



# Otago International Health Research Network

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6TH ANNUAL CONFERENCE

7 – 8 NOVEMBER 2013 | HUTTON THEATRE, OTAGO MUSEUM

**6th Annual Conference**  
**OTAGO INTERNATIONAL HEALTH**  
**RESEARCH NETWORK**

7 – 8 November 2013  
Hutton Theatre  
Otago Museum

TIME	SESSION
8:30am – 9:00am	Registration
9:00am – 9:10am	Pacific Opening
9:10am – 9:30am	Welcome - John Crump Opening Address - Hon Michael Woodhouse John Crump - Global Health Perspective 2013
<b>SESSION 1</b>	<b>Health and Economics</b>
9:30am – 9:45am	Sarah Baird - What happens once the intervention ends? The medium term health impacts of a cash transfer program in Malawi.
9:45am – 10:00am	Erin Penno - Cost effectiveness analyses of laboratory services in low resource settings.
10:00am – 10:15am	David Fielding - Female empowerment and wellbeing: evidence from Africa.
10:15am – 10:30am	Brendan Gray and Jayde Flett - Investigating links between entrepreneurship development and the health and wellbeing of Pacific Island communities.
10:30am – 10:50am	Berk Ozler - Designing useful field experiments.
10:50am – 11:15am	<i>Morning Tea</i>
<b>SESSION 2</b>	<b>Operational and commercial research</b>
11:15am – 11:30am	Susan Jack - A service arm of the Centre for International Health.
11:30am – 11:45am	Kathryn Taetzsch - Activities of World Vision and potential for interlocking research.
11:45am – 12:00pm	Ronald Jackson - Control of <i>Brucella melitensis</i> in sheep and goats in Central Asia.
12:00pm – 12:15pm	Stephen Sowerby - Commercialisation of a parasite diagnostic with human application.
12:15pm – 12:30pm	Shyamal Das - Advances on pulmonary delivery of dry powder formulations for tuberculosis.
12:30pm – 1:15pm	<i>Lunch</i>

SESSION 3	Pacific Health
1:15pm – 1:30pm	Nancy Tayles - Prehistoric Polynesians: recent research on human burials in Rima Rau Cave, Atiu, Southern Cook Islands.
1:30pm – 1:45pm	Hallie Buckley - Prehistoric Polynesians: health on Atiu, Southern Cook Islands.
1:45pm – 2:00pm	Monica Tromp** - Analysing the plant component of ancient Oceanic subsistence from human and pig dental calculus.
2:00pm – 2:15pm	Anna Gosling** - Hyperuricaemia in the Pacific: an investigation into reasons for elevated serum uric acid levels among Polynesians.
2:15pm – 2:30pm	Amy McColl** - Importance of relationships and rapport with families for a home-based child obesity prevention pilot programme with Pacific families.
2:30pm – 2:45pm	Zaneta Thayer** - Pacific Islander and Māori women have blunted diurnal cortisol decline in pregnancy and give birth to infants with reduced cortisol reactivity: implications for health disparities research in New Zealand.
2:45pm – 3:00pm	Rosalind Gibson - A high prevalence of zinc - but not iron-deficiency among women in rural Malawi: a cross-sectional study.
3:00pm – 3:15pm	Simonette Mallard** - A micronutrient-fortified complementary food intervention in Zambian infants: proposed analysis of the dietary intake data.
3:15pm – 4:00pm	<b>Afternoon Tea</b>
4:00pm – 5:00pm	KEYNOTE ADDRESS: McAuley Oration Professor Kim Mulholland Professor of Child Health and Vaccinology at the London School of Hygiene and Tropical Medicine Title: "New vaccines for the developing world - who is responsible?" Venue: Hutton Theatre - Otago Museum  ALL WELCOME

TIME	SESSION
<b>SESSION 4</b>	<b>Centre for International Health - student projects</b>
9:00am – 9:15am	Merrin Rutherford** - Management of children exposed to <i>Mycobacterium tuberculosis</i> : a public health evaluation in West Java, Indonesia.
9:15am – 9:30am	Namrata Prasad** - A systematic review of the aetiology of severe febrile illness in low and middle-income countries.
9:30am – 9:45am	Choolwe Nkwemu Jacobs** - Seroepidemiology of <i>Hepatitis E</i> virus infection in an urban population in Zambia: strong association with HIV and environmental enteropathy.
9:45am – 10:00am	Philip Hill - <i>Chlamydia</i> infection in Samoan woman: an NZAID funded prevalence survey and risk factor analysis.
10:00am – 10:15am	John Crump - Invasive <i>Salmonella</i> infections in areas of high and low malaria transmission intensity in Tanzania.
10:15am – 10:30am	Aakash Chhibber** - Child mortality after discharge following suspected pneumonia, meningitis or septicaemia in rural Gambia.
10:30am – 10:45am	<b>Morning Tea</b>
<b>SESSION 5</b>	
10:45am – 11:00am	Macandrew Bay School
11:00am – 11:30am	Kim Mulholland - Global burden of disease: trendy and true?
11:30am – 12:20 pm	International Funding Session
12:20 pm – 12:30pm	Student Prize Presentation
12:30pm – 1:45pm	<b>Special Lunch Meeting</b> Dr Satupaitea Viali MBChB, MPH, FRACP, FCSANZ, FESC Cardiologist and Specialist Physician based in Samoa Title: "Rheumatic fever, rheumatic heart disease and research in Samoa and the wider Pacific". Venue: Hutton Theatre - Otago Museum  ALL WELCOME
1:45pm	Conference closure

\*\* denotes eligible for student prize

Student prize kindly donated by



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## ABSTRACTS

### In Order of Presentation and Where Received

#### **WHAT HAPPENS ONCE THE INTERVENTION ENDS? THE MEDIUM TERM HEALTH IMPACTS OF A CASH TRANSFER PROGRAM IN MALAWI**

Sarah Baird, University of Otago, New Zealand

Ephraim Chirwa, University of Malawi, Chancellor College, Malawi

Craig McIntosh, University of California, San Diego, USA

Berk Ozler, University of Otago, New Zealand/The World Bank, USA

#### **BACKGROUND**

Cash transfer programs are an important component of social protection policy. This research evaluates the medium term impacts of the Zomba Cash Transfer Program (ZCTP), a cash transfer program that took place in Malawi from 2008-2009. The one- and two-year assessments revealed program effects on a variety of health outcomes. This analysis expands on this previous research and investigates health impacts of the program two years after the intervention ended.

#### **METHODS**

The ZCTP is a cluster randomized controlled trial that took place in Zomba, Malawi with both conditional and unconditional treatment arms. 3,796 never married young women aged 13-22 were sampled in September 2007, with the intervention taking place for two calendar years, 2008 and 2009. This research assesses the medium term impacts of the intervention (2012-2013) on a variety of health outcomes using regression analysis.

#### **RESULTS**

Preliminary results suggest that, for baseline schoolgirls, there are no medium-term impacts on marriage and fertility for either the conditional or the unconditional treatment arm. We do find some evidence that anemia was decreased for the unconditional arm. For baseline dropouts, we find large medium-term impacts on both marriage and fertility.

#### **CONCLUSIONS**

The medium-term evaluation of the ZCTP illustrates the importance of assessing the longer term impacts of global health interventions, and highlights the potential for interventions introduced at a particularly important period of transition from adolescence to adulthood to have long lasting effects. The results also show key differential impacts on outcomes between the short-term and medium-term, the conditional and unconditional treatment arms, and between baseline schoolgirls and baseline dropouts. These results are potentially important for policy makers thinking of designing cash transfer programs as part of their social protection policy.

## **COST EFFECTIVENESS ANALYSES OF LABORATORY SERVICES IN LOW RESOURCE SETTINGS**

Erin C. Penno<sup>1</sup>, John A. Crump<sup>2</sup>, Sarah Baird<sup>3</sup>

<sup>1</sup>Centre for Health Systems, Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin

<sup>2</sup>Centre for International Health, Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin

<sup>3</sup>Department of Economics and Department of Preventive and Social Medicine, University of Otago Dunedin

### **BACKGROUND**

Investment in laboratory services has been limited in low- and middle-income countries. Patient management is driven by syndrome-based generic treatment guidelines that do not rely on laboratory support. However, there is considerable geographic and temporal variation in the etiologic agents causing the major syndromes and, in turn, in the antimicrobial susceptibility patterns of these etiologic agents. Therefore, considerable mismatch between etiologic agents and prescribed treatment may occur. This project will model the cost-effectiveness of laboratory services to diagnose bacterial sepsis in low resource settings, as well as assessing the potential cost effectiveness of a hypothetical, point-of-care diagnostic test.

### **METHODS**

Cost data for laboratory services will be derived from a full-service, low-volume laboratory in northern Tanzania. Prevalence, etiology, treatment cost and outcome data will be obtained from the literature. Costs and performance characteristics for the point-of-care test will be benchmarked against malarial rapid diagnostic tests and will be compared to existing clinical assessment for sepsis protocols.

### **RESULTS**

Anticipated results include an evaluation of the cost-effectiveness of laboratory monitoring of sepsis to inform empiric treatment regimens as well as likely cost-effectiveness of a point-of-care test.

### **CONCLUSION**

It is intended that results will be used to inform policy decisions around investment in laboratory services in health systems in low- and middle-income countries.

## **FEMALE EMPOWERMENT AND WELLBEING: EVIDENCE FROM AFRICA**

David Fielding<sup>1,2\*</sup>, Aurélie Lépine<sup>3</sup>

<sup>1</sup>Department of Economics, University of Otago, New Zealand

<sup>2</sup>Centre for the Study of African Economies, University of Oxford, UK

<sup>3</sup>Department of Global Health and Development, London School of Tropical Medicine and Hygiene, UK

One of the eight Millennium Development Goals is to 'promote gender equality and empower women.' However, only 1% of official foreign aid is currently spent on gender equality and human rights. Using individual-level survey data from Senegal, we model the effects that freedom within the home has on married women's subjective wellbeing. We find the direct effects on wellbeing to be of a similar magnitude to the direct effects of consumption, education and morbidity. These results suggest the need for a review of aid allocation priorities.

## **INVESTIGATING LINKS BETWEEN ENTREPRENEURSHIP DEVELOPMENT AND THE HEALTH AND WELLBEING OF PACIFIC ISLAND COMMUNITIES**

**Brendan Gray & Jayde Flett**

Department of Marketing, University of Otago, Dunedin, New Zealand

South Pacific island nations are at the forefront of climate change, with increasingly severe storms and other natural disasters threatening the livelihoods of many communities (Sutherland et al. 2005). Social and economic changes, along with institutional voids, have also weakened the resilience of small island developing states (Pelling and Uitto 2001). However, there has been little research into the resilience of small and micro business owners. Prior to our recent studies in Samoa (Gray and Duncan 2012, Walton and Gray 2013) and Tonga (Monahan and Gray 2013), there has also been little research into the effectiveness of business models utilised by development agencies. While sustainable entrepreneurship may prove to be a panacea for ecological and economic problems (Shepherd and Patzelt 2011), there is a lack of understanding about how active involvement in ventures that tick 'triple bottom line' objectives (Dixon & Clifford 2007) might also improve the physical and mental resilience of owners and families of micro businesses. Our proposed study will address this issue by evaluating the links between entrepreneurship and improved societal well-being and reduced levels of psychological and physical diseases (e.g. depression, diabetes and heart disease) in Samoa and Tonga.

## **DESIGNING USEFUL FIELD EXPERIMENTS**

**Berk Özler**

University of Otago and The World Bank, USA

What it means to conduct empirical research is rapidly changing in development economics along with other fields, such as political science, public health, and law. The changes in economics have a lot to do with the introduction of randomized controlled trials (RCTs) into the academic and policy arena. But, the emergence of numerous field experiments has been met with equal parts enthusiasm and resistance – not to mention some confusion. In particular, critics have conceded the superior internal validity of estimated effects but have questioned the relevance of the experiments to the policy questions at hand. In this setting, it's hard for policymakers to separate signal from noise to make good use of existing research or design new studies. Berk Özler will talk about designing useful field experiments, focusing on issues of spillover effects, measurement issues, study design, and external validity

## **A SERVICE ARM OF THE CENTRE FOR INTERNATIONAL HEALTH**

**Susan Jack**

Centre of International Health, University of Otago

*Global Health Link Otago* is the service arm for the Centre for International Health (CIH), University of Otago. *Global Health Link Otago* will further the initiatives of the Centre for International Health by contributing University of Otago expertise to the design, implementation and evaluation of health initiatives in under-resourced populations in the Pacific, Asia and Africa. We work in partnership with local colleagues to maximise health gains through strategic planning, implementation and robust evaluation of health programs and interventions. We aim for effective translation of policy into implementation, while ensuring that evaluation, monitoring and accountability are integral components of health programs. Building capacity and capability will be a high priority in all the work we do.



## **CONTROL OF BRUCELLA MELITENSIS IN SHEEP AND GOATS IN CENTRAL ASIA**

R. Jackson, D. Ward, B. Bedard

Brucellosis occupies the unenviable position of the most common zoonosis in humans in the world and disease caused by *Brucella melitensis* continues to persist in many countries where there is heavy reliance by livestock owners on sheep, goats and cattle for subsistence. Its re-emergence as a serious disease in Central Asian republics of the former Soviet Union coincided with changes from the large state-owned collective farms of Soviet times to numerous privately owned small holdings and has been aided by persistence with test and slaughter control programs which were appropriate for the collectives in Soviet times but are inappropriate for the current situation of private ownership, high incidence of the disease and lack of funds.

The efficacy of controls, based on initial whole flock conjunctival vaccination of sheep and goats with Rev1 and biannual vaccination of immature animals thereafter, has recently been demonstrated by cross-sectional serological studies which were conducted as part of pilot control programs in Tajikistan and Kyrgyzstan. Seroprevalence in Tajikistan was reduced from an initial 8.9% (95% CI 7.8, 10) in sheep and goats to 1.8% (1.3, 2.4) after five years in eight districts where vaccination was generally well implemented and the prevalence of households with evidence of infection in their animals was reduced from 25.1 to 7.5%. Seroprevalence was modestly reduced to 60% (50, 80) of 2003 levels in 10 districts where vaccination was intermittent and coverage was low in some years. It was unchanged in 19 districts where there were no interventions.

Seroprevalence was reduced from an initial 11% (9.9, 12.1) to 6.5% (5.8, 7.2) after implementation of a similar pilot program for 2.5 years in sheep and goats in all 18 villages in the Ak Talaa district in Kyrgyzstan and was accompanied by a significant reduction in incidence of reported disease in humans where vaccination was practised while the incidence of human cases was unaltered throughout the rest of the republic.

Constraints associated with subsistence type agriculture, inadequate budgets for veterinary services, numerous private smallholdings, communal grazing and annual migrations to summer pastures influenced the design of the pilot programs. Experience from the programs identified needs for biannual vaccination, surveillance to measure efficacy and coverage, quality assurance of cold chain and vaccines and consideration of sheep and goats separately rather than together as small ruminants. The pilot programs have also identified willingness of livestock owners to pay local veterinarians and technicians for administration of the vaccine along with strong interest among local communities for more involvement in the control of brucellosis and other zoonoses that impact on the health of community members and their livestock. More local level responsibility and partial cost recovery are seen as key elements for sustainability of national programs. A pleasing outcome from the pilot programs has been the adoption of its methods in national control programs in two Central Asia countries with similar husbandry systems. Whole country eradication is not a feasible option for the foreseeable future because of uncontrolled movements of animals within and across national boundaries but may be feasible for some villages and communities.

## **COMMERCIALISATION OF A PARASITE DIAGNOSTIC WITH HUMAN APPLICATION**

Stephen Sowerby

Departments of Biochemistry and Applied Science, University of Otago, Dunedin

Menixis is a technology venture formed in 2010 following applied scientific research at the University of Otago to address the unmet needs of the agribusiness parasite diagnostics. Driven to mitigate operator intensive microscopy, Menixis's innovative products enable a new paradigm for parasite analysis to better inform disease management. Initial applications in the agricultural sector have led to cash flow, investment and research funding for evaluation in human medicine.

## **ADVANCES ON PULMONARY DELIVERY OF DRY POWDER FORMULATIONS FOR TUBERCULOSIS**

Shyamal C Das<sup>1</sup>, Ian G Tucker<sup>2</sup>, Peter J Stewart<sup>2</sup>

<sup>1</sup>New Zealand's National School of Pharmacy, University of Otago, PO Box 56, Dunedin 9054, New Zealand

<sup>2</sup>Drug Delivery, Disposition and Dynamics, Monash Institute of Pharmaceutical Sciences, Monash University, 381 Royal Parade, Melbourne, Victoria 3052, Australia

Pulmonary delivery of anti-TB agents is attractive since they are directly administered to the target organ. It can reduce the dose, duration and frequency of dosing and toxic effects. Research is well progressed for pulmonary delivery of anti-TB drugs such as isoniazid, rifampicin, rifabutin, capreomycin, isoxyl and clofazimine and many other agents that target host responses such as muramyl dipeptide and small interfering RNA (siRNA). Nebulizers and dry powder inhalers (DPI) are two devices used for pulmonary delivery of anti-TB agents. While nebulizers are mostly home or hospital setting devices, dry powder inhalers are portable, quick and easy to administer offering improved patient compliance. Formulations are carrier based and carrier free. Key issues of DPI formulation development are achieving high dose delivery and stability. This presentation will review the current status of DPI formulations for delivering anti-TB agents and strategies for formulation development.

## **PREHISTORIC POLYNESIANS: RECENT RESEARCH ON HUMAN BURIALS IN RIMA RAU CAVE, ATIU, SOUTHERN COOK ISLANDS**

Nancy Tayles, Hallie R. Buckley and Angela L. Clark.

Department of Anatomy, Otago School of Medical Sciences

Our team of bioarchaeologists recently completed a field season on the island of Atiu, with the objectives of researching the origins of human skeletal remains in a cave, to establish who was interred there, and what their lives had been like. This project was stimulated by the local Atiu families on whose land the cave was located. Before going to Atiu, we researched oral traditions and historic documentation about the burials. During the field season we mapped the cave and recorded the locations of disarticulated and commingled accumulations of bones. We selected areas of the cave to systematically record the locations of individual bones, remove them to a 'laboratory' in the vicinity, to record details of their osteology, including counts, sizes, and individual characteristics such as pathology and genetic variations, before returning them to the cave. The analysis of the data is in progress as this abstract is being written but the presentation will include results. We also collected small samples of bones and teeth for radiocarbon dating, isotopic study of diet and migration, and ancient DNA analysis. This aspect of the project will provide the basis for a discussion of issues relating to research in remote and isolated communities.

## **PREHISTORIC POLYNESIANS: HEALTH ON ATIU, SOUTHERN COOK ISLANDS**

Hallie R. Buckley, Nancy Tayles and Angela L. Clark

Department of Anatomy, Otago School of Medical Sciences

One objective of the research project on the prehistoric human skeletal remains from the burial cave is to make an assessment of the health status of the people. While the bones were in our laboratory on the island we recorded any macroscopic evidence of health and disease on both bones and teeth. Since the skeletons were disarticulated and scattered, there was no opportunity to determine patterns of intra-individual distribution of pathological lesions but it was still possible to consider patterns within the sample. At the time of writing this abstract, the data are yet to be analysed in detail but the most common skeletal pathology was partially healed fractures affecting primarily the upper limb. There were also lesions indicative of chronic infection, including treponemal disease. Overall the pattern is of a population suffering from a high level of trauma, perhaps from injuries on the very rough surface of the makatea (raised coral reef) but strong enough to survive at least for enough time for fractures to heal and for infections to be transmitted from the soft tissue to the bones.

## **ANALYSING THE PLANT COMPONENT OF ANCIENT OCEANIC SUBSISTENCE FROM HUMAN AND PIG DENTAL CALCULUS**

Monica Tromp<sup>1</sup>, Hallie Buckley<sup>1</sup> and Lisa Matisoo-Smith<sup>1</sup>

<sup>1</sup>Biological Anthropology Research Group, Department of Anatomy, Otago School of Medical Sciences, University of Otago, Dunedin, New Zealand

The idea of an early Oceanic subsistence economy that included commensal species such as pigs, dogs, chickens and rats has been reasonably well established through zooarchaeological analyses. Plant foods have been more difficult to assess due to the scarcity of plant remains and generalised stable isotopes results of skeletal remains. One way to glean a portion of the plant diet is to identify microfossils trapped within human dental calculus. Microfossil and bacteria residues become trapped in dental calculus during life, representing dietary and other aspects of overall health, creating a direct relationship between life history and environment. The primary barrier to using this technique for early populations is the scarcity of recovered human dental remains. Dental calculus from commensal animals may be able to increase the sample size available for analysis. This presentation gives preliminary results of microfossils extracted from human and pig dental calculus and tests the plausibility of analyzing pig diet as a proxy for human diet when human remains are not available for analyses. Samples from the Teouma cemetery on Efate, Vanuatu allow us to test this due to the uncommonly large number of recovered human and pig dental remains dating from 3000 to 2400 cal. BP.

## **HYPERURICAEMIA IN THE PACIFIC: AN INVESTIGATION INTO REASONS FOR ELEVATED SERUM URIC ACID LEVELS AMONG POLYNESIANS**

Anna L. Gosling

Departments of Biochemistry and Anatomy, University of Otago, Dunedin, New Zealand

Elevated serum urate levels are almost ubiquitous among Polynesian and Micronesian populations. This likely contributes to the relatively high rate of metabolic disease (such as type 2 diabetes and gout) in these peoples. While changes in diet and lifestyle since contact with Europeans may be contributing to disease, there is also a genetic component. Given that these affected populations have a shared ancestry, it is possible that this genetic predisposition to disease developed sometime prior to or during the initial process of colonizing the Pacific; this supposition is reinforced by bio-archaeological evidence for gout among the earliest inhabitants of the region, indicating that a propensity to high serum urate is likely to have been present since the first arrival of people. Despite raised levels of urate contributing to development of disease, urate is also vital, and is known to contribute to innate immunity, as well as having antioxidant properties. Given these beneficial qualities, it is possible that genetic variants affecting urate levels have been selected for in these populations. This research seeks to use genomic data from modern Polynesian and related populations to test for evidence of selection to help us understand why urate levels are so high.

## **IMPORTANCE OF RELATIONSHIPS AND RAPPORT WITH FAMILIES FOR A HOME-BASED CHILD OBESITY PREVENTION PILOT PROGRAMME WITH PACIFIC FAMILIES**

Amy McColl<sup>1</sup>, Faafetai Sopoaga<sup>1,2</sup>, Kirsten J Coppel<sup>3</sup>.

<sup>1</sup>Department of Preventive and Social Medicine, University of Otago, Dunedin, New Zealand

<sup>2</sup>Pacific Islands Research & Student Support Unit, University of Otago, Dunedin, New Zealand

<sup>3</sup>Edgar National Centre for Diabetes and Obesity Research, Department of Medicine, University of Otago, Dunedin, New Zealand

The prevalence of child obesity among Pacific children in New Zealand is high (23%). Child obesity prevention and treatment programmes have not proved effective for this Pacific population. However, no studies have specifically addressed the home environment. The aim of this study was to develop and implement a home-based pilot programme for preventing child obesity by promoting healthy lifestyle behaviours in 'at-risk' Pacific families in Dunedin, New Zealand

The programme targeted small changes in lifestyle behaviours tailored to each family with the aim of improving nutrition and physical activity habits. The programme was delivered in the homes of six families over 12 weeks, after which interviews were conducted to evaluate the acceptability of the pilot programme.

The programme was liked and adopted by all families. Successful positive engagement with the families was achieved through the researcher's participation and interaction with the Pacific community. Key aspects of this influential relationship were mutual obligation, trust and feeling supported. Tailoring the programme to fit with each family's situation was a positive component.

Health-related programmes in Pacific communities should invest time into developing relationships with the target community at the outset. Time invested in relationship development is likely to enhance programme participation and acceptability.

## **PACIFIC ISLANDER AND MĀORI WOMEN HAVE BLUNTED DIURNAL CORTISOL DECLINE IN PREGNANCY AND GIVE BIRTH TO INFANTS WITH REDUCED CORTISOL REACTIVITY: IMPLICATIONS FOR HEALTH DISPARITIES RESEARCH IN NEW ZEALAND**

Zaneta M Thayer<sup>1,2,3</sup>

<sup>1</sup>Department of Anthropology, Northwestern University, Evanston, IL USA

<sup>2</sup>Department of Anthropology, University of Colorado at Denver, Denver, CO USA

<sup>3</sup>Visiting Scholar at Whānaki Research Centre, School of Public Health, Massey University

### **BACKGROUND**

Health disparities are well documented within NZ. However no prior work has evaluated ethnic variation in cortisol, which may be upstream of many cardiovascular and psychiatric health disorders. This study assesses whether there are ethnic differences in cortisol among pregnant women and their young infants.

### **METHODS**

Sixty-four pregnant women were recruited from two antenatal care centres in Auckland. Women were met in late pregnancy to assess cortisol, self rated health and various stress measures. They were followed up at 6 weeks postnatal to assess offspring cortisol response to vaccination.

### **RESULTS**

Pacific Islander/Māori women had poorer self rated health and higher material deprivation compared with NZ European and Asian women. Both Pacific Islander/Māori women and Asian women had flatter diurnal decline in cortisol compared with NZ European women, consistent with a pattern of chronic strain. Pacific Islander/Māori women gave birth to infants with blunted cortisol reactivity.

### **CONCLUSIONS**

This is the first study to document ethnic differences in cortisol in NZ, and suggests that these differences are present beginning in very early life. Ethnic differences in cortisol could underlie some of the well documented disparities in health within NZ.

## **A HIGH PREVALENCE OF ZINC – BUT NOT IRON-DEFICIENCY AMONG WOMEN IN RURAL MALAWI: A CROSS-SECTIONAL STUDY**

Rosalind S Gibson<sup>1</sup>, Edwin WP Siyame<sup>2</sup>, Rachel Hurst<sup>3</sup>, Anna A Wawer<sup>3</sup>, Scott D Young<sup>4</sup>, Martin R Broadley<sup>4</sup>, Allan DC Chilimba<sup>5</sup>, Louise Ander<sup>6</sup>, Michael J Watts<sup>6</sup>, Ben Chilima<sup>7</sup>, J Gondwe<sup>7</sup>, D Kang'ombe<sup>8</sup>, Alexander Kalimbira<sup>2</sup>, Susan J Fairweather-Tait<sup>3</sup>, Karl B Bailey<sup>1</sup>

<sup>1</sup>Department of Human Nutrition, University of Otago, Dunedin, New Zealand

<sup>2</sup>Lilongwe University of Agriculture and Natural Resources, Bunda College Campus, Lilongwe, Malawi

<sup>3</sup>Department of Nutrition, Norwich Medical School, University of East Anglia, Norwich, NR4 7TJ, UK

<sup>4</sup>School of Biosciences, University of Nottingham, Loughborough, LE12 5RD, UK

<sup>5</sup>Department of Agricultural Research Services, Lunyangwa Research Station, Mzuzu, Malawi

<sup>6</sup>British Geological Survey, Nottingham, NG12 5GG, UK

<sup>7</sup>Community Health Sciences Unit, Ministry of Health, Lilongwe, Malawi

<sup>8</sup>Nutrition Unit of Ministry of Health, Lilongwe 3, Malawi

### **BACKGROUND**

Zinc deficiency is often associated with nutritional iron deficiency (ID), and may be exacerbated by low selenium status. Therefore we investigated risk of iron and zinc deficiency in women with contrasting selenium status.

### **METHOD**

In a cross-sectional study, 1-day weighed diet composites and blood samples were collected from self-selected Malawian women aged 18–50 y from low (Zombwe) (n=60) and high-plant-available soil selenium (Mikalango) (n=60) districts. Diets were analyzed for trace elements and blood for biomarkers.

### **RESULTS**

Zinc deficiency (>90%) was greater than ID anemia (6%), or ID (5%), attributed to diets low in zinc (median 5.7 mg/d) with high phytate:zinc molar ratios (20.0), but high in iron (21.0 mg/d) from soil contaminant iron. Zombwe compared to Mikalango women had lower ( $p<0.05$ ) intakes of selenium (6.5 vs. 55.3  $\mu\text{g}/\text{d}$ ), zinc (4.8 vs. 6.4 mg/d), iron (16.6 vs. 29.6 mg/d), lower plasma selenium (0.72 vs. 1.60  $\mu\text{mol}/\text{L}$ ), higher body iron (5.3 vs. 3.8 mg/kg), although plasma zinc was similar (8.60 vs. 8.87  $\mu\text{mol}/\text{L}$ ). Body iron and plasma zinc were positive determinants of hemoglobin.

### **CONCLUSION**

Risk of zinc deficiency was higher than ID and not associated with selenium status. Plasma zinc was almost as important as body iron as a hemoglobin determinant.

## **A MICRONUTRIENT-FORTIFIED COMPLEMENTARY FOOD INTERVENTION IN ZAMBIAN INFANTS: PROPOSED ANALYSIS OF THE DIETARY INTAKE DATA**

Simonette R Mallard,<sup>1</sup> Lisa A Houghton,<sup>1</sup> Rosalind S Gibson<sup>1</sup>

<sup>1</sup>Department of Human Nutrition, University of Otago, Dunedin, New Zealand

### **BACKGROUND**

Inadequate complementary feeding, including poor quality foods and inappropriate feeding practices, can result in stunted growth and development in young children. The WHO has developed core infant and young child feeding (IYCF) indicators to monitor and guide feeding practices. Given the IYCF indicators are relatively new, little has been explored in Zambia. Utilizing data from the Chilenje Infant Growth, Nutrition and Infection Study (CIGNIS) conducted in Lusaka, Zambia, we aim to assess the prevalence of micronutrient inadequacies among 6- and 12-month old infants, to describe adherence to the IYCF indicators, and explore whether adherence affected the prevalence of stunting at 18 months of age.

### **METHODS**

Briefly, the CIGNIS was a randomized controlled trial comparing the effect of micronutrient-fortified infant porridges on the prevalence of stunting at 18 months of age. 743 infants aged 6 months were enrolled in the study. 24-hour dietary recall data was collected at baseline and every 6 months thereafter. The prevalence of nutrient inadequacy will be determined and meal frequency and dietary diversity will be assessed.

### **IMPLICATIONS**

Results from this study will enhance knowledge on feeding practices in Zambia, which can be used to guide policy, programme planning and evaluation in the area of IYCF.

## **NEW VACCINES IN DEVELOPING COUNTRIES – WHO IS RESPONSIBLE? WHOSE RESPONSIBILITY IS IT?**

**Kim Mulholland**

Menzies School of Health Research, Darwin  
London School of Hygiene and Tropical Medicine, London  
Murdoch Childrens Research Institute, Melbourne

The past 25 years has seen a major increase in the number of vaccines available to improve the health and survival of children. Two conjugate vaccines, developed a decade apart, have the capacity to greatly reduce morbidity and mortality from pneumonia and meningitis in the developing world. The development, evaluation and introduction of these vaccines into the developing world has taken place against a backdrop of radical changes in funding and support for vaccine research and implementation in developing countries. These changes have left major responsibility gaps, particularly in the area of field research. These issues will be examined as we look to future use of these vaccines in the developing world.

## **MANAGEMENT OF CHILDREN EXPOSED TO MYCOBACTERIUM TUBERCULOSIS: A PUBLIC HEALTH EVALUATION IN WEST JAVA, INDONESIA**

**Merrin E Rutherford,<sup>1</sup> Rovina Ruslami,<sup>2</sup> Melissa Anselmo,<sup>1</sup> Bacti Alisjahbana,<sup>2</sup> Neti Yulianti,<sup>3</sup> Hedy Sampurno,<sup>3</sup> Reinout van Crevel<sup>4</sup> & Philip C Hill<sup>1</sup>**

<sup>1</sup>Centre for International Health, Faculty of Medicine, University of Otago, PO Box 913, Dunedin, New Zealand.

<sup>2</sup>Health Research Unit, University of Padjadjaran, Bandung, Indonesia.

<sup>3</sup>Bandung Community Lung Clinic, Bandung, Indonesia.

<sup>4</sup>Department of Internal Medicine, Radboud University, Nijmegen, Netherlands.

Correspondence to Merrin E Rutherford (email: [merrin.rutherford@gmail.com](mailto:merrin.rutherford@gmail.com))

### **OBJECTIVE**

To investigate qualitatively and quantitatively the performance of a programme for managing the child contacts of adult tuberculosis patients in Indonesia.

### **METHODS**

A public health evaluation framework was used to assess gaps in a child contact management programme at a lung clinic. Targets for programme performance indicators were derived from established programme indicator targets, the scientific literature and expert opinion. Compliance with tuberculosis screening, the initiation of isoniazid preventive therapy in children aged under 5 years, the accuracy of tuberculosis diagnosis and adherence to preventive therapy were assessed in 755 child contacts in two cohorts. In addition, 22 primary caregivers and 34 clinic staff were interviewed to evaluate knowledge and acceptance of child contact management. The cost to caregivers was recorded. Gaps between observed and target indicator values were quantified.

### **FINDINGS**

The gaps between observed and target performance indicators were: 82% for screening compliance; 64 to 100% for diagnostic accuracy, 50% for the initiation of preventive therapy, 54% for adherence to therapy and 50% for costs. Many staff did not have adequate knowledge of, or an appropriate attitude towards, child contact management, especially regarding isoniazid preventive therapy. Caregivers had good knowledge of screening but not of preventive therapy and had difficulty travelling to the clinic and paying costs.

### **CONCLUSION**

The study identified widespread gaps in the performance of a child contact management system in Indonesia, all of which appear amenable to intervention. The public health evaluation framework used could be applied in other settings where child contact management is failing.

## **A SYSTEMATIC REVIEW OF THE AETIOLOGY OF SEVERE FEBRILE ILLNESS IN LOW AND MIDDLE-INCOME COUNTRIES**

Namrata Prasad<sup>1</sup>, David R. Murdoch<sup>2</sup>, John A. Crump<sup>1</sup>

<sup>1</sup>Centre for International Health, University of Otago, Dunedin

<sup>2</sup>Department of Pathology, University of Otago, Christchurch, New Zealand

### **BACKGROUND**

Fever is a common reason for presentation to hospitals in low and middle-income countries (LMIC) worldwide. However, compared to the syndromes of respiratory tract infection and diarrhoea, fever it has not been approached comprehensively. As malaria declines, clinicians face a growing proportion of febrile patients without malaria and few tools to guide management. We conducted a systematic review of fever aetiology studies in low- and middle-income countries (LMICs).

### **METHODS**

We searched three databases, Scopus, Web of Knowledge and Ovid Medline for studies conducted in LMICs worldwide, from the year 1980 through to 2013. Eligible studies prospectively assessed fever aetiology among hospitalised patients using rigorous case definitions. We used search terms that captured studies showing clinical and microbiological evidence of infections causing fever.

### **RESULTS**

Our search yielded 1600 articles. Following de-duplication, title and abstract screening, a final set will be selected for full article review. Data on study location, year, aetiology, and demographic characteristics of participants will be extracted from eligible studies. Results will be summarised by aetiology and region.

### **CONCLUSIONS**

This study will provide the first global review of severe febrile illness aetiology in LMICs. The findings are expected to identify data gaps and to provide an evidence base for prioritization of treatment and control efforts.

## **SEROEPIDEMIOLOGY OF HEPATITIS E VIRUS INFECTION IN AN URBAN POPULATION IN ZAMBIA: STRONG ASSOCIATION WITH HIV AND ENVIRONMENTAL ENTEROPATHY**

Choolwe Jacobs<sup>1,2</sup>, Clarence Chiluba<sup>1</sup>, Cynthia Phiri<sup>1</sup>, Mpala Mwanza Lisulo<sup>1</sup>, Mumba Chomba<sup>1</sup>, Samreen Ijaz<sup>3</sup>, Paul Kelly<sup>1,4</sup>, Philip C Hill<sup>2</sup>

<sup>1</sup>Tropical Gastroenterology & Nutrition group, UNZA School of Medicine, Lusaka, Zambia

<sup>2</sup>University of Otago, New Zealand

<sup>3</sup>Virology Reference Laboratory, Health Protection Agency, Colindale

<sup>4</sup>Blizard Institute, Barts & The London School of Medicine, Queen Mary, University of London, London UK

### **BACKGROUND**

Hepatitis E virus (HEV) infection is a significant public health problem that causes major epidemics of infectious hepatitis in developing countries, with high mortality rates in pregnant women. Recent reports indicate that HEV co-infections with HIV may have a more protracted course. However, the impact of HEV infections in communities heavily affected by HIV remains poorly studied. We set out to examine age-related seroprevalence in a community where we have previously carried out studies on environmental enteropathy.

### **METHODS**

Blood samples from 194 children and 106 adults were examined for IgG and IgM antibodies for HEV. HEV data were correlated with HIV status and morphometric analysis of small intestinal biopsies.

### **RESULTS**

Seroprevalence rose throughout childhood, from 8% in children aged 1-4 years, to 36% in children aged 10-14 years. In adults the overall prevalence was 42%, with 28% in HIV seronegative adults and 71% in seropositive adults (OR 6.2; 95%CI 2.2-18;  $P=0.0001$ ). In children, the univariate logistic analysis showed that the type of vessel used for storage of drinking water in the children's household was significantly associated with anti-HEV seropositive. In adults, villous height and crypt depth measurements showed that HEV seropositivity was associated with worse enteropathy ( $P=0.05$  and  $0.005$  respectively).

### **CONCLUSIONS**

HEV infection is common in Zambia. The study shows that acquisition of HEV antibodies starts early in life and increases with age. In adults it is strongly associated with HIV status, and also with environmental enteropathy.

## CHLAMYDIA INFECTION IN SAMOAN WOMAN: AN NZAID FUNDED PREVALENCE SURVEY AND RISK FACTOR ANALYSIS

Michael Walsh, Eseta Hope, Philip Hill, and the Chlamydia in Samoa study team

Centre for International Health, University of Otago, New Zealand  
Faculty of Nursing and Health, National University of Samoa, Samoa

This is the first study to assess the prevalence of genital *Chlamydia trachomatis* (CT) infection and associated factors for infection among women in Samoa. A population-based country-wide cross-sectional survey was conducted, using a two-stage cluster and random selection sampling technique, to describe the prevalence of CT infection and the patterns of sexual behaviour and fertility amongst sexually active Samoan women aged 18 to 29 years. Associations were explored for various possible risk factors. Overall the prevalence of CT infection within the study population of 18-29 year old females living in Samoa was 36.0%. A higher prevalence of CT infection was observed within the 18-24 year age group compared with the 25-29 year age group. Those women who were single were more likely to be CT infected than those who were in an established partnership or marriage relationship (OR 1.92; 95% CI, 1.02-3.62). While younger age at first intercourse was not significantly associated with higher likelihood of CT infection, increasing numbers of sexual partners was: those with two or more (OR 2.89, 1.03-8.06) and those with three or more lifetime sexual partners (OR 3.07; 1.19-7.67) were at increased risk of CT infection. Of note, those women who reported only one sexual partner still had a CT infection prevalence of 27.6%, suggesting that male sexual behaviour is very important in Samoa with respect to CT infection. Those women who reported having a past pregnancy were significantly less likely than nulliparous women to have CT infection (OR 0.49; 0.27-0.87). The findings identify a high prevalence of CT infection in sexually active Samoan women aged 18-29 years, similar to that observed within the limited antenatal studies already undertaken in Samoa. In addition, the study has provided data on risk factors for CT infection in Samoa, which are similar to those found elsewhere.

## INVASIVE SALMONELLA INFECTIONS IN AREAS OF HIGH AND LOW MALARIA TRANSMISSION INTENSITY IN TANZANIA

Holly M. Biggs<sup>\*1</sup>, Rebecca Lester<sup>\*2</sup>, Grace D. Kinabo<sup>3</sup>, Anne B. Morrissey<sup>1</sup>, George Mtove<sup>4</sup>, Bhezad Nadjm<sup>2,5</sup>, Hugh Reyburn<sup>2,5</sup>, John A. Crump<sup>1,3,6,7</sup>

\*Equal author contributions

<sup>1</sup>Division of Infectious Diseases, Department of Medicine, Duke University Medical Center, Durham, NC, USA

<sup>2</sup>London School of Hygiene and Tropical Medicine, London, United Kingdom

<sup>3</sup>Kilimanjaro Christian Medical Centre, Moshi, Tanzania

<sup>4</sup>Teule Hospital, Muheza, Tanzania

<sup>5</sup>Joint Malaria Programme, Moshi, Tanzania

<sup>6</sup>Duke Global Health Institute, Duke University, Durham, North Carolina, USA

<sup>7</sup>Centre for International Health, University of Otago, Dunedin, New Zealand

### BACKGROUND

Invasive salmonellosis is a major cause of childhood febrile illness and death across sub-Saharan Africa. The epidemiology of *Salmonella* Typhi and invasive nontyphoidal *Salmonella* (NTS) differs; *Salmonella* Typhi is often driven by environmental risk factors, while host-related factors such as HIV infection and malaria are associated with invasive NTS.

### METHODS

We compared prevalence of malaria and bacteremia, in particular invasive salmonellosis, among hospitalized febrile children aged 2 months to 13 years at 2 sites in Tanzania. Teule Hospital (TH) and Kilimanjaro Christian Medical Centre (KCMC) are located in areas of high and low malaria transmission intensity, respectively. Sites employed similar study protocols and participants were enrolled at TH from June 2006 - May 2007 and at KCMC from September 2007 - August 2008. Blood culture using BacT/ALERT and malaria microscopy with Giemsa-stained thick and thin blood films were performed.

### RESULTS

At TH, 3,639 children were enrolled compared to 467 at KCMC. Smear positive malaria was detected in 2,195 (60.3%) of 3,639 at TH and 11 (2.4%) of 460 at KCMC ( $p < 0.001$ ). Bacteremia was present in 336 (9.2%) of 3,639 at TH and 20 (4.3%) of 463 at KCMC ( $p < 0.001$ ). NTS was isolated in 160 (4.4%) of 3,639 children at TH and 1 (0.2%) of 463 at KCMC ( $p < 0.001$ ). *Salmonella* Typhi was isolated from 11 (0.3%) patients at TH and 6 (1.3%) at KCMC ( $p = 0.008$ ). With NTS excluded, the prevalence of bacteremia at TH was 5.1% and at KCMC 4.1% ( $p = 0.378$ ). HIV prevalence among enrollees at TH was 3.9% compared to 13.2% at KCMC ( $p < 0.001$ ).

### CONCLUSIONS

Where malaria transmission was intense, invasive NTS was common and *Salmonella* Typhi was uncommon, with the converse true where malaria transmission intensity was low. Bacteremia was more prevalent at TH than KCMC, but when NTS was excluded, there was no difference in proportions of bacteremic children between the sites. Invasive NTS and *Salmonella* Typhi may compete in as yet undetermined ways, and the interactions between these pathogens, the environment, and the host is a compelling area for future research.



## **CHILD MORTALITY AFTER DISCHARGE FOLLOWING SUSPECTED PNEUMONIA, MENINGITIS OR SEPTICAEMIA IN RURAL GAMBIA**

AV Chhibber<sup>1</sup>, P Hill<sup>1</sup>, J Jafali<sup>2</sup>, M Jasseh<sup>2</sup>, MI Hossain<sup>2</sup>, M Ndiaye<sup>2</sup>, JC Pathirana<sup>2</sup>, B Greenwood<sup>3</sup>, G Mackenzie<sup>2</sup>

<sup>1</sup>Centre for International Health, School of Medicine, University of Otago, Dunedin, NZ

<sup>2</sup>Medical Research Council, The Gambia Unit

<sup>3</sup>London School of Hygiene & Tropical Medicine, London, UK

### **BACKGROUND**

IMCI recommendations *following* illnesses are based on limited evidence. We determined the risk of mortality following discharge of children with suspected pneumonia, sepsis, or meningitis.

### **METHODS**

Eligible children were: resident in the Basse Health and Demographic Surveillance System (BHDSS), aged 2-59 months, enrolled in surveillance for suspected pneumonia, sepsis, or meningitis, admitted at Basse Health Centre between May 2008 and April 2012, and discharged alive. Vital status was monitored for 180 days after discharge by the BHDSS.

### **RESULTS**

3735 children were eligible for analysis. 105 died during follow-up; half within the first 45 days.

Multivariable models were able to describe the risk of mortality following discharge by using a) clinical syndrome on admission and b) pre-discharge risk factors.

### **CONCLUSIONS**

Post-discharge mortality is significant in rural Gambia with most deaths occurring within 45 days of discharge. Children at high risk of post-discharge mortality may be identified for intervention.

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