Welcome to the winter edition of IMPACT. An issue at the forefront for many of us at Burnet Institute is improving the health of women and children in low-income countries of our region, and how best to tackle the large numbers who still die during or as a direct result of childbirth.

It’s hard to imagine in this day and age that this is still a major problem. However, just a one hour flight to the north of Australia in Papua New Guinea, the rate of women dying in childbirth is still 80 times that of a woman giving birth in Australia. This is one of the highest levels of mortality associated with childbirth anywhere in the world and an issue that needs to be rapidly addressed.

There are many factors that contribute to poor outcomes for women and children, some of these include: high rates of communicable and infectious diseases, frequency of postpartum haemorrhage, poor nutrition, lack of education, poor infrastructure and access to facilities such as health clinics and birthing centres.

So how do we tackle what seems to be an insurmountable problem? The answer really lies in developing and implementing solid research programs to identify and understand the main reasons behind the problems, and to then use the findings to define the most cost effective and efficient health interventions to remedy the situation.

Burnet’s new Healthy Mothers, Healthy Babies program is intended to do exactly this. The end game is to make a substantial impact through research and an evidence base, to reduce the death rate of women and children, initially in PNG, but also to apply these same research principles to make a similar impact in other countries of our region, such as in Myanmar and Lao PDR.

To make such an impact requires support across the board from government and from community and accordingly we have launched our Healthy Mothers, Healthy Babies program, which I know many of you will be keen to support. This on-going program will really make a difference to the lives of women and children in these countries and provide the opportunity for people to live full and productive lives. I know I can count on your support for this important program.

I would also like to take this opportunity to thank those of you who continue to support our medical research and public health programs. Your support and enthusiasm for what we do is very much appreciated and provides our scientific and public health staff much encouragement.

Best wishes,

Professor Brendan Crabb AC, Director and CEO
A woman in Papua New Guinea is 80 times more likely to die in childbirth than a woman in Australia.

The appalling rate of maternal and newborn mortality in PNG is not improving – more than 500 deaths per 100,000 live births.

Communicable diseases – pneumonia, malaria, TB, syphilis, diarrhoeal diseases, meningitis and HIV – account for 50% of deaths.

2 out of 3 of newborn deaths in PNG are preventable.

10% of babies suffer from low birth weight.

43% have stunted growth.

PNG has one of the highest maternal mortality rates in the world.
One of the greatest human needs in our region is the appalling level of death and disease among women and children in Papua New Guinea (PNG). The rate of maternal and child death is staggeringly high, with a maternal mortality rate that is one of the highest in the world and 80 times that in Australia. Each year in PNG around 1,500 mothers lose their lives, mostly from preventable causes. More than 5,000 newborns die each year in PNG, with over a third of these not surviving beyond the first 24 hours, and a further 7,000 children don’t reach their fifth birthday. Two-thirds of these newborn deaths could be prevented with basic but effective interventions.

Health care in PNG has always been challenged by its unique mix of diverse populations, rugged geography and constraints in infrastructure, especially in rural and remote areas. In most areas, life-saving health services are under-utilised or accessed late. Contributing factors are many, and include physical access difficulties, financial barriers for families, lack of understanding of the need for supervised childbirth, lack of partner support or a preference for traditional childbirth arrangements. This highlights the vital importance of understanding how best to improve community engagement in the use and provision of maternal, newborn and child health care.

Use of modern methods of contraception among married women in PNG is among the lowest in the region at just 24 per cent and has increased only modestly in the past 20 years. Less than half the demand for family planning is currently being met, with at least a third of married women who want to limit childbearing not using any family planning method. Supporting women and couples to plan for healthy timing and spacing of births is a cost-effective approach to reduce maternal and infant mortality, and has proven benefits not just in preventing death, but also for gender equality, educational attainment and poverty reduction.

In PNG, maternal mortality and newborn health is further complicated by a complex interaction between the normal state of pregnancy and common diseases that may also be present. Anaemia, malnutrition, sexually transmitted infections, tuberculosis and malaria are common amongst pregnant women in PNG, with each independently affecting maternal and newborn outcomes. Both internationally and in PNG, there are serious gaps in our understanding of how these prevalent disease processes interact during pregnancy, and of optimal models of providing and seeking health care in response.

At a time when the United Nations Millennium Development Goals are nearing their end, and focus is shifting to the post 2015 agenda, reaching women and children with life-saving interventions remains an unfinished agenda. We must maintain our focus to ensure we continue to understand how to effectively implement known life-saving interventions in the most difficult regions, and continue to ask important questions on the topics that are poorly understood.

Healthy Mothers, Healthy Babies

The unfinished work of addressing maternal and newborn deaths – By Dr Michelle Hendel
BURNET’S RESPONSE

Healthy Mothers, Healthy Babies (HMHB) in PNG is a five-year effort aimed at providing life-saving health care for women and children through operational and implementation research. It is a philanthropically-funded collaborative research program involving partnering with local representatives at the district, provincial and national level.

It includes five separate but complementary studies to provide a complete overview of the issues being faced. The emphasis is on the generation of evidence that has immediate use in East New Britain to improve services, and that can inform future health policy in PNG and similar settings.

1. Identify and quantify major causes of illness in mothers, newborns and infants attending health care facilities, and the relationship of illness in pregnancy to predicting poor pregnancy outcomes for mother and infant.

2. Identify key determinants of current maternal, newborn and child health (MNCH) care utilisation, patterns (such as timeliness and completeness) of utilisation through pregnancy and the first year of life, and the predictors of optimal utilisation of health services for MNCH.

3. Evaluate reproductive, maternal, neonatal and child health services and identify strategies to improve services aimed at reducing sickness and death.

4. Examine sexual and reproductive health knowledge, attitudes, practices and outcomes among young people.

5. Identify strategies to improve RMNCH care and strengthen disease control, targeted to populations in PNG with varying levels of access to health services.

Unlike Australia, many women in PNG have access to only rudimentary facilities for giving birth in many villages and towns. Healthy Mothers, Healthy Babies aims to save lives through quality interventions during and after birth.

This is the stark reality of the type of sterilising equipment that is currently available for health workers delivering babies in rural communities.

PNG’s appalling rate of maternal and newborn mortality as compared worldwide.

Collaborative research is an under used, but powerful mechanism for improving health and development in resource-constrained communities such as Papua New Guinea.

Burnet is involved in linking collaborative research and development in PNG by working closely with local partners who have a long-term stake in a community, and focusing on key issues that impact on the community’s health.

The Healthy Mothers, Healthy Babies (HMHB) program in East New Britain Province (ENB) is part of a new response, a philanthropically-funded collaborative research program that will help frame strategies to improve health outcomes in a country that has one of the highest maternal and newborn mortality rates in the world.

Burnet has been working in ENB for more than 10 years on improved services for pregnancy care, prevention and treatment of STIs, and the home-based management of malaria. This has involved close interaction with provincial health authorities, support to first-line health facilities, and the establishment of volunteer networks for community education and mobilisation.

Burnet Director and CEO, Professor Brendan Crabb AC reinforced the urgent need for a collaborative research approach to the major health issues facing PNG.

“High quality, innovative research is crucial to ensuring that the most effective interventions reach those most in need in PNG in a highly cost efficient way,” he said. “The most effective and lowest cost interventions are those linking development assistance programs with high quality research, and we look forward to working closely with our partners to achieve better outcomes for mothers and children in PNG.”
Currently, communicable diseases (pneumonia, malaria, TB, syphilis, diarrhoeal diseases, meningitis and HIV) account for 50 per cent of deaths each year in PNG.

Addressing PNG’s high maternal and newborn mortality rate is a priority research imperative in the HMHB approach. Longitudinal studies will quantify the major causes of poor health in pregnant women, assess complications of delivery, and identify major preventable causes of low birth weight and problems in the perinatal period.

It is also important to identify feasible, acceptable and effective interventions and service delivery strategies to improve reproductive, maternal, neonatal and child health (RMNCH) outcomes in PNG. These studies will be undertaken with a strong focus on building local capacity in laboratory, research and quality improvement activities at the health facility, provincial and national level.

The concept of collaborative research for development is highly relevant to Burnet’s work to improve health services as part of the Healthy Mothers, Healthy Babies project. This targets the need to improve not just the reach of health services but also the quality of care provided - what United Nations agencies are increasingly calling ‘the quality gap’ between rich and poor countries.

Operational and implementation research is urgently needed to identify, trial and prove better ways to deliver appropriate health care within rural and disadvantaged settings of PNG. This is what drives the proposal for an integrated, longitudinal study of diseases, outcomes and health service utilisation at this critical point in the life cycle.

Burnet will work with local health services for mothers and babies; those rural clinics and township hospitals that are providing care during pregnancy, childbirth, and the first months of a baby’s life. The quality of existing services will be mapped to assist local staff in identifying areas for improvement. Together with local staff, Burnet will help design small implementation research activities to identify gaps and trial potential solutions. This also provides an opportunity for PNG clinical staff to develop research skills by undertaking small research activities with the support and guidance of Burnet’s public health researchers.

The introduction of local audits will assist in strengthening quality of care. When a maternal or newborn death (or other serious outcome) occurs, there will be a thorough investigation; one that aims not to apportion blame, but to identify areas for improvement. In adopting this idea, a health facility can use audits as a means to measure the frequency of poor outcomes, and also track improvements that take place after the audits have been introduced.

Through Healthy Mothers, Healthy Babies, Burnet aims to help build PNG’s health and medical research capabilities, strengthen the health services in East New Britain, and assist local communities to develop the capacity to understand and respond to their health needs.

The two major needs to be addressed based on Burnet’s experience in the province and the local health staff are:

1. Testing better ways to provide interventions of proven effectiveness to communities that currently lack access.

2. Defining the major disease burdens that contribute to maternal and infant mortality, such as anaemia, malaria, malnutrition, and postpartum haemorrhage.

Burnet has established a laboratory in St Mary’s Hospital, Kokopo, to analyse samples from mothers and their babies.

The HMHB research studies are being supported by Burnet’s Kokopo office.
THE DEADLY INTERACTION OF MALARIA, TB AND IRON DEFICIENCY

By Ms Kerryn Moore

Pregnancy and infectious diseases a high-risk combination

The high prevalence of infectious diseases, malaria and TB, throughout PNG poses a significant health risk to mothers and their babies. To avoid rejecting the baby the immune system of pregnant women changes dramatically. These immunological changes make pregnant women more susceptible to Plasmodium, the malaria-causing parasite, and Mycobacterium tuberculosis, the tuberculosis-causing bacteria. Additionally, red blood cells infected with malaria parasites bind to the placenta to evade the body’s natural immune defences, causing placental malaria – a severe threat to a developing baby.

Studies recently undertaken by Burnet Institute show that up to two-thirds of pregnant women are infected with malaria parasites, and the incidence of TB, including multidrug-resistant strains (MDR-TB) in the general population is one of the highest in the Asia-Pacific region. However, the actual burden of disease is unknown because of limitations in data collection and reporting.

Both malaria and TB in pregnancy are associated with miscarriage, maternal death, stillbirth, low birthweight and preterm birth. Also, preterm birth and low birthweight are strong predictors of illness and death in childhood.

Malaria and TB affect the immune system in young children

Like pregnant women, malaria and TB also disproportionately affect children. Natural immunity to malaria in endemic areas develops throughout childhood with repeat infections, which makes severe disease and death less likely. However, many children will die before their immune systems have had the chance to develop.

Burnet scientists are working to develop a vaccine for malaria, which will build immunity in the absence of natural infection, thereby significantly alleviating the burden of childhood malaria.

Infants and young children are also more likely to develop severe forms of TB associated with high death rates, such as TB meningitis. Newborns of mothers with TB are at particularly high risk of also developing TB.

Effective preventative therapy is available to reduce the risk of transmission to exposed newborns, but implementation is poor. In PNG, Burnet is working to integrate TB screening, treatment, and preventative therapy with antenatal and postpartum services to reduce the burden of the devastating disease on newborns.

The harmful interaction between iron deficiency and infectious diseases

Iron deficiency is prevalent worldwide, but the numbers are staggering in PNG with recent Burnet studies indicating that more than 70 per cent of pregnant women are iron deficient. During pregnancy, it contributes to anaemia, maternal death and adverse pregnancy outcomes. Iron deficiency is also common in children, leading to impaired physical and cognitive development.

Burnet’s Healthy Mothers, Healthy Babies program, which takes an integrated and evidence-based approach to research and health service delivery, will assist in identifying strategies that will save maternal and newborn lives.
Our HMHB field research officers have begun conducting questionnaires at the clinics and collecting samples from the women and their newborns to be tested for diseases.

Tragically, more than 7,000 children die in PNG before reaching their 5th birthday, from preventable causes.

Tuberculosis can pose a significant health risk to mothers and their babies in PNG.

Organization recommends iron supplementation for pregnant women and children. However, this seemingly simple intervention is complicated in highly infectious environments. Changes in iron levels can affect the severity of several infections, though we are not sure why. Iron supplementation in pregnant women and children increases the severity of malaria infection, and increased dietary iron has been associated with pulmonary tuberculosis.

In a Burnet-led study in PNG, harmful interactions between iron and infection are thought to be responsible for a counter intuitive finding that newborns of women with iron deficiency are at reduced risk of low birthweight and preterm birth, compared to women with adequate iron stores. That is, when infection is widespread, being iron deficient may be of benefit.

Studies also suggest that malaria alters the distribution of iron throughout the body, whereby iron accumulates in macrophages – the host cell of *Mycobacterium tuberculosis* (TB-causing bacteria). This could contribute to malaria-TB co-infection, which may exacerbate chronic TB (though research in this area is limited).

A point-of-care diagnostic test for iron deficiency using the iron regulatory hormone, hepcidin, could be developed which could also determine the body’s readiness to absorb iron supplements (dictated by the presence of infection).

**Burnet’s integrated response approach**

When several conditions intersect and interact in pregnancy and childhood, tackling each condition in isolation will be ineffective, if not harmful. There is a pressing need for further integration of infectious disease control programs and micronutrient programs into existing maternal and child health services. Most experts agree that integrated services are essential not only for efficiency, but also to meet the needs of women who have more than one health problem. What is not well known is exactly when and how to integrate services: this is another of the critical research topics that Burnet is addressing through this program.

Burnet’s Healthy Mothers, Healthy Babies program is unique in taking an integrated and evidence-based approach to improving maternal and child health. Studies will determine the impact of integrating TB screening and treatment with antenatal and postpartum care, and community-based malaria and TB control programs. In the laboratory and the field, Burnet researchers are working to further understand the coexistence of iron deficiency and infection, its impact on maternal, newborn and infant outcomes, and to identify how integrated services could best meet these needs.
Together we can make a difference to the lives of women and children in Papua New Guinea

“I urge you to make a donation now to our Healthy Mothers, Healthy Babies program. Your assistance will improve the health and wellbeing of women and children. Your contribution will make a difference.”

Professor Brendan Crabb AC
Director and CEO
Burnet Institute
Burnet Institute’s extensive experience working in PNG has enabled us to identify many of the reasons why there is so much suffering, especially among women and children in this country. However, simply knowing the reasons, doesn’t always provide the best solutions, and in such ethnically diverse and remote settings, it’s not always clear what the most effective response or intervention should be.

We urgently need to undertake research to identify better ways to deliver appropriate health care to women and their children, especially in the rural and disadvantaged settings of PNG.

**How will your support make a difference?**

Your support will help us to save lives by addressing the major disease burden that contributes to the deaths of women and children. These are issues such as anaemia, malaria, malnutrition, tuberculosis, sexually transmitted infections (STIs) and complications of delivery.

And importantly, it will help us identify the best ways of providing effective health interventions to communities that currently lack readily accessible quality health care.

By precisely identifying the problems and implementing practical solutions, together we can help thousands of young women build a solid health foundation for themselves and give their children a much healthier start in life.

**You will be helping to:**

1. **Save lives** by addressing major disease burdens in pregnancy such as: nutritional deficiencies, anaemia, tuberculosis and malaria and develop effective interventions to treat these to prevent poor outcomes for mothers, newborns and infants.

2. **Save lives** by diagnosing and treating STIs. Develop the best way to effectively diagnose and treat important STIs to prevent maternal and newborn disease and disability.

3. **Save lives** through quality interventions at and after birth. Develop practical ways to maximise health care use and the quality of health services by mothers and their families to reduce maternal and newborn deaths.

4. **Saves lives** by promoting healthy timing and spacing of pregnancy.

**Your investment**

We can’t do this alone. We need your support, so we’d like to invite you to join a committed group who want to make a tangible difference to the lives of thousands of poor and vulnerable women and children in PNG.

If you, or people you know, are willing to consider becoming a part of this transformational program, please donate today at [www.burnet.edu.au/hmhb](http://www.burnet.edu.au/hmhb) as a matter of urgency. We do appreciate your support.

**Together we can make a difference to the lives of women and children in Papua New Guinea.**

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