RESULTS: All nurses were currently employed in teaching, clinical or management areas. At least one or two nurses were working in each of 7 of the 9 provinces; in the two smaller provinces there were none. Many nurses were sole practitioners in remote locations without back-up from doctors or other experienced nurses; all had additional administrative or public health duties. Different types of courses were identified: a residential diploma through the University of Papua New Guinea or New Zealand and a diploma by correspondence through the University of Sydney. CONCLUSIONS: Child health nurses in the Solomon Islands fulfill vital clinical, public health, teaching and administrative roles. Currently they are too few in number, and this is a limiting factor for improving the quality of child health services in that country. Current methods of training require overseas travel, or are expensive, or lack relevance, or remove nurses from their work-places and families for prolonged periods of time. A local post-basic child health nursing course is urgently needed, and models exist to achieve this.

13 Corser CA, McLenachan PA, Pierson MJ, Harrison GL, Penny D.

The Q2 mitochondrial haplogroup in Oceania. *PLoS One* 2012;7(12):e52022. Epub 2012 Dec 20.

Many details surrounding the origins of the peoples of Oceania remain to be resolved, and as a step towards this we report seven new complete mitochondrial genomes from the Q2a haplogroup, from Papua New Guinea, Fiji and Kiribati. This brings the total to eleven Q2 genomes now available. The Q haplogroup (that includes Q2) is an old and diverse lineage in Near Oceania, and is reasonably common; within our sample set of 430, 97 are of the Q haplogroup. However, only 8 are Q2, and we report 7 here. The tree with all complete Q genomes is proven to be minimal. The dating estimate for the origin of Q2 (around 35 Kya) reinforces the understanding that humans have been in Near Oceania for tens of thousands of years; nevertheless the Polynesian maternal haplogroups remain distinctive. A major focus now, with regard to Polynesian ancestry, is to address the differences and timing of the 'Melanesian' contribution to the maternal and paternal lineages as people moved further and further into Remote Oceania. Input from other fields such as anthropology, history and linguistics is required for a better understanding and interpretation of the genetic data.

14 Culotta E.

Anthropology. Turning from war to peace in Papua New Guinea. *Science* 2012 Sep 28;337(6102):1593-1594.

15 Davy CP, Patrickson M.

Implementation of evidence-based healthcare in Papua New Guinea. *Int J Evid Based Healthc* 2012 Dec;10(4):361-368. doi: 10.1111/j.1744-1609.2012.00294.x.

AIM: The aim of this research was to understand how health workers in developing countries reach

diagnostic and treatment decisions. In developing countries, health workers are often forced to make diagnostic and treatment decisions based on limited knowledge, unhelpful information, infrequent and low technology back-up services and without the support of more senior staff. Yet patients continue to be treated. This paper investigates how primary healthcare workers in such contexts reach these diagnostic and treatment decisions. METHOD: Using a qualitative methodology, 58 primary healthcare workers from the three primary healthcare facilities in Papua New Guinea – aid posts, sub-health centres and health centres – participated in an in-depth interview, in order to investigate how diagnostic and treatment decisions were made. RESULTS: Although participants were originally trained in the biomedical model, they lived and worked in a context where other belief systems operated to diagnose and treat illness. This led to the coexistence of at least three models of treatment: the biomedical model, traditional indigenous health practices and Christian beliefs. Thus, a homogenous biomedical understanding of health and well-being was not possible in this setting, and treatment options did not always follow the biomedical recommendations. CONCLUSIONS: In developing countries where competing medical frameworks exist, evidence-based practices may be more difficult to implement. Although the skill and knowledge of the provider and availability of treatment resources are still important, belief in the accuracy of the diagnosis and the potency of the treatment by the patient and the patient's community as well as the health provider may be just as significant.

16 Fedden S, Boroditsky L.

Spatialization of time in Mian. *Front Psychol* 2012;3:485. doi: 10.3389/fpsyg.2012.00485. Epub 2012 Nov 19.

We examine representations of time among the Mianmin of Papua New Guinea. We begin by describing the patterns of spatial and temporal reference in Mian. Mian uses a system of spatial terms that derive from the orientation and direction of the Hak and Sek rivers and the surrounding landscape. We then report results from a temporal arrangement task administered to a group of Mian speakers. The results reveal evidence for a variety of temporal representations. Some participants arranged time with respect to their bodies (left to right or toward the body). Others arranged time as laid out on the landscape, roughly along the east/west axis (either east to west or west to east). This absolute pattern is consistent both with the axis of the motion of the sun and the orientation of the two rivers, which provides the basis for spatial reference in the Mian language. The results also suggest an increase in left to right temporal representations with increasing years of formal education (and the reverse pattern for absolute spatial representations for time). These results extend previous work on spatial representations for time to a new geographical region, physical environment, and linguistic and cultural system.

17 Foong RX, Rajasingam D.

Learning from low-resource maternity care using pregnancy outcomes from the Solomon Islands. *Int J Gynaecol Obstet* 2012 Dec;119(3):284. Epub 2012 Sep 19.

18 Gessain A, Cassar O.

Epidemiological aspects and world distribution of

HTLV-1 infection.

Front Microbiol 2012;3:388. Epub 2012 Nov 15.

The human T-cell leukemia virus type 1 (HTLV-1), identified as the first human oncogenic retrovirus 30 years ago, is not a ubiquitous virus. HTLV-1 is present throughout the world, with clusters of high endemicity located often nearby areas where the virus is nearly absent. The main HTLV-1 highly endemic regions are the Southwestern part of Japan, sub-Saharan Africa and South America, the Caribbean area, and foci in the Middle East and Australo-Melanesia. The origin of this puzzling geographical or rather ethnic repartition is probably linked to a founder effect in some groups with the persistence of a high viral transmission rate. Despite different socio-economic and cultural environments, the HTLV-1 prevalence increases gradually with age, especially among women in all highly endemic areas. The three modes of HTLV-1 transmission are mother to child, sexual transmission, and transmission with contaminated blood products. Twenty years ago, de Thé and Bomford estimated the total number of HTLV-1 carriers to be 10-20 million people. At that time, large regions had not been investigated, few population-based studies were available and the assays used for HTLV-1 serology were not very specific. Despite the fact that there is still a lot of data lacking in large areas of the world and that most of the HTLV-1 studies concern only blood donors, pregnant women, or different selected patients or high-risk groups, we shall try, based on the most recent data, to revisit the world distribution and the estimates of the number of HTLV-1 infected persons. Our best estimates range from 5 to 10 million HTLV-1 infected individuals. However, these results were based on only approximately 1.5 billion of individuals originating from known HTLV-1 endemic areas with reliable available epidemiological data. Correct estimates in other highly populated regions, such as China, India, the Maghreb and East Africa, is currently not possible, thus the current number of HTLV-1 carriers is very probably much higher.

- 19 **Gething PW, Elyazar IR, Moyes CL, Smith DL, Battle KE, Guerra CA, Patil AP, Tatem AJ, Howes RE, Myers MF, George DB, Horby P, Wertheim HF, Price RN, Mueller I, Baird JK, Hay SI.**

A long neglected world malaria map: *Plasmodium vivax* endemicity in 2010.

PLoS Negl Trop Dis 2012;6(9):e1814. Epub 2012 Sep 6.

BACKGROUND: Current understanding of the spatial epidemiology and geographical distribution of *Plasmodium vivax* is far less developed than that for *P. falciparum*, representing a barrier to rational strategies for control and elimination. Here we present the first systematic effort to map the global endemicity of this hitherto neglected parasite. **METHODOLOGY AND FINDINGS:** We first updated to the year 2010 our earlier estimate of the geographical limits of *P. vivax* transmission. Within areas of stable transmission, an assembly of 9,970 geospatially *P. vivax* parasite rate (PvPR) surveys collected from 1985 to 2010 were used with a spatiotemporal Bayesian model-based geostatistical approach to estimate endemicity age-standardised to the 1-99 year age range (PvPR(1-99)) within every 5x5 km resolution grid square. The model incorporated data on Duffy negative phenotype frequency to suppress endemicity predictions, particularly in Africa. Endemicity was predicted within a relatively narrow range throughout the endemic

world, with the point estimate rarely exceeding 7% PvPR(1-99). The Americas contributed 22% of the global area at risk of *P. vivax* transmission, but high endemic areas were generally sparsely populated and the region contributed only 6% of the 2.5 billion people at risk (PAR) globally. In Africa, Duffy negativity meant stable transmission was constrained to Madagascar and parts of the Horn, contributing 3.5% of global PAR. Central Asia was home to 82% of global PAR with important high endemic areas coinciding with dense populations particularly in India and Myanmar. South East Asia contained areas of the highest endemicity in Indonesia and Papua New Guinea and contributed 9% of global PAR. **CONCLUSIONS AND SIGNIFICANCE:** This detailed depiction of spatially varying endemicity is intended to contribute to a much-needed paradigm shift towards geographically stratified and evidence-based planning for *P. vivax* control and elimination.

- 20 **Gibbs P, Worth H.**

'Eat coffee candy and die': sex, death and Huli funerals.

Sex Health 2012 Nov;9(5):497-498. doi: 10.1071/SH12018.

BACKGROUND: Sex and death have traditionally been linked in Huli culture in the Southern Highlands in Papua New Guinea. Huli regarded that close contact with women could result in men becoming sick or dying. However, there has been rapid social and economic development in the area and Huli traditions are changing. At the same time, HIV prevalence is rising. **METHODS:** Twenty-five semistructured in-depth interviews were carried out with key informants during a study on HIV risk in the Southern Highlands. Interviews were conducted mostly in Tok Pisin. Interviews were transcribed and the data were analysed through thematic coding. **RESULTS:** Huli people use 'eating coffee candy' as a metaphor for engaging in sex at funerals. This is very new and against traditional values, where women attended funerals and men only built the coffins and buried the body. Nowadays, sex occurs at funerals. This change has disturbed older people because it has not only changed the customary meaning of the funeral space, but it has also encouraged the spread of HIV. Huli use the fatalistic expression 'Eat coffee candy and die' to refer to funerals as a space of HIV risk. **CONCLUSION:** Huli community and church leaders, and health workers are attempting to deal with the situation by not allowing men to stay at the funeral site overnight, burying the dead on the same day they die and using customary village law to charge men caught having sex at a funeral. However, traditional beliefs and rapid social change in the context of an HIV epidemic need to be taken into account.

- 21 **Gibson RS, Cavalli-Sforza T.**

Using reference nutrient density goals with food balance sheet data to identify likely micronutrient deficits for fortification planning in countries in the Western Pacific region.

Food Nutr Bull 2012 Sep;33(3 Suppl):S214-S220.

BACKGROUND: Collection of nationwide food consumption data at the individual level is the preferred option for planning fortification programs. However, such data are seldom collected in low-income countries. In contrast, Food Balance Sheets (FBS), published annually for approximately 180 countries, may provide a source of national data for program planning. **OBJECTIVE:** To explore

the use of micronutrient densities from FBS data to identify likely deficits for eight micronutrients in national diets. **METHODS:** Micronutrient densities in the daily available food supply per capita were calculated from the micronutrient contents of 95 food commodities in 17 Western Pacific Region countries. Densities were compared with reference nutrient density goals developed to ensure that at least 95% of individuals, irrespective of life-stage group, are likely to have adequate intakes. **RESULTS:** Of the eight micronutrients, Cambodia and Korea D.P.R. had likely deficits for six; China, Fiji, Kiribati, Korea Republic, Lao P.D.R., Philippines, Solomon Islands, Vanuatu, and Viet Nam had likely deficits for five; Brunei Darussalam, Malaysia, Mongolia, New Zealand, and Papua New Guinea had likely deficits for four; and New Caledonia had likely deficits for three. The most frequent deficits were for iron, zinc, and calcium (all countries), followed by vitamin B2 and vitamin A (n = 13), vitamin B1 (n = 2), and vitamin B12 (n = 1). **CONCLUSIONS:** The nutrient density approach could be applied to FBS data for ranking countries according to likely micronutrient deficits, but it provides no information on distribution of nutrient supply for fortification program planning. The approach described here could be applied to data from Household Consumption and Expenditures Surveys (HCES) to characterize households at greatest risk.

22 Grabenstein JD, Klugman KP.

A century of pneumococcal vaccination research in humans.

Clin Microbiol Infect 2012 Oct;18 Suppl 5:15-24. Epub 2012 Aug 6.

Sir Almroth Wright coordinated the first trial of a whole-cell pneumococcal vaccine in South Africa from 1911 to 1912. Wright started a chain of events that delivered pneumococcal vaccines of increasing clinical and public-health value, as medicine advanced from a vague understanding of the germ theory of disease to today's rational vaccine design. Early whole-cell pneumococcal vaccines mimicked early typhoid vaccines, as early pneumococcal antisera mimicked the first diphtheria antitoxins. Pneumococcal typing systems developed by Franz Neufeld and others led to serotype-specific whole-cell vaccines. Pivotaly, Alphonse Dochez and Oswald Avery isolated pneumococcal capsular polysaccharides in 1916-17. Serial refinements permitted Colin MacLeod and Michael Heidelberger to conduct a 1944-45 clinical trial of quadrivalent pneumococcal polysaccharide vaccine (PPV), demonstrating a high degree of efficacy in soldiers against pneumococcal pneumonia. Two hexavalent PPVs were licensed in 1947, but were little used as clinicians preferred therapy with new antibiotics, rather than pneumococcal disease prevention. Robert Austrian's recognition of high pneumococcal case-fatality rates, even with antibiotic therapy, led to additional trials in South Africa, the USA and Papua New Guinea, with 14-valent and 23-valent PPVs licensed in 1977 and 1983 for adults and older children. Conjugation of polysaccharides to proteins led to several pneumococcal conjugate vaccines licensed since 2000, enabling immunization of infants and young children and resultant herd protection for all ages. Today, emergence of disease caused by pneumococcal serotypes not included in various vaccine formulations fuels research into conserved proteins or other means to maximize protection against more than 90 known pneumococcal serotypes.

23 Guillaume L, Ofanoa R, Swillen L, Singh N, Bossin HC, Schaffner F.

Distribution of *Aedes albopictus* (Diptera, Culicidae) in southwestern Pacific countries, with a first report from the Kingdom of Tonga.

Parasit Vectors 2012 Nov 6;5:247.

BACKGROUND: *Aedes (Stegomyia) albopictus* is currently one of the most notorious globally invasive mosquito species. Its medical importance is well documented, and its fast expansion throughout most continents is being monitored with concern. It is generally assumed that its expansion through the Western Pacific island countries has not progressed since its establishment in Fiji in 1989. However, the current status of *Ae. albopictus* in the Pacific region is largely unknown. **FINDINGS:** According to data from the literature and our own observations, *Ae. albopictus* is currently present in the following countries of the southern Pacific region: Papua New Guinea, Solomon Islands, Fiji, and the Kingdom of Tonga, where it was first detected in July 2011. It is absent from New Caledonia and French Polynesia where routine entomological surveillance is carried out, and was not detected during entomological work in 2007, either on the Cook Islands or on the Wallis and Futuna Islands. The species was not reported from American Samoa in 2004, but it is mentioned as probably present in Vanuatu. This is the first report of *Ae. albopictus* in Tonga. **CONCLUSIONS:** The introduction and establishment of *Ae. albopictus* in Tonga was expected due to the geographical proximity of this country to Fiji where the species is strongly established. The pathway of introduction is unknown. The expansion of *Ae. albopictus* in the Pacific region poses an increasing threat to public health given the role this mosquito plays as primary vector of emerging infectious diseases such as Chikungunya fever.

24 Horwood PF, Luang-Suarkia D, Bebes S, Boniface K, Datta SS, Siba PM, Kirkwood CD.

Surveillance and molecular characterization of group A rotaviruses in Goroka, Papua New Guinea.

Am J Trop Med Hyg 2012 Dec;87(6):1145-1148. Epub 2012 Nov 5.

In this study, we investigated the molecular epidemiology of group A rotaviruses in cases of acute gastroenteritis in Goroka, Papua New Guinea. From April 2008 through November 2010, 813 diarrheal stool samples were collected from children <5 years of age hospitalized with acute gastroenteritis. Rotavirus antigen was detected in 31.2% of samples using a commercial enzyme-linked immunosorbent assay. Genotyping revealed the presence of the globally circulating strains G1P[8] (50.0%), G3P[8] (23.0%), and G2P[4] (8.2%). The globally emerging strains G9 and G12 were detected in 1.2% and 6.1% of samples, respectively. Mixed infections were detected in a high proportion of samples (11.9%), with 9.0% and 3.7% of samples displaying multiple G and P genotypes, respectively.

25 Howse G.

Elements of Pacific public health laws: an analysis of the public health acts of Papua New Guinea, Vanuatu, the Solomon Islands, and Fiji.

Asia Pac J Public Health 2012 Sep;24(5):860-866.

Pacific countries are sovereign nations with distinctive histories, ethnicity, customs, primary resources, economies, and health systems. Despite these and other acknowledged differences, similarities exist in many areas such as geography,

legal history, and culture. Many share the experience of colonization, with imported British laws and the subsequent experience of independence. Most Pacific countries are also developing countries. This article broadly describes approaches to legislating in public health in Papua New Guinea, Fiji, Vanuatu, and the Solomon Islands and notes common elements in their public health laws, in particular, in relation to administration, allocation of powers and responsibilities, interaction with local government, communicable disease control, and nuisance. The article concludes that many Pacific public health laws could deliver better support for current health policy, more sensitivity to the culture and customs of the region, and better management of public health risk through laws that are better suited to their Pacific environment, easier to understand, more flexible, and more relevant to current health policy.

26 **Hunter E.**

"Creating Futures" in Papua New Guinea: just the beginning.
Australas Psychiatry 2012 Dec;20(6):507-511. Epub 2012 Oct 31.

OBJECTIVES: "Creating Futures 2012: PNG" was the largest mental health conference to date in Melanesia. This paper describes the history, purpose and content of this initiative as a means to facilitate capacity building in Papua New Guinea (PNG), increase binational cooperation and develop a regional mental health network. CONCLUSIONS: Fifty Australian professionals were recruited to work with PNG colleagues to develop a suite of 20 workshops on locally identified themes. Over 300 delegates from across PNG and the western Pacific attended the four-day meeting, which was framed by Professor Vikram Patel in a series of presentations on global health. Feedback from PNG delegates and potential ongoing activities are described.

27 **Inui S, Hosoya T, Shimamura Y, Masuda S, Ogawa T, Kobayashi H, Shirafuji K, Moli RT, Kozone I, Shin-ya K, Kumazawa S.**

Solophenols B-D and solomonin: new prenylated polyphenols isolated from propolis collected from the Solomon Islands and their antibacterial activity.
J Agric Food Chem 2012 Nov 28;60(47):11765-11770. Epub 2012 Nov 14.

Three new prenylated flavonoids, namely, solophenols B (1), C (2), and D (3), as well as a new prenylated stilbene, solomonin (4), were isolated from propolis collected from the Solomon Islands. In addition, 17 known compounds were identified. The structures of the new compounds were determined by a combination of methods, including mass spectrometry and NMR. These new compounds and several known compounds were tested for antibacterial activity against *Staphylococcus aureus*, *Bacillus subtilis*, and *Pseudomonas aeruginosa*. Most of them exhibited potent antibacterial activity. These findings may indicate that propolis from the Solomon Islands has potential applications as an ingredient in food additives or pharmaceuticals.

28 **Jimenez Soto E, La Vincente S, Clark A, Firth S, Morgan A, Dettrick Z, Dayal P, Aldaba BM, Varghese B, Trisnantoro L, Prasai Y; Investment Case Team for India, Indonesia, Nepal, Papua New Guinea and the Philippines.**

Developing and costing local strategies to improve maternal and child health: the investment case

framework.

PLoS Med 2012;9(8):e1001282. Epub 2012 Aug 7.

29 **Jorim RY, Korape S, Legu W, Koch M, Barrows LR, Matainaho TK, Rai PP.**

An ethnobotanical survey of medicinal plants used in the Eastern Highlands of Papua New Guinea.
J Ethnobiol Ethnomed 2012 Dec 18;8:47.

BACKGROUND: The Eastern Highlands area of Papua New Guinea (PNG) has a rich tradition of medicinal plant use. However, rapid modernization is resulting in the loss of independent language traditions and consequently a loss of individuals knowledgeable in medicinal plant use. This report represents a program to document and preserve traditional knowledge concerning medicinal plant use in PNG. This report documents and compares traditional plant use in the Eastern Highlands districts of Unggai-Bena, Okapa, and Obura-Wonenara, and puts these new records in context of previously documented PNG medicinal plant use. METHODS: This manuscript is an annotated combination of Traditional Medicines survey reports generated by UPNG trainees using a survey questionnaire titled "Information sheet on traditional herbal preparations and medicinal plants of PNG". The Traditional Medicines survey project is supported by WHO, US NIH and PNG governmental health care initiatives and funding. RESULTS: Overall, after "poisoning" (synonymous with "magic") the most commonly recorded ailments addressed by medicinal plant use were pain, gynecological disease, gastrointestinal maladies, anemia or malnutrition and malaria. However, the recorded indications for plant use varied widely amongst the different survey locations. Unlike many areas of PNG, mixing of ingredients was the most common mode of preparation recorded, except for two areas where the consumption of fresh plant material was more common. Throughout the Eastern Highlands oral administration was most common, with topical application second. Overall, leaves were most commonly used in the preparations of the healers interviewed, followed by bark and stems. Several new medicinal uses of plants were also documented. CONCLUSIONS: Collaboration between the WHO, UPNG and the PNG Department of Health initiated Traditional Medicine survey program in order to preserve traditional knowledge concerning medicinal plant use in PNG. This effort promotes integration of effective and accessible traditional practices with Western protocols. The Traditional Medicine surveys are particularly important because, in the absence of the clinical validation, the documentation of the consistent use of a given plant for specific indication by a large number of herbalists, across a wide range of ethnic traditions, may be considered as a positive criterion for the promulgation of said use amongst PNG's recently formed traditional healer associations.

30 **Kelly A, Kupul M, Nake Trumb R, Aeno H, Neo J, Fitzgerald L, Hill PS, Kaldor JM, Siba P, Vallely A.**

More than just a cut: a qualitative study of penile practices and their relationship to masculinity, sexuality and contagion and their implications for HIV prevention in Papua New Guinea.
BMC Int Health Hum Rights 2012 Jul 20;12:10.

BACKGROUND: Male circumcision (MC) has been shown to reduce vaginal transmission of HIV to men. While community acceptability is important in a country's preparedness to introduce MC, it is equally important to map contemporary MC and other penile cutting practices, and the socio-cultural dimensions

underpinning these practices. **METHODS:** A total of 486 men and women (n=276 and n=210, respectively) participated in 82 semi-structured and 45 focus group discussions from four different provinces of Papua New Guinea (PNG), each representing one of the four socially and geographically diverse regions of the country. **RESULTS:** Of the men interviewed 131 self-reported that they had undergone a penile alteration with some reporting multiple types. Practices were diverse and could be grouped into five broad categories: traditional (customary) penile cutting; contemporary penile cutting; medical circumcision; penile inserts; and penile bloodletting practices in which sharp objects are used to incise the glans and or inserted and withdrawn from the male urethra in order to induce bleeding. Socio-cultural traditions, enhanced sexual pleasure and improved genital hygiene were key motivators for all forms of penile practices. **CONCLUSIONS:** The findings from this study highlight the complex and diverse nature of penile practices in PNG and their association with notions of masculinity, sexuality and contagion. Contemporary penile practices are critical to a community's acceptance of MC and of a country's ability to successfully implement MC in the context of a rich and dynamic culture of penile practices. If an MC program were to be successfully rolled out in PNG to prevent HIV it would need to work within and build upon these diverse cultural meanings and motivators for penile practices already commonly performed in PNG by men.

- 31 **Khositseth S, Bruce LJ, Walsh SB, Bawazir WM, Ogle GD, Unwin RJ, Thong MK, Sinha R, Choo KE, Chartapisak W, Kingwatanakul P, Sumboonnanda A, Vasuvattakul S, Yenchtisomanus P, Wrong O.**

Tropical distal renal tubular acidosis: clinical and epidemiological studies in 78 patients.

QJM 2012 Sep;105(9):861-877.

BACKGROUND: Distal renal tubular acidosis (dRTA) caused by mutations of the SLC4A1 gene encoding the erythroid and kidney isoforms of anion exchanger 1 (AE1 or band 3) has a high prevalence in some tropical countries, particularly Thailand, Malaysia, the Philippines and Papua New Guinea (PNG). Here the disease is almost invariably recessive and can result from either homozygous or compound heterozygous SLC4A1 mutations. **METHODS:** We have collected and reviewed our own and published data on tropical dRTA to provide a comprehensive series of clinical and epidemiological studies in 78 patients. **RESULTS:** Eight responsible SLC4A1 mutations have been described so far, four of them affecting multiple unrelated families. With the exception of the mutation causing South-East Asian ovalocytosis (SAO), none of these mutations has been reported outside the tropics, where dRTA caused by SLC4A1 mutations is much rarer and almost always dominant, resulting from mutations that are quite different from those found in the tropics. SLC4A1 mutations, including those causing dRTA, may cause morphological red cell changes, often with excess haemolysis. In dRTA, these red cell changes are usually clinically recessive and not present in heterozygotes. The high tropical prevalence of dRTA caused by SLC4A1 mutations is currently unexplained. **CONCLUSION:** A hypothesis suggesting that changes in red cell metabolism caused by these mutations might protect against malaria is put forward to explain the phenomenon,

and a possible mechanism for this effect is proposed.

- 32 **Kim SY, Lee Y, Sohn M, Hahm KH.**
Developing a tool for assessing public health law in countries.

Asia Pac J Public Health 2012 Sep;24(5):867-871. Epub 2012 Oct 2.

At present, the World Health Organization (WHO) is in the process of developing a tool designed to assess the status of public health legislation in a given country. An Expert Consultation on Public Health Law was convened in Manila, Philippines, in May 2011. The participants agreed that the tool could serve as a guide for a regional approach to assist Member States in assessing the scope, completeness, and adequacy of their public health law. Given the broad definition of "public health" and the laws that affect health, directly or indirectly, the participants further agreed to narrow the field to 4 areas based on significant WHO works/policies, each organized into an independent module: (1) International Digest on Health Law, (2) Primary Health Care, (3) International Health Regulations 2005, and (4) Framework Convention on Tobacco Control. The tool would be drafted in a questionnaire format that asks the respondent to determine whether primary and/or subsidiary legislation exists in the country on a specific topic and, if so, to cite the relevant law, describe the pertinent points, and attach and/or link to the full text where available. The participants agreed that the respondents should include government officials and/or academics with legal competency. Version 1 of the tool was piloted in the Philippines, the Republic of Korea, Samoa, and Vanuatu. At a 2nd Expert Consultation on Public Health Law, convened in Incheon, Republic of Korea, in October 2011, in conjunction with the 43rd Conference of the Asia-Pacific Academic Consortium on Public Health, the participants determined that the tool was generally usable, certain concerns notwithstanding, such as the risk of standardizing compliance with WHO policies. The agreed next step is to finalize the analysis tool by August 2012, marking the end of stage I in the development process. Stage II will consist of team building and networking of responsible officers and/or professionals in the countries. The tool will be further developed to reflect specific in-country situations.

- 33 **Knox J, Marshall C.**
Chromoblastomycosis in a Solomon Islander.

Med J Aust 2012 Sep 17;197(6):350.

- 34 **Lisciandro JG, Prescott SL, Nadal-Sims MG, Devitt CJ, Richmond PC, Pomat W, Siba PM, Holt PG, Strickland DH, van den Biggelaar AH.**

Neonatal antigen-presenting cells are functionally more quiescent in children born under traditional compared with modern environmental conditions.

J Allergy Clin Immunol 2012 Nov;130(5):1167-1174. e10. Epub 2012 Jul 19.

BACKGROUND: One explanation for the high burden of allergic and autoimmune diseases in industrialized countries is inappropriate immune development under modern environmental conditions. There is increasing evidence that the process of immune deviation already begins in utero, but the underlying immunologic mechanisms are not clear. **OBJECTIVE:** We sought to identify differences in the function of neonatal antigen-presenting cells (APCs) in children born in settings that are more traditional versus those of modern societies. **METHODS:**

Cord blood mononuclear cells were collected from newborns from Papua New Guinea (PNG; traditional) and Australia (modern) and compared for differences in APCs and T-cell phenotype and function. RESULTS: Australian cord naive T cells (CD4(+) CD25(-)CD127(+) cells) showed an enhanced and more rapid proliferative response in an autologous, APC-dependent culture system, a result of differences in neonatal APCs rather than T-cell function. This included an increased capacity to process antigen and to upregulate activation markers after stimulation. In contrast, resting PNG APCs exhibited higher baseline levels of activation and inhibitory markers and were less responsive or nonresponsive to stimulation *in vitro*. CONCLUSIONS: This study supports the hypothesis that prenatal environments can influence the developing immune system *in utero*. Children born under modern environmental conditions exhibit increased APC reactivity at birth compared with children born under traditional environmental conditions. The functionally more quiescent nature of PNG neonatal APCs might protect against the development of harmful inflammatory responses in early life.

35 **Manning L, Laman M, Rosanas-Urgell A, Michon P, Aipit S, Bona C, Siba P, Mueller I, Davis TM.**

Severe anemia in Papua New Guinean children from a malaria-endemic area: a case-control etiologic study.

PLoS Negl Trop Dis 2012;6(12):e1972. Epub 2012 Dec 13.

BACKGROUND: There are few detailed etiologic studies of severe anemia in children from malaria-endemic areas and none in those countries with holoendemic transmission of multiple *Plasmodium* species. METHODOLOGY/PRINCIPAL FINDINGS: We examined associates of severe anemia in 143 well-characterized Papua New Guinean (PNG) children aged 0.5-10 years with hemoglobin concentration <50 g/L (median [inter-quartile range] 39 [33-44] g/L) and 120 matched healthy children (113 [107-119] g/L) in a case-control cross-sectional study. A range of socio-demographic, behavioural, anthropometric, clinical and laboratory (including genetic) variables were incorporated in multivariate models with severe anemia as dependent variable. Consistent with a likely trophic effect of chloroquine or amodiaquine on parvovirus B19 (B19V) replication, B19V PCR/IgM positivity had the highest odds ratio (95% confidence interval) of 75.8 (15.4-526), followed by *P. falciparum* infection (19.4 (6.7-62.6)), vitamin A deficiency (13.5 (5.4-37.7)), body mass index-for-age z-score <2.0 (8.4 (2.7-27.0)) and incomplete vaccination (2.94 (1.3-7.2)). *P. vivax* infection was inversely associated (0.12 (0.02-0.47)), reflecting early acquisition of immunity and/or a lack of reticulocytes for parasite invasion. After imputation of missing data, iron deficiency was a weak positive predictor (6.4% of population attributable risk). CONCLUSIONS/SIGNIFICANCE: These data show that severe anemia is multifactorial in PNG children, strongly associated with under-nutrition and certain common infections, and potentially preventable through vitamin A supplementation and improved nutrition, completion of vaccination schedules, and intermittent preventive antimalarial treatment using non-chloroquine/amodiaquine-based regimens.

36 **Manning L, Laman M, Rosanas-Urgell A, Turlach B, Aipit S, Bona C, Warrell J, Siba P, Mueller I,**

Davis TM.

Rapid antigen detection tests for malaria diagnosis in severely ill Papua New Guinean children: a comparative study using Bayesian latent class models.

PLoS One 2012;7(11):e48701. Epub 2012 Nov 5.

BACKGROUND: Although rapid diagnostic tests (RDTs) have practical advantages over light microscopy (LM) and good sensitivity in severe falciparum malaria in Africa, their utility where severe non-falciparum malaria occurs is unknown. LM, RDTs and polymerase chain reaction (PCR)-based methods have limitations, and thus conventional comparative malaria diagnostic studies employ imperfect gold standards. We assessed whether, using Bayesian latent class models (LCMs) which do not require a reference method, RDTs could safely direct initial anti-infective therapy in severe ill children from an area of hyperendemic transmission of both *Plasmodium falciparum* and *P. vivax*. METHODS AND FINDINGS: We studied 797 Papua New Guinean children hospitalized with well-characterized severe illness for whom LM, RDT and nested PCR (nPCR) results were available. For any severe malaria, the estimated prevalence was 47.5% with RDTs exhibiting similar sensitivity and negative predictive value (NPV) to nPCR ($\geq 96.0\%$). LM was the least sensitive test (87.4%) and had the lowest NPV (89.7%), but had the highest specificity (99.1%) and positive predictive value (98.9%). For severe falciparum malaria (prevalence 42.9%), the findings were similar. For non-falciparum severe malaria (prevalence 6.9%), no test had the WHO-recommended sensitivity and specificity of >95% and >90%, respectively. RDTs were the least sensitive (69.6%) and had the lowest NPV (96.7%). CONCLUSIONS: RDTs appear a valuable point-of-care test that is at least equivalent to LM in diagnosing severe falciparum malaria in this epidemiologic situation. None of the tests had the required sensitivity/specificity for severe non-falciparum malaria but the number of false-negative RDTs in this group was small.

37 **Marfurt J, Chalfein F, Prayoga P, Wabiser F, Wirjanata G, Sebayang B, Piera KA, Wittlin S, Haynes RK, Möhrle JJ, Anstey NM, Kenangalem E, Price RN.**

Comparative ex vivo activity of novel endoperoxides in multidrug-resistant *Plasmodium falciparum* and *P. vivax*.

Antimicrob Agents Chemother 2012 Oct;56(10):5258-5263. Epub 2012 Jul 30.

The declining efficacy of artemisinin derivatives against *Plasmodium falciparum* highlights the urgent need to identify alternative highly potent compounds for the treatment of malaria. In Papua Indonesia, where multidrug resistance has been documented against both *P. falciparum* and *P. vivax* malaria, comparative ex vivo antimalarial activity against *Plasmodium* isolates was assessed for the artemisinin derivatives artesunate (AS) and dihydroartemisinin (DHA), the synthetic peroxides OZ277 and OZ439, the semisynthetic 10-alkylaminoartemisinin derivatives artemisone and artemiside, and the conventional antimalarial drugs chloroquine (CQ), amodiaquine (AQ), and piperazine (PIP). Ex vivo drug susceptibility was assessed in 46 field isolates (25 *P. falciparum* and 21 *P. vivax*). The novel endoperoxide compounds exhibited potent ex vivo activity against both species, but significant differences in intrinsic activity were observed. Compared to AS and its

active metabolite DHA, all the novel compounds showed lower or equal 50% inhibitory concentrations (IC(50)s) in both species (median IC(50)s between 1.9 and 3.6 nM in *P. falciparum* and 0.7 and 4.6 nM in *P. vivax*). The antiplasmodial activity of novel endoperoxides showed different cross-susceptibility patterns in the two *Plasmodium* species: whereas their *ex vivo* activity correlated positively with CQ, PIP, AS, and DHA in *P. falciparum*, the same was not apparent in *P. vivax*. The current study demonstrates for the first time potent activity of novel endoperoxides against drug-resistant *P. vivax*. The high activity against drug-resistant strains of both *Plasmodium* species confirms these compounds to be promising candidates for future artemisinin-based combination therapy (ACT) regimens in regions of coendemicity.

- 38 **Massey PD, Wakageni J, Kekeubata E, Maena'adi J, Laete'esafi J, Waneagea J, Fangaria G, Jimuru C, Houaimane M, Talana J, MacLaren D, Speare R.** TB questions, East Kwaio answers: community-based participatory research in a remote area of Solomon Islands. *Rural Remote Health* 2012;12:2139. Epub 2012 Oct 24.

INTRODUCTION: East Kwaio is a remote region on the island of Malaita, Solomon Islands. Atoifi Adventist Hospital (the Hospital) is the only hospital and tuberculosis (TB) services provider in the region. If people come to the hospital with TB, they are usually admitted for the two-month intensive phase of treatment as there are no community-based TB services. Most people walk or travel by canoe to the hospital as there are no roads. East Kwaio is known to have high rates of TB; however, it has a low case detection rate and low treatment completion. The aims of this study were to explore why people with TB, especially from the mountain areas, present to the hospital so late in their illness or do not present at all. The study was part of a larger project to strengthen the research capacity of local health workers and community leaders, supported by visiting researchers from Australia. **METHODS:** Semi-structured interviews with TB patients, a focus group of key informants and direct interaction with a community with a history of TB were used to explore reasons why people present to the hospital late in their TB illness. **RESULTS:** Four interviews and a focus group of 12 key informants were conducted and a mountain hamlet with a history of TB was visited. The results represent the data from the interviews and the focus group. The time delay in presenting to the hospital from when participants first became unwell ranged between two and three years. In the mountain hamlet, two additional people with probable TB were seen who had not presented to the hospital during illnesses of five and nine months. Reasons for delays included: seeking care from traditional healers; the challenge of accessing health services due to distance, cost and cultural issues different from the hospital's worldview; social isolation when in hospital; and being old so not having long to live. Delays in diagnosis of people with TB will increase the risk of transmission to family and through hamlets and villages. This study has led to plans being developed to build a more culturally appropriate TB ward and community treatment program. **CONCLUSIONS:** The study has identified TB questions that need East Kwaio answers. It has shown that a small project can inform the development of important changes to TB services, such as the redevelopment and relocation

of the TB ward. To enable TB control, the local health services need to develop an understanding of, and appropriately engage with, traditional beliefs that influence how people interact with hospital TB treatment and management. This is the case even if the beliefs are based on a worldview different from that of the health service providers. Ongoing operational research is required into TB diagnosis and treatment services and the many factors that contribute to the high TB burden in this remote area.

- 39 **Mayor A, Bardají A, Felger I, King CL, Cisteró P, Dobaño C, Stanisci DI, Siba P, Wahlgren M, del Portillo H, Mueller I, Menéndez C, Ordi J, Rogerson S.**

Placental infection with *Plasmodium vivax*: a histopathological and molecular study. *J Infect Dis* 2012 Dec 15;206(12):1904-1910. Epub 2012 Oct 10.

BACKGROUND: Evidence of the presence of *Plasmodium vivax* in the placenta is scarce and inconclusive. This information is relevant to understanding whether *P. vivax* affects placental function and how it may contribute to poor pregnancy outcomes. **METHODS:** Histopathologic examination of placental biopsies from 80 Papua New Guinean pregnant women was combined with quantitative polymerase chain reaction (qPCR) to confirm *P. vivax* infection and rule out coinfection with other *Plasmodium* species in placental and peripheral blood. Leukocytes and monocytes/macrophages were detected in placental sections by immunohistochemistry. **RESULTS:** Mono-infection by *P. vivax* and *Plasmodium falciparum* was detected by qPCR in 8 and 10 placentas, respectively. Seven of the 8 women with *P. vivax* placental mono-infection were negative in peripheral blood. By histology, 3 placentas with *P. vivax* mono-infection showed parasitized erythrocytes in the intervillous space but no hemozoin in macrophages nor increased intervillous inflammatory cells. In contrast, 7 placentas positive for *P. falciparum* presented parasites and hemozoin in macrophages or fibrin as well as intervillous inflammatory infiltrates. **CONCLUSIONS:** *Plasmodium vivax* can be associated with placental infection. However, placental inflammation is not observed in *P. vivax* mono-infections, suggesting other causes of poor delivery outcomes associated with *P. vivax* infection.

- 40 **Mendez FL, Watkins JC, Hammer MF.**

A haplotype at STAT2 introgressed from Neanderthals and serves as a candidate of positive selection in Papua New Guinea.

Am J Hum Genet 2012 Aug 10;91(2):265-274.

Signals of archaic admixture have been identified through comparisons of the draft Neanderthal and Denisova genomes with those of living humans. Studies of individual loci contributing to these genome-wide average signals are required for characterization of the introgression process and investigation of whether archaic variants conferred an adaptive advantage to the ancestors of contemporary human populations. However, no definitive case of adaptive introgression has yet been described. Here we provide a DNA sequence analysis of the innate immune gene STAT2 and show that a haplotype carried by many Eurasians (but not sub-Saharan Africans) has a sequence that closely matches that of the Neanderthal STAT2. This haplotype, referred to as N, was discovered through a resequencing

survey of the entire coding region of STAT2 in a global sample of 90 individuals. Analyses of publicly available complete genome sequence data show that haplotype N shares a recent common ancestor with the Neanderthal sequence (~80 thousand years ago) and is found throughout Eurasia at an average frequency of ~5%. Interestingly, N is found in Melanesian populations at ~10-fold higher frequency (~54%) than in Eurasian populations. A neutrality test that controls for demography rejects the hypothesis that a variant of N rose to high frequency in Melanesia by genetic drift alone. Although we are not able to pinpoint the precise target of positive selection, we identify nonsynonymous mutations in ERBB3, ESYT1, and STAT2 – all of which are part of the same 250 kb introgressive haplotype – as good candidates.

41 Mitjà O, Hays R, Rinaldi AC, McDermott R, Bassat Q.

New treatment schemes for yaws: the path toward eradication.

Clin Infect Dis 2012 Aug;55(3):406-412. doi: 10.1093/cid/cis444. Epub 2012 May 18.

42 Negin J, Martiniuk AL, Farrell P, Dalipanda T.

Frequency, cost and impact of inter-island referrals in the Solomon Islands.

Rural Remote Health 2012;12:2096. Epub 2012 Sep 19.

INTRODUCTION: Providing quality health services to people living in remote areas is central to global efforts to achieve universal access to health care. Effective referral systems are especially critical in resource-limited countries where small populations are separated by considerable distances, geographic challenges and the limitations of human resources for health. This study aimed to build an evidence base on inter-island referrals in the Solomon Islands, in particular regarding the number of referrals, reasons for referrals, and cost, to ultimately provide recommendations regarding referral practice effectiveness and efficiency. **METHODS:** Data were taken from the referral database collected and maintained by the National Referral Hospital (NRH) in the capital, Honiara. Data included age, sex, ward or department visited, date of travel back to home port, home port and province. Data were available and included for 2008, 6 months of 2009, all of 2010 and 1 month of 2011; a total of 31 months. Travel costs were taken from NRH administrative information and included in the analysis. In addition, 10 qualitative interviews were conducted with clinicians and policy-makers in the tertiary hospital and one provincial hospital to gather information regarding inter-island referrals, their appropriateness and challenges faced. **RESULTS:** In the Solomon Islands, referrals from outer islands to the NRH are substantial and are gradually increasing over time. The two most populous provinces outside of the capital, Western and Malaita, represented 51% of all referrals in the study period. Of those referred, 21% were less than 15 years of age - even though 40% of the country's population is under 15 - with 30% being young adults of 15-24 years. Orthopaedic conditions comprised the largest number of referrals, with obstetric and gynaecological conditions a close second. The cost of referrals is rapidly increasing and was almost US\$350,000 per year for the NRH alone. The amount budgeted for patient travel from the provinces to the NRH was a fraction of what is needed to cover the current number of referrals leading to a substantial

budget shortfall. There did not appear to be a clear link between number of doctors in each province and the rate of referrals. **CONCLUSION:** Improving the appropriateness of referrals can have a substantial impact on access, quality of care and costs. Improvements in equipment in remote facilities, in human resources for health and in information technology can strengthen the quality of care in outer islands. Reducing the burden on referral facilities will allow them to provide appropriate care to those most in need while building public trust in all layers of the health system.

43 Noro JC, Kalaitzis JA, Neilan BA.

Bioactive natural products from Papua New Guinea marine sponges.

Chem Biodivers 2012 Oct;9(10):2077-2095. doi: 10.1002/cbdv.201100292.

The discovery of novel natural products for drug development relies heavily upon a rich biodiversity, of which the marine environment is an obvious example. Marine natural product research has spawned several drugs and many other candidates, some of which are the focus of current clinical trials. The sponge megadiversity of Papua New Guinea is a rich but underexplored source of bioactive natural products. Here, we review some of the many natural products derived from PNG sponges with an emphasis on those with interesting biological activity and, therefore, drug potential. Many bioactive natural products discussed here appear to be derived from non-ribosomal peptide and polyketide biosynthesis pathways, strongly suggesting a microbial origin of these compounds. With this in mind, we also explore the notion of sponge-symbiont biosynthesis of these bioactive compounds and present examples to support the working hypothesis.

44 Núñez R, Cooperrider K, Doan D, Wassmann J.

Contours of time: topographic construals of past, present, and future in the Yupno valley of Papua New Guinea.

Cognition 2012 Jul;124(1):25-35. doi: 10.1016/j.cognition.2012.03.007. Epub 2012 Apr 28.

Time, an everyday yet fundamentally abstract domain, is conceptualized in terms of space throughout the world's cultures. Linguists and psychologists have presented evidence of a widespread pattern in which deictic time – past, present and future – is construed along the front/back axis, a construal that is linear and ego-based. To investigate the universality of this pattern, we studied the construal of deictic time among the Yupno, an indigenous group from the mountains of Papua New Guinea, whose language makes extensive use of allocentric topographic (uphill/downhill) terms for describing spatial relations. We measured the pointing direction of Yupno speakers' gestures – produced naturally and without prompting – as they explained common expressions related to the past, present and future. Results show that the Yupno spontaneously construe deictic time spatially in terms of allocentric topography: the past is construed as downhill, the present as co-located with the speaker, and the future as uphill. Moreover, the Yupno construal is not linear, but exhibits a particular geometry that appears to reflect the local terrain. The findings shed light on how, our universal human embodiment notwithstanding, linguistic, cultural and environmental pressures come to shape abstract concepts.

45 Oppenheimer S.

Iron and infection: narrative review of a major iron supplementation study in Papua New Guinea undertaken by the Department of Tropical Paediatrics, Liverpool School of Tropical Medicine, 1979-1983, its aftermath and the continuing relevance of its results. *Paediatr Int Child Health* 2012 Nov;32 Suppl 2:S21-S29.

In 1978, I returned from a 2-year government posting as provincial paediatrician to East and West Sepik provinces of Papua New Guinea (PNG), having already enrolled on the Diploma of Tropical Medicine and Hygiene (DTM&H) course at the Liverpool School of Tropical Medicine. I had been too late to enrol for the more relevant Diploma in Tropical Paediatrics course, but, whilst on the DTM&H course, made up for lost time by presenting myself to Professor Ralph Hendrickse in his office. I outlined my proposal for a double-blind, controlled, randomised trial of iron intervention with the aim of improving iron nutrition and decreasing susceptibility to and morbidity from infections in a cohort of infants in PNG. My reason for suggesting such a study was the high rate of anaemia in infants there and my perception from the literature of the time that the balance of studies favoured a beneficial effect of iron supplementation on infectious susceptibility, and that iron deficiency was associated with reversible abnormalities of immune function (although it had and has since been difficult to demonstrate the severity and relevance of these in observational in-vivo studies in humans). Ralph made an on-the-spot decision, immediately offering me the opportunity to join his department on 1 January 1979 on temporary funding while I applied for (and secured) a major grant from the Wellcome Trust for this work.

46 Pelly EB.

Exploring men's health in indigenous Papua New Guinea.

Aust Nurs J 2012 Nov;20(5):47.

47 Phillips GA, Hendrie J, Atua V, Manineng C.

Capacity building in emergency care: an example from Madang, Papua New Guinea.

Emerg Med Australas 2012 Oct;24(5):547-552. Epub 2012 Sep 7.

BACKGROUND: Divine Word University (DWU) is an emerging national university of Papua New Guinea (PNG) based in the provincial capital of Madang, providing training for Health Extension Officers (HEOs). HEOs form the backbone of healthcare delivery in PNG as clinicians, public health officers and health centre managers. Both campus-based and clinical teaching at the nearby Modilon Hospital is limited because of significant resource constraints. **OBJECTIVE:** This article describes a visiting clinical lecturer programme in which Australasian emergency physicians and emergency registrars deliver teaching to HEO students at DWU and Modilon Hospital. **METHODS:** Volunteer doctors are briefed pre-departure and given prepared educational tools. Visits are from 2 weeks to 3 months, and include the possibility of accredited training for emergency registrars through the Australasian College for Emergency Medicine. DWU provides secure accommodation and assistance with travel and visa logistics. Tasks for visiting lecturers include delivering campus-based teaching on emergency medicine (EM) topics, structured and opportunistic bedside tutorials, and clinical teaching

and assistance with ED care alongside local EM clinicians. **DISCUSSION:** Programme evaluation has relied on qualitative feedback, which has been positive from all stakeholders. Visiting lecturers gain teaching skills and insights into the challenges of emergency healthcare delivery in an international, resource-constrained setting. Local staff receive assistance and support as well as learning new teaching skills. Students receive increased interactive learning opportunities. **CONCLUSION:** This programme provides positive models of both emergency care capacity building in a resource-constrained setting and training in international EM for Australasian clinicians.

48 Pulford J, Tandrapah A, Atkinson JA, Kaupa B, Russell T, Hetzel MW.

Feasibility and acceptability of insecticide-treated plastic sheeting (ITPS) for vector control in Papua New Guinea.

Malar J 2012 Oct 9;11:342.

BACKGROUND: This study assessed the feasibility and acceptability of utilizing insecticide-treated plastic sheeting (ITPS) as a malaria control intervention in Papua New Guinea (PNG). **METHODS:** ZeroVector® ITPS was installed in 40 homes across four study sites representing a cross section of malaria transmission risk and housing style. Structured questionnaires were completed at the time of ITPS installation (n = 40) and at four weeks post installation (n = 40) with the household head. Similarly, group interviews with the male and/or female household heads were completed at installation (n = 5) and four-week follow-up (n = 4). **RESULTS:** ZeroVector® ITPS was successfully installed in a range of homes employing traditional and/or modern building materials in PNG. The ITPS installations remained intact over the course of the four-week trial period and were highly acceptable to both male and female household heads. No dissatisfaction with the ITPS product was reported at four-week follow-up; however, the installation process was time consuming, participants reported a reduction in mosquito net use following ITPS installation and many participants expressed concern about the longevity of ITPS over the longer term. **CONCLUSION:** ZeroVector® ITPS installation is feasible and highly acceptable in a diverse range of PNG contexts and is likely to be favourably received as a vector control intervention if accessible en masse. A longer-term evaluation is required before firm policy or public health decisions can be made regarding the potential application of ITPS in the national malaria control programme. The positive study findings suggest a longer-term evaluation of this promising malaria control intervention warrants consideration.

49 Pulford J, Oakiva T, Angwin A, Bryant M, Mueller I, Hetzel MW.

Indifferent to disease: a qualitative investigation of the reasons why some Papua New Guineans who own mosquito nets choose not to use them.

Soc Sci Med 2012 Dec;75(12):2283-2290. Epub 2012 Sep 7.

This paper presents findings from a qualitative study designed to explore the reasons why some Papua New Guineans who own mosquito nets choose not to use them, whether on a regular or episodic basis. In-depth interviews (IDIs) were conducted with a sub-sample (n = 44) of participants in a country wide household survey who reported

owning or having access to a mosquito net, but not having slept under a mosquito net the night prior to survey. All IDs were completed between December 2010 and June 2011. Analysis was informed by a general inductive methodology. Multiple impediments to regular mosquito net use were identified by study participants, although all were broadly grouped into the inter-related categories of net-, environmental- or human-factors. Indifference emerged as the most influential impediment towards regular net use presenting as a general attitudinal context in which a majority of participant responses were grounded. A lack of knowledge regarding malaria transmission pathways or the utility of mosquito nets did not appear to underlie this indifference. Rather, the indifference appeared to be rooted in a lack of fear of malaria infection cultivated through lived experience. A wide range of interventions could potentially promote greater mosquito net use amongst this population. However, the basis of any intervention strategy, given the pervasive indifferent attitude towards regular mosquito net use, should be to render individual mosquito net use as easy and as convenient as possible and to promote complementary malaria control strategies where appropriate.

50 **Razee H, Whittaker M, Jayasuriya R, Yap L, Brentnall L.**

Listening to the rural health workers in Papua New Guinea – the social factors that influence their motivation to work. *Soc Sci Med* 2012 Sep;75(5):828-835. Epub 2012 May 10.

Despite rural health services being situated and integrated within communities in which people work and live, the complex interaction of the social environment on health worker motivation and performance in low middle income countries has been neglected in research. In this article we investigate how social factors impact on health worker motivation and performance in rural health services in Papua New Guinea (PNG). Face-to-face in-depth interviews were conducted with 33 health workers from three provinces (Central, Madang, and Milne Bay) in PNG between August and November 2009. They included health extension officers, community health workers and nursing officers, some of whom were in charge of the health centres. The health centres were a selection across church based, government and private enterprise health facilities. Qualitative analysis identified the key social factors impacting on health worker motivation and performance to be the local community context, gender roles and family related issues, safety and security and health beliefs and attitudes of patients and community members. Our study identified the importance of strong supportive communities on health worker motivation. These findings have implications for developing sustainable strategies for motivation and performance enhancement of rural health workers in resource poor settings.

51 **Redman-MacLaren M, MacLaren DJ, Harrington H, Asugeni R, Timothy-Harrington R, Kekeubata E, Speare R.**

Mutual research capacity strengthening: a qualitative study of two-way partnerships in public health research.

Int J Equity Health 2012 Dec 18;11:79.

INTRODUCTION: Capacity building has been employed in international health and development

sectors to describe the process of 'experts' from more resourced countries training people in less resourced countries. Hence the concept has an implicit power imbalance based on 'expert' knowledge. In 2011, a health research strengthening workshop was undertaken at Atoifi Adventist Hospital, Solomon Islands to further strengthen research skills of the Hospital and College of Nursing staff and East Kwaio community leaders through partnering in practical research projects. The workshop was based on participatory research frameworks underpinned by decolonising methodologies, which sought to challenge historical power imbalances and inequities. Our research question was, "Is research capacity strengthening a two-way process?" METHODS: In this qualitative study, five Solomon Islanders and five Australians each responded to four open-ended questions about their experience of the research capacity strengthening workshop and activities: five chose face to face interview, five chose to provide written responses. Written responses and interview transcripts were inductively analysed in NVivo 9. RESULTS: Six major themes emerged. These were: Respectful relationships; Increased knowledge and experience with research process; Participation at all stages in the research process; Contribution to public health action; Support and sustain research opportunities; and Managing challenges of capacity strengthening. All researchers identified benefits for themselves, their institution and/or community, regardless of their role or country of origin, indicating that the capacity strengthening had been a two-way process. CONCLUSIONS: The flexible and responsive process we used to strengthen research capacity was identified as mutually beneficial. Using community-based participatory frameworks underpinned by decolonising methodologies is assisting to redress historical power imbalances and inequities and is helping to sustain the initial steps taken to establish a local research agenda at Atoifi Hospital. It is our experience that embedding mutuality throughout the research capacity strengthening process has had great benefit and may also benefit researchers from more resourced and less resourced countries wanting to partner in research capacity strengthening activities.

52 **Reiling L, Richards JS, Fowkes FJ, Wilson DW, Chokejindachai W, Barry AE, Tham WH, Stubbs J, Langer C, Donelson J, Michon P, Tavul L, Crabb BS, Siba PM, Cowman AF, Mueller I, Beeson JG.**

The *Plasmodium falciparum* erythrocyte invasion ligand PfRh4 as a target of functional and protective human antibodies against malaria.

PLoS One 2012;7(9):e45253. Epub 2012 Sep 20.

BACKGROUND: Acquired antibodies are important in human immunity to malaria, but key targets remain largely unknown. *Plasmodium falciparum* reticulocyte-binding-homologue-4 (PfRh4) is important for invasion of human erythrocytes and may therefore be a target of protective immunity. METHODS: IgG and IgG subclass-specific responses against different regions of PfRh4 were determined in a longitudinal cohort of 206 children in Papua New Guinea (PNG). Human PfRh4 antibodies were tested for functional invasion-inhibitory activity, and expression of PfRh4 by *P. falciparum* isolates and sequence polymorphisms were determined. RESULTS: Antibodies to PfRh4 were acquired by children exposed to *P. falciparum* malaria, were predominantly comprised of IgG1 and IgG3

subclasses, and were associated with increasing age and active parasitemia. High levels of antibodies, particularly IgG3, were strongly predictive of protection against clinical malaria and high-density parasitemia. Human affinity-purified antibodies to the binding region of PfRh4 effectively inhibited erythrocyte invasion by *P. falciparum* merozoites and antibody levels in protected children were at functionally-active concentrations. Although expression of PfRh4 can vary, PfRh4 protein was expressed by most isolates derived from the cohort and showed limited sequence polymorphism. **CONCLUSIONS:** Evidence suggests that PfRh4 is a target of antibodies that contribute to protective immunity to malaria by inhibiting erythrocyte invasion and preventing high density parasitemia. These findings advance our understanding of the targets and mechanisms of human immunity and evaluating the potential of PfRh4 as a component of candidate malaria vaccines.

- 53 **Riddell M, Senn N, Clements CJ, Hobday L, Cowie B, Kurubi J, Kevin A, Siba P, Reeder JC, Morgan C.** Rubella control in Papua New Guinea: age-specific immunity informs strategies for introduction of rubella vaccine.

Vaccine 2012 Dec 14;30(52):7506-7512. Epub 2012 Oct 25.

AIM: To determine the age-specific immunity profile for rubella from three discrete study populations in Papua New Guinea, and to inform policy regarding the possible introduction of rubella vaccine. **BACKGROUND:** In 2005, the Western Pacific Region (WPR), of which Papua New Guinea (PNG) is a member state, declared the goal of regional measles elimination by 2012. Recently, WPR has incorporated an accelerated control goal for rubella and congenital rubella syndrome (CRS). PNG currently recommends two doses of measles vaccination at 6 and 9 months of age with a monovalent measles vaccine, which does not include rubella vaccine. **METHODS:** Convenience samples were collected from 1326 eligible participants in PNG and assessed for rubella immunity using the Dade Behring Enzygnost™ Anti-Rubella-Virus enzyme immunoassay. Nearly 34% were collected during an age stratified prospective survey of febrile patients in Madang Province; approximately 49% were collected from women of childbearing age in East Sepik and Milne Bay Provinces. Remaining specimens were collected from 6 to 7-month-old infants in Port Moresby prior to receiving the first dose of measles vaccine. **FINDINGS:** Of all samples tested, 65.2% (95% confidence interval (CI): 62.6-67.8) had evidence of immunity to rubella infection. Of women more than 15 years of age, 91.6% (95% CI: 89.4-93.5) were immune. The force of infection was highest between 5 and 19 years of age. **CONCLUSIONS:** Although a population-based sample was not used, our multi-centre study of the population immunity profile suggests that immunity against rubella is extremely high in most women of childbearing age, but women who become pregnant at an early age may be at high risk of rubella infection during pregnancy and potential delivery of an infant with CRS. Routine measles vaccine coverage, a proxy for measles-rubella vaccine coverage, as measured in recently published studies, is well below the WHO target of 80% coverage. Introduction of a child or infant dose of rubella vaccine requires caution and further study.

- 54 **Rosanas-Urgell A, Senn N, Rarau P, Aponte JJ,**

- Reeder JC, Siba PM, Michon P, Mueller I.**

Lack of associations of $\alpha(+)$ -thalassemia with the risk of *Plasmodium falciparum* and *Plasmodium vivax* infection and disease in a cohort of children aged 3-21 months from Papua New Guinea.

Int J Parasitol 2012 Nov;42(12):1107-1113. Epub 2012 Oct 17.

Despite consistent evidence of a protective effect of $\alpha(+)$ -thalassemia against severe *Plasmodium falciparum* disease, the mechanisms underlying this protection remain unknown. An increase in risk of *Plasmodium vivax* malaria in early childhood resulting in a cross-species protection against severe *P. falciparum* malaria has been proposed as a possible mechanism in Melanesian children. The association of $\alpha(+)$ -thalassemia genotypes with a risk of *P. falciparum* and *P. vivax* infection and uncomplicated illness was reassessed in a cohort of 1,112 Papua New Guinean children, followed from 3 to 21 months of age. Three hundred and eighty-nine (35.0%) children were homozygous for $\alpha(+)$ -thalassemia ($\alpha\alpha$), 506 (45.5%) heterozygous ($\alpha\alpha'$) and 217 (19.5%) homozygous for the wild-type allele. No significant differences in the incidence of *P. falciparum* (Pf) or *P. vivax* (Pv) malaria were observed between $\alpha(+)$ -thalassemia homozygote (Pf: incidence rate ratio (IRR)=1.13, CI (95) (0.82-1.56), p = 0.45, Pv: IRR = 1.15, CI (95) (0.88-1.50), p = 0.31), heterozygote (Pf: IRR = 0.98, CI (95) (0.71-1.34), p = 0.93, Pv: IRR = 1.14, CI (95) (0.88-1.48), p = 0.33) and wild-type children. The prevalence of infection with either species did not differ between $\alpha(+)$ -thalassemia genotypes, although densities of *P. vivax* (but not of *P. falciparum*) infections were significantly higher in $\alpha(+)$ -thalassemia homozygote and heterozygote children. An excessive risk of moderate-to-severe anemia (Hb <8 g/dl) was observed in $\alpha(+)$ -thalassemia homozygote children (IRR = 1.54, CI (95) (1.12-2.11), p = 0.008). This study therefore failed to confirm an increased risk of *P. vivax* or *P. falciparum* malaria in very young, $\alpha(+)$ -thalassemic children without significant levels of acquired immunity. This confirms the lack of protection by $\alpha(+)$ -thalassemia against uncomplicated *P. falciparum* and challenges the hypothesis of immunological cross-protection between *P. falciparum* and *P. vivax* as a mechanism underlying $\alpha(+)$ -thalassemia protection against severe *P. falciparum* disease in Melanesian children.

- 55 **Rosanas-Urgell A, Lin E, Manning L, Rarau P, Laman M, Senn N, Grimberg BT, Tavul L, Stanisic DI, Robinson LJ, Aponte JJ, Dabod E, Reeder JC, Siba P, Zimmerman PA, Davis TM, King CL, Michon P, Mueller I.**

Reduced risk of *Plasmodium vivax* malaria in Papua New Guinean children with Southeast Asian ovalocytosis in two cohorts and a case-control study. *PLoS Med* 2012;9(9):e1001305. Epub 2012 Sep 4.

BACKGROUND: The erythrocyte polymorphism, Southeast Asian ovalocytosis (SAO) (which results from a 27-base pair deletion in the erythrocyte band 3 gene, SLCA4A1 Δ 27) protects against cerebral malaria caused by *Plasmodium falciparum*; however, it is unknown whether this polymorphism also protects against *P. vivax* infection and disease. **METHODS AND FINDINGS:** The association between SAO and *P. vivax* infection was examined through genotyping of 1,975 children enrolled in three independent epidemiological studies conducted in the Madang area of Papua New Guinea. SAO was associated with a statistically significant 46% reduction in the

incidence of clinical *P. vivax* episodes (adjusted incidence rate ratio [IRR] = 0.54, 95% CI 0.40-0.72, $p < 0.0001$) in a cohort of infants aged 3-21 months and a significant 52% reduction in *P. vivax* (blood-stage) reinfection diagnosed by PCR (95% CI 22-71, $p = 0.003$) and 55% by light microscopy (95% CI 13-77, $p = 0.014$) in a cohort of children aged 5-14 years. SAO was also associated with a reduction in risk of *P. vivax* parasitaemia in children 3-21 months (1,111/ μ l versus 636/ μ l, $p = 0.011$) and prevalence of *P. vivax* infections in children 15-21 months (odds ratio [OR] = 0.39, 95% CI 0.23-0.67, $p = 0.001$). In a case-control study of children aged 0.5-10 years, no child with SAO was found among 27 cases with severe *P. vivax* or mixed *P. falciparum*/*P. vivax* malaria (OR = 0, 95% CI 0-1.56, $p = 0.11$). SAO was associated with protection against severe *P. falciparum* malaria (OR = 0.38, 95% CI 0.15-0.87, $p = 0.014$) but no effect was seen on either the risk of acquiring blood-stage infections or uncomplicated episodes with *P. falciparum*. Although Duffy antigen receptor expression and function were not affected on SAO erythrocytes compared to non-SAO children, high level (>90% binding inhibition) *P. vivax* Duffy binding protein-specific binding inhibitory antibodies were observed significantly more often in sera from SAO than non-SAO children (SAO, 22.2%; non-SAO, 6.7%; $p = 0.008$). CONCLUSIONS: In three independent studies, we observed strong associations between SAO and protection against *P. vivax* malaria by a mechanism that is independent of the Duffy antigen. *P. vivax* malaria may have contributed to shaping the unique host genetic adaptations to malaria in Asian and Oceanic populations.

56 Rosewell A, Addy B, Komnapi L, Makanda F, Ropa B, Posanai E, Dutta S, Mola G, Man WY, Zwi A, MacIntyre CR.

Cholera risk factors, Papua New Guinea, 2010. *BMC Infect Dis* 2012 Nov 5;12:287.

BACKGROUND: Cholera is newly emergent in Papua New Guinea but may soon become endemic. Identifying the risk factors for cholera provides evidence for targeted prevention and control measures. METHODS: We conducted a hospital-based case-control study to identify cholera risk factors. Using stool culture as the standard, we evaluated a cholera point of care test in the field. RESULTS: 176 participants were recruited: 54 cases and 122 controls. Independent risk factors for cholera were: being over 20 years of age (aOR 2.5; 95% CI 1.1-5.4), defecating in the open air (or river) (aOR 4.5; 95% CI 1.4-14.4) and knowing someone who travelled to a cholera affected area (aOR 4.1; 95% CI 1.6-10.7); while the availability of soap for handwashing at home was protective (aOR 0.41; 95% CI 0.19-0.87). Those reporting access to a piped water distribution system in the home were twice as likely to report the availability of soap for handwashing. The sensitivity and specificity of the rapid test were 72% (95% CI 47-90) and 71% (95% CI 44-90). CONCLUSIONS: Improving population access to a piped water distribution system and sanitation will likely reduce transmission by enabling enhanced hygiene and limiting the contamination of water sources. The One step *V. cholerae* O1/O139 Antigen Test is of limited utility for clinical decision making in a hospital setting with access to traditional laboratory methods. Settlement dwellers and mobile populations of all age groups should be targeted for interventions in Papua New Guinea.

57 Siba V, Horwood PF, Vanuga K, Wapling J, Sehuko R, Siba PM, Greenhill AR.

Evaluation of serological diagnostic tests for typhoid fever in Papua New Guinea using a composite reference standard.

Clin Vaccine Immunol 2012 Nov;19(11):1833-1837. Epub 2012 Sep 19.

Typhoid fever remains a major global health problem. A major impediment to improving outcomes is the lack of appropriate diagnostic tools, which have not significantly improved in low-income settings for 100 years. We evaluated two commercially available rapid diagnostic tests (Tubex and TyphiDot), a prototype (TyphiRapid TR-02), and the commonly used single-serum Widal test in a previously reported high-burden area of Papua New Guinea. Samples were collected from 530 outpatients with axillary temperatures of $\geq 37.5^{\circ}\text{C}$, and analysis was conducted on all malaria-negative samples ($n = 500$). A composite reference standard of blood culture and PCR was used, by which 47 participants (9.4%) were considered typhoid fever positive. The sensitivity and specificity of the Tubex (51.1% and 88.3%, respectively) and TyphiDot (70.0% and 80.1%, respectively) tests were not high enough to warrant their ongoing use in this setting; however, the sensitivity and specificity for the TR-02 prototype were promising (89.4% and 85.0%, respectively). An axillary temperature of $\geq 38.5^{\circ}\text{C}$ correlated with typhoid fever ($p = 0.014$). With an appropriate diagnostic test, conducting typhoid fever diagnosis only on patients with high-grade fever could dramatically decrease the costs associated with diagnosis while having no detrimental impact on the ability to accurately diagnose the illness.

58 Sicuri E, Davy C, Marinelli M, Oa O, Ome M, Siba P, Conteh L, Mueller I.

The economic cost to households of childhood malaria in Papua New Guinea: a focus on intra-country variation.

Health Policy Plan 2012 Jul;27(4):339-347. Epub 2011 Jun 22.

BACKGROUND: We compare direct and indirect household costs associated with malaria treatment for children <3 years in two provinces of Papua New Guinea. In particular, we explore the role of uncertainty around mean household costs and whether assuming a normal distribution for household costs limits the accuracy of any direct cost comparisons. METHODS: Exit surveys were undertaken at inpatient and outpatient health facilities. In order to handle uncertainty and facilitate comparisons, parametric and non-parametric bootstrap methods were used to estimate direct and indirect costs at the individual data level. The inpatient and outpatient incremental costs from Madang and Maprik health facilities were compared and significant differences between provinces were identified. RESULTS: Differences were noted between provinces for both inpatient and outpatient household costs. Total arithmetic mean costs for an outpatient malaria episode were US\$7.54 in Madang and US\$9.20 in Maprik. Total mean inpatient malaria episode costs were US\$25.20 in Madang and US\$14.08 in Maprik. As cost distributions were not normal, non-parametric bootstrap techniques were used for cost comparisons. Total household costs per outpatient episode of malaria were lower, although not significantly, in Maprik than in Madang (incremental cost of US\$-1.67; 95% CI -4.16 to 0.31), while total household costs per inpatient episode were significantly higher in Madang than in Maprik.

(difference of US\$11.16; 95% CI 5.47-25.33). A difference was noted between provinces in the proportion of indirect costs in total household costs for an outpatient visit: 76% in Madang vs 94% in Maprik. The proportion for indirect costs associated with inpatient visits varied less: 63% in Madang vs 68% in Maprik. **CONCLUSIONS:** Intra-country differences need to be considered in estimating household costs for both outpatient and inpatient malaria treatment. Our findings suggest that it is important to recognize the impact of both direct and indirect costs on individuals' capacity to afford treatment. Certain indirect costs are difficult to measure accurately, particularly respondents' interpretations of their productive versus non-productive time. Despite this, exploring intra-country cost variation can provide important information to health policy makers.

59 Sorokowski P, Sorokowska A.

Judgments of sexual attractiveness: a study of the Yali tribe in Papua.

Arch Sex Behav 2012 Oct;41(5):1209-1218. doi: 10.1007/s10508-012-9906-x. Epub 2012 Feb 14.

Preferences for waist-to-hip ratio (WHR), sexual dimorphism in stature (SDS), and leg-to-body ratio (LBR) have been investigated predominantly in Western cultures. The aim of the present study was to examine the preferences of a relatively isolated, indigenous population (i.e., Yali of Papua, inhabiting the mountainous terrain east of the Baliem valley). A total of 53 women and 52 men participated in the study. Study sites differed in distance from Wamena, the biggest settlement in the region, and frequency of tourists' visits. We found that the mate preferences among Yali men and women for WHR, LBR, and SDS were not exactly the same as in Western samples. Yali preferred low women's WHR and relatively high women's (but not men's) LBR. Women's and men's ratings of each SDS set were similar, which suggests that the "male-taller norm" in Yali tribe was far weaker than in Western cultures. Additionally, the observed preferences were modified by contact with different cultures, age, and accessibility of food resources (pig possession). Our results suggest that human norms of attractiveness are malleable and can change with exposure to different environments and conditions.

60 Spencer P, Fry RC, Kisby GE.

Unraveling 50-year-old clues linking neurodegeneration and cancer to cycad toxins: are microRNAs common mediators?

Front Genet 2012;3:192. doi: 10.3389/fgene.2012.00192. Epub 2012 Sep 28.

Recognition of overlapping molecular signaling activated by a chemical trigger of cancer and neurodegeneration is new, but the path to this discovery has been long and potholed. Six conferences (1962-1972) examined the puzzling neurotoxic and carcinogenic properties of a then-novel toxin [cycasin: methylazoxymethanol (MAM)- β -d-glucoside] in cycad plants used traditionally for food and medicine on Guam where a complex neurodegenerative disease plagued the indigenous population. Affected families showed combinations of amyotrophic lateral sclerosis (ALS), parkinsonism (P), and/or a dementia (D) akin to Alzheimer's disease (AD). Modernization saw declining disease rates on Guam and remarkable changes in clinical phenotype (ALS was replaced by P-D and then by D) and in two genetically distinct ALS-PDC-affected populations (Kii-Japan, West Papua-Indonesia) that used cycad

seed medicinally. MAM forms DNA lesions – repaired by O(6)-methylguanine methyltransferase (MGMT) – that perturb mouse brain development and induce malignant tumors in peripheral organs. The brains of young adult MGMT-deficient mice given a single dose of MAM show DNA lesion-linked changes in cell-signaling pathways associated with miRNA-1, which is implicated in colon, liver, and prostate cancers, and in neurological disease, notably AD. MAM is metabolized to formaldehyde, a human carcinogen. Formaldehyde-responsive miRNAs predicted to modulate MAM-associated genes in the brains of MGMT-deficient mice include miR-17-5p and miR-18d, which regulate genes involved in tumor suppression, DNA repair, amyloid deposition, and neurotransmission. These findings marry cycad-associated ALS-PDC with colon, liver, and prostate cancer; they also add to evidence linking changes in microRNA status both to ALS, AD, and parkinsonism, and to cancer initiation and progression.

61 Tynan A, Vallely A, Kelly A, Law G, Millan J, Siba P, Kaldor J, Hill PS; Male Circumcision Acceptability and Impact Study, PNG (MCAIS).

Vasectomy as a proxy: extrapolating health system lessons to male circumcision as an HIV prevention strategy in Papua New Guinea.

BMC Health Serv Res 2012 Sep 4;12:299.

BACKGROUND: Male circumcision (MC) has been shown to reduce the risk of HIV acquisition among heterosexual men, with WHO recommending MC as an essential component of comprehensive HIV prevention programs in high prevalence settings since 2007. While Papua New Guinea (PNG) has a current prevalence of only 1%, the high rates of sexually transmissible diseases and the extensive, but unregulated, practice of penile cutting in PNG have led the National Department of Health (NDoH) to consider introducing a MC program. Given public interest in circumcision even without active promotion by the NDoH, examining the potential health systems implications for MC without raising unrealistic expectations presents a number of methodological issues. In this study we examined health systems lessons learned from a national no-scalpel vasectomy (NSV) program, and their implications for a future MC program in PNG. **METHODS:** Fourteen in-depth interviews were conducted with frontline health workers and key government officials involved in NSV programs in PNG over a 3-week period in February and March 2011. Documentary, organizational and policy analysis of HIV and vasectomy services was conducted and triangulated with the interviews. All interviews were digitally recorded and later transcribed. Application of the WHO six building blocks of a health system was applied and further thematic analysis was conducted on the data with assistance from the analysis software MAXQDA. **RESULTS:** Obstacles in funding pathways, inconsistent support by government departments, difficulties with staff retention and erratic delivery of training programs have resulted in mixed success of the national NSV program. **CONCLUSIONS:** In an already vulnerable health system significant investment in training, resources and negotiation of clinical space will be required for an effective MC program. Focused leadership and open communication between provincial and national government, NGOs and community is necessary to assist in service sustainability. Ensuring clear policy and guidance across the entire sexual and reproductive health sector will provide opportunities

to strengthen key areas of the health system.

62 Ulijaszek SJ, Henneberg M.

Results of epidemiological studies of blood pressure are biased by continuous variation in arm size related to body mass.

Hum Biol 2012 Aug;84(4):437-444.

In cross-sectional epidemiological studies, blood pressure (BP) is often found to be positively correlated with fatness. Usually sphygmomanometers with only one cuff size for adults are used to measure BP while arm circumference (AC) influences BP readings. We have studied cross-sectional anthropometric and BP data of adult men and women from three populations: Cook Islanders (n = 259), Papua New Guinean: Purari (n = 295), and Ok Tedi (n = 274). These were selected because of their diverse socio-economic, anthropometric, and BP characteristics. Partial correlations and regressions were used to analyze these data. Systolic and diastolic pressures (SBP, DBP) showed dependence on AC, body mass index (BMI), and skinfold thickness. Stature had some effect on SBP and DBP, independent of BMI and AC. When effects of AC and stature were statistically controlled, BMI did not correlate with either SBP or DBP. People of larger body mass have greater AC, and this biases BP readings. Average values of SBP and DBP in groups of underweight, normal, overweight, and obese people predicted by AC (sex, age, and BMI being statistically controlled) closely matched observed SBP and DBP averages in those groups. Out of 24 pairwise comparisons (3 samples from different populations × 4 groups of BMI × 2 pressure readings) of predicted and actual BP, only two produced statistically significant differences while 21 of the differences were 5 mm Hg or less. Correlations between BP and obesity found in epidemiological studies may be severely biased by effects of variation in AC. Sphygmomanometric measurements of BP should be corrected for continuous variation in AC.

63 Valley A, Fitzgerald L, Fiya V, Aeno H, Kelly A, Sauk J, Kupul M, Neo J, Millan J, Siba P, Kaldor JM.

Intravaginal practices and microbicide acceptability in Papua New Guinea: implications for HIV prevention in a moderate-prevalence setting.

BMC Res Notes 2012 Nov 1;5:613.

BACKGROUND: The acceptability of female-controlled biomedical prevention technologies has not been established in Papua New Guinea, the only country in the Pacific region experiencing a generalised, moderate-prevalence HIV epidemic. Socio-cultural factors likely to impact on future product uptake and effectiveness, such as women's ability to negotiate safer sexual choices, and intravaginal hygiene and menstrual practices (IVP), remain unclear in this setting. **METHODS:** A mixed-method qualitative study was conducted among women and men attending a sexual health clinic in Port Moresby. During in-depth interviews, participants used copies of a hand-drawn template to indicate how they wash/clean the vulva and/or vagina. Interviewers pre-filled commercially available vaginal applicators with 2-3mL KY Jelly® to create a surrogate vaginal microbicide product, which was demonstrated to study participants. **RESULTS:** A total of 28 IDIs were conducted (women = 16; men = 12). A diverse range of IVP were reported. The majority of women described washing the vulva only with soap and water as part of their daily routine; in preparation for sex;

and following sexual intercourse. Several women described cleaning inside the vagina using fingers and soap at these same times. Others reported cleaning inside the vagina using a hose connected to a tap; using vaginal inserts, such as crushed garlic; customary menstrual 'steaming' practices; and the use of material fragments, cloth and newspaper to absorb menstrual blood. Unprotected sex during menstruation was common. The majority of both women and men said that they would use a vaginal microbicide gel for HIV/STI protection, should a safe and effective product become available. Microbicide use was considered most appropriate in 'high-risk' situations, such as sex with non-regular, transactional or commercial partners. Most women felt confident that they would be able to negotiate vaginal microbicide use with male sexual partners but if necessary would be prepared to use product covertly. **CONCLUSIONS:** Notional acceptability of a vaginal microbicide gel for HIV/STI prevention was high among both women and men. IVP were diverse in nature, socio-cultural dimensions and motivators. These factors are likely to impact on the future acceptability and uptake of vaginal microbicides and other biomedical HIV prevention technologies in this setting.

64 Vengiau G, Umezaki M, Phuanukoannon S, Siba P, Watanabe C.

Diet and physical activity among migrant Bougainvilleans in Port Moresby, Papua New Guinea: association with anthropometric measures and blood pressure.

Am J Hum Biol 2012 Sep-Oct;24(5):716-718. Epub 2012 Jul 17.

OBJECTIVES: Obesity and hypertension are increasing in Papua New Guinea. This study investigated the association of dietary pattern and physical activity level with anthropometric measurements and blood pressure in migrant Bougainvilleans in the capital city of Port Moresby. **METHODS:** Adults who had moved from Naasioi territory on Bougainville Island and resided in Port Moresby during the study period were studied (n = 70). The International Physical Activity Questionnaire was used to evaluate physical activity, and dietary pattern was assessed by per week consumption frequency of food items. **RESULTS:** The least square regression analysis revealed that interindividual variation in body mass index and waist circumference was explained by variations in physical activity but not by dietary pattern. Blood pressure was not associated with physical activity level or dietary pattern. **CONCLUSION:** The individual variation in anthropometric measurements in urban Papua New Guinea is mainly influenced by physical activity level.

65 Weitz CA, Friedlaender FR, Van Horn A, Friedlaender JS.

Modernization and the onset of overweight and obesity in Bougainville and Solomon Islands children: cross-sectional and longitudinal comparisons between 1966 and 1986.

Am J Phys Anthropol 2012 Nov;149(3):435-446. Epub 2012 Oct 5.

This set of cross-sectional and longitudinal data from children and young adults in certain Bougainville and Solomon Islands populations undergoing rapid modernization during the period 1966-1986 reveals very different responses to essentially the same stimuli – the introduction and widespread availability

of western dietary items and reductions in habitual activity. Our analyses of over 2,000 children and young adults first measured in 1966-1972, with follow-up surveys in 1968-1970 and 1985-1986, show changes in overweight/obesity in these communities have their onset around puberty, and are not related to differences in childhood growth stunting. The prevalence of overweight and obesity increased substantially during the period of this study among young adults, particularly women, and in groups with more Polynesian affinities, where the frequency of overweight (BMI ≥ 25) tripled over this 20-year interval. However, the BMI of the more Papuan groups on Bougainville remained remarkably stable, even though they were close to the epicenter of modernization during this period, the Bougainville Copper Mine.

66 **Wiessner P, Pupu N.**

Toward peace: foreign arms and indigenous institutions in a Papua New Guinea society. *Science* 2012 Sep 28;337(6102):1651-1654.

In 1990, shotguns and M-16s were adopted into Enga warfare, setting off some 15 years of devastation as youths (~17 to 28) took charge of interclan warfare. In response, people called on elder leaders to adapt customary institutions to restore peace; subsequently, war deaths and the frequency of war declined radically. Data from precolonial warfare, 501 recent wars, and 129 customary court sessions allow us to consider (i) the principles and values behind customary institutions for peace, (ii) their effectiveness, (iii) how they interact with and compare to state institutions of today, and (iv) how such institutions might have shaped our human behavioral repertoire to make life

in state societies possible.

67 **Williams C, Brian G.**

Using health rights to improve programme design: a Papua New Guinea case study.

Int J Health Plann Manage 2012 Jul-Sep;27(3):246-256. Epub 2012 Mar 1.

The non-state sector is becoming increasingly influential in funding and implementing global health programmes. However, their disease-specific focus and vertical interventions have led to criticism that these programmes can be unsustainable and unable to achieve long-term goals. This paper demonstrates that health rights can inform programme design to guide the design of appropriate and sustainable aid-funded health programmes. It draws on UN General Comment 14, which clarified the right to health duties of states and their international partners, and which determined that 'core obligations' in health must become progressively available, accessible, acceptable and of good quality. A rights-based tool assessed the design of activities proposed for Papua New Guinea by a consortium of Australian non-government organisations. The tool revealed that none of the 36 indicators was addressed in full. Five of the 12 indicators pertaining to availability were addressed partially, as were three of 10 relating to accessibility and one of six concerning human rights concepts. As shown by the case study, failure to address the indicators in this tool will result in simplistic programme designs that can win political or financial support, but will fail to respect health rights or deliver a quality health service, available, accessible and acceptable to all.