BACKGROUND REPORT

to the Policy Report

Improving maternal, newborn and child health in Papua New Guinea through Family and Community Health Care
Acknowledgements

The authors acknowledge significant input from Sue England and Garth Luke of World Vision Australia, and Dr Alison Morgan of The Nossal Institute for Global Health, University of Melbourne. We would also like to thank the many people who read and commented on the paper from PNG and elsewhere.

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This Background Report, as well as a shorter Policy Report that summarises the evidence presented here, are downloadable from: www.burnet.edu.au or www.wchknowledgehub.com.au

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Preface

One of World Vision’s main goals is to improve the health of children and mothers around the world. Whilst significant progress has been made in these areas, with decreasing numbers of children and mothers dying each year, more needs to be done to build on the global movement driving this change. That is why we continue to work closely with communities, governments, researchers and other non-government organisations in almost one hundred countries.

In many of the communities in which we work I have seen the differences that families and communities can make to their own health. The research in this paper utilises the expertise of the Burnet Institute and Compass: the Women’s and Children’s Health Knowledge Hub. It shows just how large a difference health action by families and communities can make.

In a country like Papua New Guinea, with limited resources and significant geographic obstacles, it is critically important to make maximum use of local resources.

I would like to thank the researchers who contributed to this paper and to our colleagues in PNG who also provided input.

I hope it helps to build a more comprehensive response to the health needs of children and women in PNG and elsewhere.

Tim Costello

CEO, World Vision Australia
## Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ANC</td>
<td>Antenatal care</td>
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<td>ARI</td>
<td>Acute respiratory infection</td>
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<td>CCM</td>
<td>Community Case Management for pneumonia</td>
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<td>CBK</td>
<td>Clean birth kit, also CDK – clean delivery kit</td>
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<tr>
<td>CHW</td>
<td>Community Health Worker - in PNG, a professional cadre working in health centres and rural aid posts</td>
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<tr>
<td>DALY</td>
<td>Disability-adjusted life year</td>
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<td>EPI</td>
<td>Expanded Programme on Immunization</td>
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<td>FCC</td>
<td>Family and community health care</td>
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<td>FP</td>
<td>Family planning</td>
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<td>HIV</td>
<td>Human immunodeficiency virus</td>
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<td>IMCI</td>
<td>Integrated management of childhood illnesses</td>
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<td>IMR</td>
<td>National Institute for Medical Research</td>
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<tr>
<td>IPT</td>
<td>Intermittent preventive treatment for malaria</td>
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<tr>
<td>ITN</td>
<td>Insecticide treated (bed) net</td>
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<tr>
<td>IYCF</td>
<td>Infant and young child feeding</td>
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<td>LiST</td>
<td>Lives Saved Tool</td>
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<tr>
<td>MDG</td>
<td>Millennium development goal</td>
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<tr>
<td>MMR</td>
<td>Maternal mortality ratio</td>
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<tr>
<td>NGO</td>
<td>Non-government organisation</td>
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<tr>
<td>NMR</td>
<td>Neonatal mortality rate</td>
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<tr>
<td>ORS</td>
<td>Oral rehydration solution</td>
</tr>
<tr>
<td>PPTCT</td>
<td>Prevention of parent-to-child transmission</td>
</tr>
<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
</tr>
<tr>
<td>PPH</td>
<td>Postpartum haemorrhage</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually transmitted infection</td>
</tr>
<tr>
<td>TBA</td>
<td>Traditional birth attendant</td>
</tr>
<tr>
<td>USMR</td>
<td>Mortality rate for children under 5 years</td>
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<tr>
<td>VBA</td>
<td>Village birth attendant – a subset of VHV</td>
</tr>
<tr>
<td>VHV</td>
<td>Village health volunteer – generic term for lay health workers in PNG</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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SUMMARY

Family and community health care (FCC) is the prevention and treatment of illness by family and community members, including trained lay health workers – known as Village Health Volunteers (VHVs) in Papua New Guinea (PNG). FCC in PNG is essential to maternal, newborn and child health and nutrition because:

- FCC can help prevent and treat many of the major health threats in areas where health services are not easily accessed; and
- FCC optimises the impact of all maternal, newborn and child health (MNCH) interventions by supporting timely care-seeking from health facilities and good home care afterwards.

Despite widespread application of FCC in PNG, coverage and support is patchy. There is a pressing need to increase the support for FCC within national planning and coordination processes, and to strengthen the connection between FCC and the peripheral health system.

For FCC to work well it needs to include proven evidence-based interventions, be widely practiced in communities, and have a strong connection to, and the support of, a functional local health system. Similarly, health system strengthening for better health centres and community health posts is unlikely to be effective without synchronised efforts to improve FCC. This paper summarises global and local evidence on the prevention and treatment services that could be provided by family and community members in PNG. We try to show what is known about the likely impact and relative costs of FCC interventions and summarise what is known about current levels of coverage in PNG. The aim is to estimate the benefits of greater FCC action, to provide local health program managers, whether government or non-government, with an expanded array of proven options to consider in their planning and to suggest ways that they could increase implementation of FCC interventions in line with the Government’s National Health Strategy 2011-2020. We hope that this information can help PNG and donor health program managers align the content and processes of current and planned programs with international practice, and provide authoritative data to support expansion of FCC activities.

PNG is not on track to meet millennium development goals (MDGs) relating to reductions in child (MDG4) and maternal (MDG5) mortality. Children are dying because of limitations on preventative and curative health services as well as gaps within families including insufficient knowledge on illness prevention and management, delayed care-seeking, and other deficiencies in healthy behaviours. Deaths of mothers and newborns are even more directly attributable to poor functioning of the formal health system.

The evidence suggests that up to one third of maternal deaths, over two-thirds of newborn deaths and half of child deaths could be prevented through near universal coverage of the FCC interventions described here: delivered through informed community members, trained VHVs and supported by stronger local health centres and community health posts. The known cost-effectiveness data, and other relative cost estimates suggest that this would be a very high value investment, both economically and socially.
The most effective FCC interventions, which seem feasible and relevant in PNG, comprise

- **During pregnancy and birth:**
  - Family planning and birth spacing counselling & distribution
  - Nutrition counselling and distribution of iron, folate, calcium, de-worming tablets
  - Birth preparedness counselling and promoting delivery in a facility
  - Testing and treatment of STIs and HIV
  - Intermittent preventative treatment for malaria
  - Clean birth kit distribution for use by women with no option but home-birth
  - Preventing and treating post partum haemorrhage at community level
  - Provision of antibiotics in the community for post partum sepsis.

- **For newborns immediately after birth and in the first month of life:**
  - Delayed bathing and keeping the baby warm (especially if low birth weight)
  - Hygienic care of umbilical cord and hand washing
  - Promotion of early and exclusive breastfeeding
  - Home visit by VHV within the first day of life.
  - Early recognition and community availability of treatment for newborn infections.

- **For children one month to 5 years:**
  - Promoting & supporting immunisation
  - Distributing bed nets
  - Intermittent prevention treatment for malaria
  - Hygiene and sanitation education
  - Treatment of pneumonia, malaria, and diarrhoea in community
  - Nutrition counselling on exclusive breastfeeding and infant and young child feeding
  - Distribution of Vitamin A, deworming zinc supplementation and iodine.

The global evidence is convincing that FCC can make a major contribution to the survival and health of mothers, newborns and children in PNG. Analysis of the situation in PNG provided here demonstrates that many government and non-government programs could do more to include the most cost-effective FCC interventions in their programs. Ultimately, health improvements and progress towards the MDGs will require both family and community-based care, working in synergy with health system strengthening.
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FAMILY AND COMMUNITY CARE

Family and community health care (FCC) is the prevention and treatment of illness by family and community members, rather than by health professionals. In PNG, this means interventions that do not require electricity, refrigeration, sophisticated medical equipment, or specialised medical training. In fact for settings such as PNG, many of the highest impact life-saving interventions can be provided as FCC. They include interventions to:

- educate families on healthy behaviours,
- educate families on early recognition of serious illness and how to respond;
- educate families on home care for important illnesses;
- distribute or administer medicines, vitamins or vaccines that help prevent disease;
- distribute or administer medicines for treatment and home care of important illnesses.

Some community members may be trained to provide these interventions and educate the community, and experience in PNG and internationally has shown that both professional health staff and lay health workers ("village health volunteers" (VHVs) in PNG) can be successfully trained in the FCC interventions discussed in this document.\(^2\)\(^4\)

FCC needs to include proven evidence-based interventions, be widely practiced in communities, and have a strong connection to a functional local health system. Similarly, health system strengthening for better health centres and community health posts is unlikely to be effective without synchronised efforts to improve FCC.

THE PURPOSE OF THIS REPORT

Given large existing health needs, limited resources and difficult geographic challenges facing PNG it is likely that low-cost family and community level care could significantly improve health outcomes in the country. This is because FCC helps equip communities with the knowledge and resources they need to prevent and treat many threats to health and because it can deliver some critical services in areas where health systems are failing. In all situations it helps optimise impact of MNCH interventions by supporting good care-seeking and then home care after a visit to a health facility.

This report:

- collates the current state of local and international knowledge on the impact, cost, and strategies for implementation of a range of maternal, newborn and child health interventions that are, or could be, provided at the family and community level in PNG;
- estimates the benefits of greater FCC action;
- provides local health program managers, whether government or non-government, with an expanded array of proven options to consider in their planning; and
- suggests ways that local government and non-government health programs can increase implementation of FCC interventions, with consideration to cooperation, staffing, support and supervision, in line with the Government’s National Health Strategy 2011-2020.

We hope that this information can help PNG and development program managers align the content and processes of current and planned programs with international practice, and provide authoritative data to support effective expansion of FCC activities.
OVERVIEW OF THE HEALTH OF MOTHERS, NEWBORNS AND CHILDREN IN PNG

Papua New Guinea (PNG) is a country of 7 million people of extensive cultural and linguistic diversity with over 800 different cultural groups. The majority, 87%, live in isolated circumstances as the country has mountainous and densely forested regions and very few road connections to the capital of Port Moresby. Poverty and disadvantage are prevalent with 36% of people living below the poverty line of US$1.25 per day. Government spending on health is 3.2% of gross domestic product (GDP) and living and health standards have suffered some setbacks in recent years.

PNG is not on track to meet millennium development goals (MDGs) relating to reductions in child (MDG4) and maternal (MDG5) mortality. Mortality in children under 5 years of age (USMR) has improved by 25%; from 91 deaths per 1,000 live births in 1990 to 68 in 2009; however neonatal mortality, at a rate (NMR) of 39 deaths per 1,000 live births, constitutes a significant portion of the USMR and has reduced by only 15% since 1990. The commonest causes of death in children in PNG are diseases in the early newborn period - pneumonia, malaria, and other infections. Malnutrition contributes substantially to childhood mortality and morbidity with prevalence of underweight, stunting, and wasting (depending on age) above public health significance cut-off points. Maternal health is a priority in PNG although estimates of the maternal mortality ratio (MMR) vary; in 2006 the National Demographic and Health Survey (DHS) reported 733 maternal deaths per 100,000 live births; however the World Health Organization (WHO) estimate 250. The total fertility rate has declined over the past forty years however remains high at 4; women’s literacy rates are lower than that of men, and only half of all births are attended by an appropriately skilled health worker.

Across all adult and child causes of death, pneumonia, malaria, tuberculosis, diarrhoeal diseases, meningitis and HIV/AIDS remain common, although non-communicable diseases are increasing. There is a generalised epidemic of HIV with a prevalence of 0.9% predominantly due to heterosexual transmission. A lack of gender equality and personal security has led to twice the prevalence rate in women compared to men in the group aged 15-29 years which in turn places children at great risk.

Children are dying because of limitations on preventative and curative health services as well as gaps within families including insufficient knowledge on illness prevention and management, delayed care-seeking, and other deficiencies in healthy behaviours. Deaths of mothers and newborns are even more directly attributable to poor functioning of the formal health system. Many causes of maternal and newborn deaths require skilled medical care often with a short window of opportunity; up to 50% of maternal and almost 40% of newborn deaths occur within 24 hours after delivery. Presently, health services, particularly the life-saving skilled birth attendants and facilities adequately equipped for child birthing, are frequently too distant and of inadequate standard to respond to these emergencies. In this setting, it is especially important to maximise actions by the community that the evidence-base shows are effective at reducing deaths.

In 2010 the Government of PNG released the National Health Plan for 2011-2020 that documents the intention to improve maternal, neonatal and child health through a tight focus on the relevant interventions that can improve survival for these groups and development of the Child Health Policy and

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1 Defined as those less than 5 years of age
Plan\textsuperscript{15} and commissioning the Ministerial Taskforce on Maternal Health.\textsuperscript{13} While the plan concentrates on the formal health system it does not exclude family and community care activities. The plan documents the government’s intention to improve collaboration between the formal health system and community-based initiatives, extend community-based health care and distribution systems, empower people to improve their own health and encourage community and family level care and the VHV program.\textsuperscript{16}

The health system in PNG

Health care is provided by the national and provincial governments although almost half of the available services and many health centres are provided by churches.\textsuperscript{17} Health services vary significantly between urban and rural areas and between provinces. Rural health services have been decentralised however coordination, accountability, financing and service delivery are generally not performing well\textsuperscript{18} which is contributing to the poor health status of rural communities.\textsuperscript{19} People living in rural areas have less health centre access, poorer water and sanitation facilities, fewer educational opportunities, higher prevalence of malnutrition, and greater likelihood of maternal, neonatal and childhood death than their urban counterparts.\textsuperscript{1, 7} Health centres operate outreach clinics to provide immunisation, nutrition monitoring, antenatal care (ANC) and family planning however coverage is extremely low, with for example only 22 outreach sessions per 1,000 children under 5 years of age.\textsuperscript{16}

There is a very significant shortage of formal health workers with only 0.06 doctors, 0.56 nurses and midwives, and 0.66 community health workers (CHWs) per 1,000 people,\textsuperscript{17} compared with the WHO recommendation of at least 2.28 skilled health workers (doctors, nurses and midwives) per 1,000 population.\textsuperscript{13} Unlike common usage in other countries (where CHWs are often volunteers), in PNG the term “CHW” refers to a community-oriented professional cadre in the health workforce who are salaried, undergo two years training, and work full-time in health centres, sub-centres or community health posts. There is also a critical shortage of obstetricians and gynaecologists;\textsuperscript{20} paediatricians are working in only 15 out of the 20 provinces and there are only 2,500\textsuperscript{6} skilled birth attendants (midwives and nurses) in the country to cover an estimated 210,000 birth each year\textsuperscript{7}, thus skilled delivery care is only available to a minority.

PNG also has an informal, unpaid, variegated cadre of trained lay health workers. The generic term of “village health volunteer” (VHV) includes workers with a mixture of training in child-birth, child care, family planning and other functions. Although the training and skills may be limited, they have intimate contact with families and communities and usually come from the local area. They are often tasked with health promotion and education to link communities with formal health services,\textsuperscript{21} some attend childbirth, and other activities include distribution of clean birth kits (CBKs), antimalarial medications, antibiotics, or contraceptive advice and materials. They are most commonly trained and supported by church health services or non-government organisations (NGOs).\textsuperscript{22}

Government spending on health is short of what is required for delivery of essential health services. The WHO recommends spending of at least US$34 per capita per annum however between 2000 and 2006 the average government health expenditure was only US$25 per capita per annum.\textsuperscript{16} It is estimated that the country receives US$203 million through official development assistance and these funds account for 24% of the total health spending.\textsuperscript{5} Basic health services are supposed to be free in PNG however fees are frequently charged for outpatient visits\textsuperscript{5} and patients can be burdened by travel expenses and loss of productivity due to the time taken to seek care.
PNG Government health policies

In 2010 the Government of PNG released the National Health Plan for 2011-2020 which documents the Government’s intention to improve child survival and maternal health, reduce the burden of communicable diseases, promote healthy lifestyles and improve preparedness for disease outbreaks and emerging population health issues. Key activities include improvements to service delivery, strengthening of partnerships and coordination, and strengthening of the health system in terms of workforce, financing, information systems, infrastructure, drug and medicine supplies and governance.

To specifically address child health the government released the Child Health Policy and Plan to guide initiatives from 2009 to 2015. Priority has been given to Integrated Management of Childhood Illnesses (IMCI); Expanded Program of Immunization (EPI); standardised treatment protocols; neonatal and paediatric care in hospitals and health centres; neonatal care by health workers and mothers; nutrition through breastfeeding, complementary feeding, vitamin A supplementation, deworming, zinc for diarrhoea, and fortification; malaria; tuberculosis; and HIV.

Placing importance on maternal wellbeing, the Government established the Ministerial Taskforce on Maternal Health which reviewed maternal health data and reports and examined the health system functions. This led to a proposed action plan to enable education for girls and women, strengthen the health system, increase family planning coverage, train skilled birth attendants, and improve and extend emergency obstetric care services. Following formal publication in 2010, this now forms the basis of a joint maternal health action plan that directs the efforts of the National Department of Health and other development partners.

The concept of FCC, as defined above, is well in line with the National Health Plan - especially the government’s aims to improve collaboration between the formal health system and community-based initiatives, extend community-based health care and distribution systems, empowering people to improve their own health and encouraging community and family level care and the VHV program.

Our approach in this paper

A comprehensive literature review was undertaken, which aimed to include published papers up until March 2011 and grey literature made available to us through contacts within PNG. Both researchers established a framework for screening and selection of relevant data sources that included interventions feasible within FCC and/or that provided information on the relative efficacy of FCC interventions. The benefits, costs and delivery mechanisms have been based on evidence specifically relating to PNG where possible. Where PNG data is not available estimates have been drawn from high quality studies based on global analyses or settings with similar health system challenges to PNG. Estimates of impact have been drawn from studies as well as results of modelling from the Lives Saved Tool (LiST). LiST is computer software used by the WHO to estimate impact of interventions on mortality at certain coverage levels in specific time frames. The literature presents impact and costs of interventions in a range of measures, most commonly in terms of disability-adjusted life years (DALY) or number of lives. The authors have made subjective ‘value for money’ judgements based on the relative costs, classifications presented by other authors and generally accepted international standards.
We have provided impact estimates in this paper so that readers can gain a sense of the relative possible effectiveness of the various FCC interventions. It is important to note that when considering the likely mortality-reduction impact of a whole package of interventions, it is not possible to simply add the individual intervention impact estimates – this is because most interventions interact with each other in their effects. Where available we have given the likely combined impact in terms of lives saved of each package of interventions.

It should also be noted that most of the cost information provided comes from global datasets, because the impact of FCC has been rarely studied in PNG. WHO, UNICEF and similar agencies have developed complex modelling tools to estimate the likely impacts and costs of interventions, and of complete packages of interventions, but these are resource-intensive and have not yet been applied in PNG. The cost information provided is not intended to be used for detailed budget planning (which is beyond the scope of this paper) rather it is intended to give the reader an understanding of the relative cost of interventions when compared with each other. The global cost-effectiveness modelling suggests that all FCC interventions described in this paper are likely to be cost-effective in PNG.

The interventions have been presented separately for maternal, newborn and child health however it should be remembered that the effects of many interventions extend through the life course, for example those for maternal health will benefit newborn health and survival.
COST-EFFECTIVE FCC INTERVENTIONS FOR MATERNAL HEALTH AND SURVIVAL

PNG’s progress in maternal health has been poor in the past two decades. Latest estimates of the maternal mortality rate (MMR) vary substantially from 250\(^7\) (based on WHO modelling) to 733\(^11\) (measured in the Demographic and Health Survey (DHS) of 2006). Accurate measurement of MMR, or documentation of the effect of interventions, is much more difficult than for child or newborn health, because of the need for large sample sizes to detect significant changes in maternal mortality. We do know that skilled birth attendance occurs for only 59\%^11\ of births and that the causes of maternal deaths in PNG are consistent with global figures, with post partum haemorrhage (PPH) the most common, followed by eclampsia (severe high blood pressure during pregnancy), post partum sepsis and obstructed labour\(^6,13\). The contribution of unsafe abortion has not been well measured but may be significant. Infections (such as malaria or syphilis) and undernutrition during pregnancy also contribute to excess maternal deaths, as well as having a major contribution to newborn death.\(^13,25\) Whichever MMR measurements are used, it is clear that there has been limited progress in this area in PNG and in 2008 the government convened a Ministerial Task-force on Maternal Mortality, which now supports a centrally led action plan.\(^13\)

What FCC could achieve for maternal health

There is a clear role for FCC before pregnancy and during the antenatal period to provide education, support and distribute preventive care. There are limits to the role of FCC during childbirth and immediately afterwards (intrapartum and post partum), because many of the causes of maternal death require emergency obstetric care for complete management. However, only 52\% of births in PNG take place at health facilities\(^7\) and newer research suggests that community-based support can reduce risks, improve use of clinical services and some medicines (particularly misoprostol and antibiotics) can be effectively distributed for community use at childbirth. While there are some concerns regarding risks of community-based administration of certain medications, the potential benefits are great – for this reason we suggest that they first be introduced through carefully measured trials. A recent comprehensive review suggests that a 32\% reduction in maternal mortality could be achieved by community-based care packages.\(^2\)

The highest impact FCC interventions before pregnancy or during the antenatal period include:

- Family planning to reduce numbers of unintended pregnancies and increase birth spacing;
- Nutrition support including distribution of iron, folate, calcium and deworming medications;
- Counselling on birth-preparedness, place of birth, nutrition and testing for STIs (including HIV);
- Intermittent preventive treatment (IPT) of malaria.
FCC interventions that act during childbirth or immediately afterwards (post partum) include:

- Distribution of clean birth kits (CBKs) for use in home births;
- Increase availability of oxytocics to prevent post partum haemorrhage (PPH);
- Provision of oxytocics or antibiotics for treatment of PPH or postpartum sepsis.

Support of pregnant women by men (husbands or fathers) and/or other female peers, has been demonstrated to improve intervention effectiveness in a number of countries, both during the antenatal period, and in childbirth.

International cost-effectiveness modelling of a package comprising deworming, IPT for malaria, misoprostol distribution, iron and folate tablet supply, STI testing, and tetanus vaccinations suggests it may avert up to 25% of maternal deaths for an average cost of US$7.26 per client. Some interventions such as oxytocic or antibiotic provision require significant training of VHV, requiring well-monitored programs and support from local health services. For oxytocics, the options are distribution of misoprostol for self-administration by mothers (as prevention), or delivery of oxytocin in Uniject™ by trained health workers. These are both experimental and warrant careful pilots or trials as part of their introduction. Misoprostol has great potential in prevention of PPH in the community and it has been shown to be feasible in settings as difficult as rural or remote PNG. However it is not without risks and its introduction must be in a carefully measured setting. FCC can both support this health system strengthening and help to fill gaps in health service access. Access to formal health services will continue to be a problem because of high costs, poor transport accessibility, and sometimes due to perceived unpleasant attitudes and treatment by health workers.

Many of the FCC interventions discussed here will have an impact on newborn health and survival in addition to improving maternal health – for example better prevention and management of peri-partum infections could address up to 15% of maternal deaths, and around 25% of newborn deaths. These newborn benefits are noted here, and expanded upon in the newborn section below.

Impact, relative costs and description of maternal FCC interventions

Table 1 summarises the impact and cost of those interventions that are specifically focused on maternal health, with any published information on their use in PNG. Additional detail on the interventions is provided after the table. Many interventions are either highly or moderately cost-effective, and none of the interventions rated as poorly cost-effective (although for some the cost-effectiveness has not been clearly measured). The PNG data demonstrated that these FCC interventions are needed and likely to be effective in PNG.

**Uniject™** is a compact, pre-filled autodisable injection device shown suitable for use by trained lay health workers
Table 1. Summary of the impact and costs of family and community care for maternal health interventions in PNG and globally

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence of impact, globally</th>
<th>Evidence of impact, in PNG</th>
<th>Published evidence of their use in PNG</th>
<th>Cost</th>
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<tr>
<td><strong>Before pregnancy and antenatal interventions</strong></td>
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<tr>
<td><strong>Family Planning (FP)</strong> - community-based counselling and distribution of contraceptives</td>
<td>FP and safe abortion can avert 20% of maternal deaths.24 Birth spacing of 24-36 months reduces the risk of neonatal death 2-3 times.28 29 Maternal death by 30%.30 31 Preterm birth by 40%.31 Delayed first birth until age 20 reduces maternal anaemia, preterm birth and LBW.32</td>
<td>No impact studies reported.</td>
<td></td>
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<td><strong>Iron and folate supplementation</strong></td>
<td>Iron supplementation in pregnancy reduces anaemia and thus the risk of maternal death by 23%.31 Peri-conception folate supplementation reduces the risk of neural tube defects by 72% and may reduce LBW deliveries.3</td>
<td>Nationally, 36% of women are anaemic although 80% reported receiving some iron tablets in their last pregnancy.10 In Maprik and Esa’ala districts 56%-91% of women were anaemic although community-based iron distribution reduced this by up to 33%.36</td>
<td>VHV distribution of iron/folate tablets reduced anaemia in non-pregnant women from 91% to 84% and in pregnant women from 83% to 66%.36</td>
<td>US$15-47 per DALY saved.24 Unit cost $0.07 in PNG.34 Another source stated $US66-115 per DALY saved.37</td>
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<td><strong>Calcium supplementation</strong></td>
<td>Calcium supplements (1-2g) daily reduces the risk of pre-eclampsia by 55%, hypertension by 35% and preterm delivery by 24% in women with low intake (&lt;900mg/day).38</td>
<td>Not reported</td>
<td>Not reported</td>
<td>US$15-47 per DALY saved.24</td>
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<tr>
<td><strong>Deworming</strong></td>
<td>Anti-helminth treatment may reduce maternal anaemia,39 LBW, preterm births and perinatal mortality4 although study results are mixed.31 40</td>
<td>In one community trial impact on anaemia was not discernable due to concurrent iron supplementation.36</td>
<td>National coverage not reported. One community-based program achieved 90% coverage.36</td>
<td>US$0.02 per tablet in PNG, excluding program costs.41</td>
</tr>
<tr>
<td><strong>Nutrition counselling</strong></td>
<td>Perinatal balanced energy-protein supplementation reduces intra-uterine growth retardation (IUGR) by 32% and risk of stillbirth by 45%.35 36 5.3% of women are underweight (BMI&lt;18.5)10 although prevalence ranges from 2.4-15% by region.36</td>
<td>Not reported</td>
<td>Not reported</td>
<td>IPT in pregnancy costs US$29 per DALY saved.43 Unit price $0.03 in PNG.34</td>
</tr>
<tr>
<td><strong>Intermittent preventive treatment (IPT) of malaria</strong></td>
<td>Malaria in pregnancy is linked to maternal anaemia, preterm delivery, LBW and increased risk of neonatal death.3 IPT reduces risk 43% of IUGR in first &amp; second pregnancies.35</td>
<td>Earlier protocol of 2 courses before 20 weeks of pregnancy reduced malaria from 41% to 20% with 50% less reinfection after 12 months in Maprik.36 Trials are underway in PNG, led by national IMR and partners.</td>
<td>Antimalarials in stock at 90% of health centres but only 44% of aid posts.62 IPT coverage is not reported.</td>
<td></td>
</tr>
<tr>
<td><strong>Birth preparedness counselling</strong></td>
<td>Group sessions by trained facilitators improves birth preparedness and newborn care practices, and reduces NMR by 25-50% and stillbirth rates.44</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Women’s groups US$5–6 per woman, US$138-251 per life year saved.46 45</td>
</tr>
<tr>
<td>Intervention</td>
<td>Evidence of impact, globally</td>
<td>Evidence of impact, in PNG</td>
<td>Published evidence of their use in PNG</td>
<td>Cost</td>
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<tr>
<td>-----------------------------------------------------------------------------</td>
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<tr>
<td><strong>Intrapartum and post partum interventions</strong></td>
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</tr>
<tr>
<td><strong>Clean birth kits (CBKs) and hygienic delivery</strong></td>
<td>20%-29% reduction in infection-related maternal deaths with hygienic practices at 90% of home births</td>
<td>Not reported</td>
<td>10,000 CBKs were supplied 22 provinces in 2008–2009</td>
<td>Local US$0.17, imported US$0.73 per birth, US$215–921 per life saved</td>
</tr>
<tr>
<td><strong>Misoprostol for either PPH prevention or treatment of PPH</strong></td>
<td>May aver 13-21% of maternal deaths</td>
<td>Not reported</td>
<td>Misoprostol use is restricted to health facilities. It is not in the protocol for PPH care at community level.</td>
<td>Preventive US$0.42 per dose,24 US$1400 per life saved,48 US$170 per DALY saved</td>
</tr>
<tr>
<td><strong>Referrals by village birth attendants (VBAs) and TBAs</strong></td>
<td>TBA training improves referrals for skilled birth attendance and maternal use of services</td>
<td>Training of VBAs for 3 weeks increased uptake of ANC and FP, referrals of antenatal complications, and health promotion activities</td>
<td>Skilled birth attendance for 53%-59% of births, 52% of births take place at health facilities.</td>
<td>Group meetings for VBAs to refer and promote facility care: US$3442 per newborn life saved, US$111 per life year saved</td>
</tr>
</tbody>
</table>

**Pre-pregnancy and antenatal FCC interventions**

Community-based family planning services have been established in PNG for some time although current contraceptive prevalence (modern or traditional method) is only 32%. Near universal access to these services will help achieve delayed first pregnancies, suitable birth intervals and contraception when desired and has the potential to avert approximately 20% of maternal deaths. The inclusion of testing for STIs and referral for treatment in counselling sessions will improve the health of mothers and the survivals of newborns. In some regions of PNG up to 40% of women test positive for an STI. The high prevalence of syphilis specifically threatens the lives of newborns due to LBW however as few as 30% of women in PNG are screened during ANC services. For pregnant women in PNG syphilis rapid-test screening and treatment referral has been successful in community settings. Family planning services must be available to the most vulnerable; in PNG 15% of all girls aged 15-19 years are married and 3-5% have already given birth even though pregnancy at this age has double the risk of intrapartum maternal death. Both CHWs and trained lay health workers have proven effective in providing counselling and distribution of temporary contraceptives, with referral of men and women for other methods of contraception as desired. Uptake in PNG has been greater through outreach and home visits than clinic consultations as more family members may be present and feeling comfortable to discuss sensitive issues. For adolescents, unintended pregnancies are reduced with increased education and contraception availability. The delivery of family planning services alongside postpartum care has increased contraceptive prevalence to a greater extent than separately offered services and has greater impact by averting very short birth intervals. Scale-up through FCC is essential as family planning coverage remains limited – only 24% of women use a modern method of contraception although more than 50% of women with 2 children and more than 70% of those with 3 do not wish to have any more children. Those in remote areas and lower levels of education are most likely to be missing out. Family planning is

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a cost-effective intervention with added savings and benefits through the reduction of unintended pregnancies, unsafe abortions and the treatment of associated complications. The addition of family planning to maternal and newborn care programs actually costs 5.7% less than maternal and newborn care alone as it reduces the number of pregnancies and the likelihood of complications that require additional care.

Nutrition counselling and supplements can have a modest impact on reducing maternal deaths — especially calcium and iron/folate - and a greater impact in prevention of LBW (with better newborn survival as noted below). Community-based distribution of iron/folate tablets for pregnant women, can reduce anaemia, improve maternal health and growth of the foetus, and help a mother withstand a PPH, if one occurs. Iron and folate can also be provided through multi-micronutrient supplements and in one trial in PNG, trained VHVs distributed supplements (alongside malaria treatment, deworming, and bednet distribution) which reduced the prevalence of anaemia by 17% within 12 months, despite the usual difficulties in logistics and compliance. Iron deficiency anaemia remains prevalent in both pregnant and non-pregnant women in PNG and even though iron/folate tablets have been used widely (70%-80% of pregnant women across PNG have received them) actual consumption is often low - for instance only 3.7% consumed 100+ tablets in a study in Madang. Pregnant women have struggled to obtain iron/folate tablets as health clinics control distribution, sometimes via VHVs, and frequently have short supplies. Poor iron tablet compliance is also related to forgetfulness and side-effects. FCC is ideally placed to support both distribution and improve compliance. The distribution of calcium supplements can be managed efficiently at the community level by outreach staff and trained VHVs. Calcium supplementation reduces the risks of morbidity and mortality from eclampsia (reducing pre-eclampsia by 55%) for women and preterm delivery for newborns when diets are calcium deficient. The extent of calcium deficiency and eclampsia has not been recorded by national surveys.

Evidence in favour of community-based anti-helminthic (de-worming) treatment during pregnancy is limited although small studies indicate that albendazole-iron combination early in pregnancy may reduce LBW deliveries and in Nepal was linked to a decrease in neonatal mortality. For implementation in PNG, administration of albendazole for women by VHVs achieved high coverage of 90% when integrated with antimalarial and nutritional activities at 4 monthly intervals.

Counselling of women for improved nutrition during pregnancy is clearly indicated as malnutrition and food restrictions and taboos for mothers are common with health workers reporting that women frequently, 45.3%, under eat during pregnancy to avoid birthing a large baby. Underweight in women is more pronounced in rural areas, particularly for women with no formal education, while obesity is more prevalent in urban centres. Pregnant women in PNG have reported regular betel nut chewing, 94%, smoking, 9%, and alcohol consumption, 1%, which increase the risk of LBW and therefore neonatal mortality.

Some nutritional supplements can commence before pregnancy such as the UNICEF-sponsored program for weekly iron/folate supplements among young women of reproductive age — a program tested in PNG as feasible within FCC.

Intermittent preventive treatment for malaria (IPT) in pregnancy is a feature of the new national malaria control strategy and has the potential to reduce those 20% of maternal deaths due to underlying conditions, anaemia for instance, as well as benefit newborns through a significant reduction in LBW as
noted below. The new protocol calls for two or three doses of sulphadoxine/pyrimethamine, at least one month apart, from 18 weeks of pregnancy onwards. FCC, through distribution in communities or homes, could reach many more women than through professional ANC alone, given that ANC attendance for four visits is only 55%. IPT is recommended for all pregnant women, although in PNG, women in their first pregnancy are at greater risk of severe malarial infection (P. falciparum), 40%, than multigravidae, 10-25%. Distribution of IPT and iron/folate tablets for pregnant women should be integrated for prevention of harm through iron supplementation of malaria-infected women.

**Birth preparedness counselling** through group workshops, home visits or community awareness activities improves both maternal and neonatal wellbeing. Monthly group meetings with trained facilitators increase the likelihood that women will prepare emergency funds, identify signs of birth complications, use ANC, institutional delivery, skilled birth attendance and hygienic delivery practices. This approach, in a rural setting in Nepal with 90% home births, reduced maternal mortality by 78% and neonatal mortality by 30%. Birth preparedness through ‘educational interactions’ with pregnant women and their families by trained midwives, VHV’ and village chiefs increased ANC use by 22%, skilled birth attendance by 32% and referrals to hospitals by 281%. Direct rather than group counselling on birth preparedness by trained lay health workers (such as VHV) improves identification of a health facility and an accompanying person, transport arrangements, and savings funds in 52% of recipients, who were also 45% more likely to have a skilled birth attendant. In Bangladesh CHW home visits for birth preparedness and postpartum care generated greater increases in iron and folate supplement use and saved more neonatal lives than community group sessions. Birth preparedness through public workshops and social marketing has increased facility-based deliveries and reduced neonatal mortality. Birth preparedness counselling is less effective with passive community involvement, infrequent contact with facilitators or the provision of education without addressing local problems. Greater impact is generated with separate information sessions for husbands and women. Inclusion of husbands also improves the proportion of pregnant women taking iron tablets, reducing household chores, improving their diets, and receiving ANC by skilled providers when compared to a lack of information sessions or session only for women.

**Intra-partum and post partum interventions**

**Hygienic delivery practices** through the combination of clean birth kits (CBKs) and hand washing is a highly cost-effective means to avert maternal death due to sepsis. These will also have a major impact on newborn survival through reduction of newborn sepsis and are discussed further in the newborn section below. In Pakistan the use of CBKs was increased from 3% to 35% through visits by trained government lay health workers (equivalent to VHV) who worked alongside traditional birth attendants (TBAs). In Madang province partnership between the Department of Health, World Vision and the Lutheran Church has supported distribution for use by trained TBAs.

**Provision of uterotonic medicines for post partum haemorrhage** has the potential to dramatically reduce the leading cause of maternal death in PNG. Misoprostol is heat-stable, cost-effective and administered orally and thus highly suitable for resource-poor community settings, although it is not as efficacious as oxytocin, which remains the preferred option when an injection is feasible. It has been used to prevent PPH – when a dose is taken immediately after the baby is delivered – or as a treatment if PPH occurs. The prevention usage has recently been added to the WHO essential intercept.

‡‡ IPT is not given to pregnant women with HIV infection who are on cotrimoxazole prophylaxis.
drugs list recommendations, for situations where oxytocin injections are not feasible. 

Community-based trials of misoprostol in India, Indonesia and Nepal have shown that oral misoprostol can be distributed for self-administration or administered directly by auxiliary nurse midwives, trained lay health workers and volunteers with significant reductions in the rate and severity of acute PPH. Misoprostol was self-administered with 100% accuracy in Afghanistan with uterotonic therapy coverage of 92% in the intervention compared to 25% in the control area. Community-based distribution in rural Nepal increased uterotonic coverage from 11% to 74%, with greatest benefits gained by poor, illiterate, geographically isolated women, and reduced the MMR; 72 deaths per 100,000 live births compared with 292 among non-users. Community-based use of misoprostol is cost-effective and can save US$11.50 per birth by reducing medical intervention for PPH. The effectiveness and safety of misoprostol for prevention and treatment of PPH have been established through a Cochrane review and meta-analysis.

At present misoprostol is regulated for use only in health facilities in PNG, although distribution by trained VHVs is under active discussion. Misoprostol can cause complications if taken too early in pregnancy or childbirth, and its introduction in FCC should be done in a carefully monitored environment. As an alternative to misoprostol for prevention and treatment of PPH, oxytocin in the form of the prefilled syringe - Uniject™ is an option with evidence (somewhat limited at this stage) showing its success, safety and potential cost-effectiveness with delivery at the community level by both trained formal and informal health workers.

Community-based provision of antibiotics has a theoretical benefit if used in treatment of puerperal sepsis or other post partum infections in mothers and some modelling has attempted to estimate the likely effect of this. Unfortunately, there are major knowledge gaps in relation to maternal sepsis and very few empirical studies, as yet, to demonstrate costs or effectiveness of such programs. However, given that bacterial infections after childbirth are likely to be significant in maternal mortality in PNG, and that antibiotics for childhood infections are already distributed through FCC, this potential intervention should be studied in remote, high-mortality settings in PNG.

Inclusion of VHVs who have been previously trained as birth attendants, in maternal health activities can increase rates of skilled birth attendance and use of formal health services. Their roles are often seen as firstly to help connect women to formal health services through counselling and assessment, and secondarily to attend deliveries in the home if facility-based childbirth proves impossible. Training of lay birth attendants can reduce newborn mortality by 30% although direct impact on maternal mortality remains debated. In PNG, programs have trained VHVs as birth attendants (also termed village birth attendants – “VBAs”) to act in settings where use of maternity care services is hindered by poor accessibility. The East Sepik Women and Children’s Health Project trained and supported VBAs to assess the health of pregnant women, refer those at high risk of complications and assist with deliveries when skilled birth attendance is impossible. This increased uptake of ANC, family planning, skilled birth attendance and use of health facilities although the program faced challenges in providing refresher training and supervision and supply shortages. Acceptance of trained VBAs in PNG has been mixed with women in Milne Bay province avoiding VBAs due to privacy and taboos while in the Southern Highlands they have been well accepted. TBAs, trained lay health workers or group facilitators may refer women or increase service use through women’s groups and home visits as evidenced in Pakistan and Nepal where care-seeking improved and perinatal mortality reduced.
COST-EFFECTIVE FCC INTERVENTIONS FOR NEWBORN HEALTH AND SURVIVAL

The state of neonatal health in PNG

In PNG the neonatal mortality rate (NMR) was estimated to be between 32.7 and 39.8 deaths per 1000 live births in 2008. This represents limited progress since 1990 when the NMR was 46.6. Neonatal deaths account for 38% of deaths in children under 5 years; of the approximate 14,000 child deaths in PNG each year over 5,000 occur in the first 28 days of life. This is a critical area if PNG is to achieve substantial progress on the child mortality MDG4. The majority of newborn deaths occur on, or soon after, the day of birth. Newborn deaths are likely to be significantly under-reported for cultural or administrative reasons (including the poor coverage of birth or death registration), and some may be mistakenly classified as stillbirths. There is considerable interest at global levels in also counting stillbirths, especially those that could feasibly be prevented by better care during pregnancy and childbirth however data in PNG are not well recorded, so this was not attempted for this paper.

The major causes of newborn death in PNG (see Figure 1) include

1. low birth weight due to premature birth; and
2. serious infections, often in the first days of life; and
3. damage during the birth process, particularly due to lack of oxygen (birth asphyxia).

What FCC could achieve for newborn health

FCC interventions can play a major role in reducing the first and second causes of death listed above through:

- better maternal care in pregnancy that prevents low birth weight (see maternal section);
- prevention of infections with use of clean birth kits (CBK), clean delivery and with hygienic home care;
- prevention of low temperature with delayed bathing and thermal control;
- promotion of breastfeeding that starts early (within one hour of birth) and is exclusive; special care for low birth weight babies (LBW) supporting referral for the smaller LBW (<1.5kg) babies and extra attention to temperature support, hygiene and feeding for other LBW – possibly provided as the ‘kangaroo mother care’ package; and
- home or community treatment of newborn infections, supported by prompt recognition and referral.

FCC may have a lesser role in response to hypoxic damage during birth because a major reduction in these deaths needs access to skilled birth attendance and emergency obstetric care. However some studies have also shown the feasibility and impact of community-based newborn resuscitation for babies that are born at home.
Of the estimated 5,300 newborn deaths each year in PNG up to 70%, or 3,700, newborn deaths can be prevented by near universal FCC care. The impact varies, dependent on what package of interventions are provided, however a basic package feasible in PNG should avert approximately 30% of deaths. Between 370-740 (7-14%) of these lives could be saved through 90% coverage with the preventive FCC package, 530-1,270 (10-24%) could be saved with the addition of community-based special care of the LBW newborn, and up to 3,700 (70%) through the inclusion of resuscitation of newborns suffering asphyxia and antibiotic treatment for suspected sepsis. The impact of FCC is most evident, and most needed, in settings with a neonatal mortality rate (NMR) greater than 45 per 1,000 live births. This is likely to apply to many rural and remote settings in PNG.

Cost estimates suggest that all newborn FCC interventions assessed rate as highly cost-effective. At 90% coverage the preventive package is estimated (in global data) to cost US$2,400 per death averted and the addition of LBW care reduces this to approximately US$1,600 per death averted. The cost estimates show that combined, or integrated, delivery of multiple interventions reduces the cost per life saved and is therefore the most cost-effective means of delivering FCC.

Impact, relative costs and description of newborn FCC interventions

Table 2 summarises the impact and cost of those interventions that specifically focus on newborn health, including any published information relating to PNG. Additional detail on the interventions is provided after the table. The PNG data that is available demonstrates that there is a need for these newborn FCC interventions and that they are likely to be effective in the PNG context.
Table 2. Summary of the impact and costs of family and community care for neonatal health interventions in PNG and globally

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence of impact, globally</th>
<th>Evidence of impact, in PNG</th>
<th>Published evidence of their use in PNG</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clean birth kits (CBKs) and clean birth practices</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Reduce deaths from sepsis by 15%, tetanus by 30% with use in 90% of home births.</td>
<td>NMR from 19.4 down to 4.8 with CBKs used by village birth attendants.</td>
<td>10,000 CBKs were distributed to trained TBAs and VBNAs in 22 provinces in 2008–2009.</td>
<td>Produced locally US$0.7, imported US$0.73 per birth. Estimated US$215 per life saved.</td>
<td></td>
</tr>
<tr>
<td><strong>Care for low birth weight (LBW) newborns</strong></td>
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<tr>
<td>32%-66% reduced risk of neonatal death with community-based ‘kangaroo mother care’ for LBW newborns</td>
<td>Reduced hypothermia and increased weight gain for preterm babies given kangaroo care in hospital.</td>
<td>10% of newborns LBW (&lt; 2500g).</td>
<td>US$221–608 per life saved when added to community-based post natal care.</td>
<td></td>
</tr>
<tr>
<td><strong>Newborn care packages (preventive and therapeutic activities)</strong></td>
<td></td>
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</tr>
<tr>
<td>Newborn care packages for prevention reduce NMR by 15%-54%. Adding therapeutic care (antibiotics for suspected sepsis and resuscitation) reduces NMR up to 70%.</td>
<td>Not reported</td>
<td>In East Sepik coupling a post-natal care package with birth dose hepatitis B vaccination increased coverage from 18 to 83%.</td>
<td>US$20 per DALY saved. US$1.65-2.445 per life saved. US$5.30 per infection treated.</td>
<td></td>
</tr>
<tr>
<td><strong>Neonatal resuscitation</strong></td>
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</tr>
<tr>
<td>83% of asphyxia cases could be revived and NMR reduced by 41% via mouth-to-mouth although impact can be greater with bag-and-mask.</td>
<td>Not reported</td>
<td>Not reported</td>
<td>With bag-and-mask costs US$15-47 per DALY saved.</td>
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<tr>
<td><strong>Promotion of breastfeeding</strong></td>
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<tr>
<td>Breastfeeding within 24 hours of birth reduces neonatal deaths by 8-19%. Promotion and support of breastfeeding reduces deaths at 0-12 months by 12%, 12-24 months by 10%, and 24-36 months by 9%.</td>
<td>Not reported</td>
<td>45% given colostrum, 84% breast fed within 24 hours of birth, 35% exclusively breastfed until six months.</td>
<td>Breastfeeding support for 95% in the Western Pacific costs US$23 per DALY saved.</td>
<td></td>
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</tbody>
</table>

Clean birth kits can be distributed to trained VHNs, or to mothers, via NGOs and church health services. Their use has been documented in many provinces of PNG: Central, National Capitol, East Sepik, Western, Gulf, Milne Bay, Oro, Morobe, Madang, Sanduan, Simbu, Eastern Highlands, East New Britain, Western Highlands, Enga, Southern Highlands, New Ireland, West New Britain, Bougainville, and Manus. CBKs in PNG have comprised gloves, soap, blade, sheet or mat, cord ties, wipes and antiseptic and have been manufactured locally to reduce cost as well as build community involvement and local income generation. CBKs have been used by village birth attendants in the Southern Highlands and, accompanied by training and referral for high-risk women, contributed to a reduction in the NMR; down to 4.8 while it remained 19.4 in control villages. For uptake and appropriate use CBKs distribution should be accompanied by behavioural change communication and there is a possible, but unmeasured, empowerment effect if provided directly to mothers. General support of clean delivery includes promotion and education on clean delivery and immediate cord care with families, TBAs and VHNs who attend births.

Special care of the low birth weight (LBW) newborn addresses the extra vulnerability of newborns less than 2500g, who are at a 30% greater risk of death. This affects 10% of all newborns in PNG with some provinces experiencing much higher LBW than others. Community-based care for LBW includes extra attention to counselling for breastfeeding, thermal care, hygienic cord care, and early recognition and care-seeking for illness. The risk of death can also be reduced through ‘kangaroo mother care’ which incorporates skin-to-skin thermal care by constant nursing against the mother’s chest.
chest, extra care with hygiene, exclusive breastfeeding and other appropriate feeding, and early recognition and treatment for illness.\textsuperscript{85, 89} In numerous studies in South Asia extra care for LBW infants has been delivered at home by mothers and grandmothers through education, support and home visits by trained lay health workers and has been able to reduce case fatality by up to 58\% for LBW in general and 69\% for preterm births.\textsuperscript{86, 97}

**Home-based newborn preventive care packages** include: promotion of birth preparedness and education on signs of birth complications; counselling and preparation for newborn care; promotion of thermal care including delaying the first bath by 48 hours if possible; clean care of the umbilical cord stump; **exclusive breastfeeding that starts early** (first feed within an hour of birth if possible); and community mobilization to form education and advocacy groups, especially of women. Early and exclusive breastfeeding could avert up to 19\% of neonatal deaths.\textsuperscript{94, 95}

**Home-based treatment of newborn infections** has been trialled especially in South Asia\textsuperscript{54, 67, 93, 98-100} where trained community-based staff, including lay health workers, have demonstrated safe and successful use of diagnostic algorithms and administration of both syrup and injectable antibiotics in homes.\textsuperscript{101, 102} This is rarely practiced in PNG at present, although VHV\s have provided birth-dose injections of hepatitis B vaccine using Uniject\textsuperscript{TM} alongside postnatal care in East Sepik province.\textsuperscript{91} However, present protocols in PNG do not allow VHVs to use oral or injectable medications with newborns.

**Newborn resuscitation in the home** for babies who fail to commence breathing at birth has reduced asphyxia-related deaths by up to 83\%.\textsuperscript{3} Trained TBAs and lay health workers have achieved these results using either mouth-to-mouth or bag-and-mask techniques at home births with high cost-effectiveness although experience has shown that training must be carefully delivered.\textsuperscript{3}
COST-EFFECTIVE FCC INTERVENTIONS FOR CHILD HEALTH AND SURVIVAL

The state of child health in PNG

Child health has improved moderately in PNG in the past 10 years; since 1990 the U5MR has declined by 25%, from 91 down to 68 in 2008, owing to improved immunization coverage, initiation of integrated management of childhood illness (IMCI), reduced fertility rate and increased maternal education. Many interventions for child health can be delivered in communities by locally based staff or outreach from health facilities – a somewhat easier task for health systems than provision of quality care at the time of childbirth.

The causes of death in children under 5 years in PNG are consistent with those found in other developing countries. This is displayed in the chart below which shows causes for both newborns and children.

Several trends in past decades include: the persisting importance of pneumonia, malaria and serious infections such as meningitis; the decline in the proportion of deaths due to measles and diarrhoea; and the increase in those due to diseases of the newborn and HIV infection.

Figure 1. Causes of death in newborns and children under 5 in PNG

Malnutrition (not shown in the chart above) in children is a contributing factor in up to 35% of deaths and is a major public health concern in PNG with national prevalence of both stunting, of 44%, and underweight, of 25%; alarming levels compared to global standards. Undernutrition, including iron deficiency anaemia, is worse among rural children. The poorest nutritional status of children is seen in Momase. For example, in Madang Province children have greater than national average prevalence of acute malnutrition, with 32% underweight and 10% wasted. By contrast, more children in the Eastern Highlands are chronically malnourished, with stunting at 46%.
What could FCC achieve for child health?

FCC in PNG, and elsewhere, has already proven it can reduce child deaths through:

- **Nutritional interventions**, including: promotion of exclusive and continuing breastfeeding, infant and young child feeding (IYCF) counselling, preventive vitamin A and zinc supplementation, deworming, iodine fortification;

- **Preventive care**, including: support to families to facilitate full immunisation, distribution of insecticide-impregnated bed nets (ITN), intermittent preventive treatment of malaria (IPT), prevention of parent-to-child transmission (PPTCT) of HIV, access to clean water, improved sanitation and hygiene knowledge, and community education and mobilisation around healthy childhood; and

- **Community-based treatments** for pneumonia, diarrhoeal disease and malaria.

Of the approximately 9,000 infant and child deaths (excluding newborns) each year in PNG, 15-50% of these lives, between 1350 and 4500, could be saved through near universal coverage with a combination of nutritional FCC (biannual vitamin A dosing, preventive zinc supplementation, complementary feeding actions and nutritional status monitoring) and community-based management of pneumonia and diarrhoea. This combination is estimated by the WHO to cost US$462 per DALY saved in the Western Pacific region — a level which rates the package as highly cost-effective by global standards.

**Impact, relative costs and description of child FCC interventions**

Table 3 summarises the impact and cost of those interventions that are specifically focused on child health, with published information on their use in PNG. Many interventions are either highly or moderately cost-effective, and none of the interventions rated as poorly cost-effective (although for some the cost-effectiveness has not been clearly measured). The PNG data has demonstrated that these child FCC interventions are likely to be effective in PNG. Additional detail on the interventions is provided after the table.

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Note that approaches to malaria treatment changed from late 2010.
### Table 3. Summary of impact and costs of family and community care for child health interventions in PNG and globally

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence of impact, globally</th>
<th>Evidence of impact, in PNG</th>
<th>Prevalence and program coverage in PNG</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition Interventions</strong></td>
<td></td>
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</tr>
<tr>
<td>Promotion of breast-feeding</td>
<td>Promotion and support of breastfeeding reduces deaths at 0-12 months by 12%, 12-24 months by 10%, and 24-36 months by 9%.</td>
<td>Not reported</td>
<td>35% exclusively breastfed until six months, 29% breastfed past 18 months.</td>
<td>Breastfeeding support for 95% in the Western Pacific is US$23 per DALY saved.</td>
</tr>
<tr>
<td>IYCF counselling and growth monitoring</td>
<td>Complementary feeding support and education can reduce the odds of stunting by up to 75%. There is no evidence for impact of growth monitoring on its own, without associated counselling.</td>
<td>In a highlands study early introduction of solids was strongly associated with pneumonia.</td>
<td>Malnutrition is high in children 6-59 months: stunting is 38-44%; underweight is 18-25%; wasting is 4%. Iron deficiency anaemia is 63% in children 6-24 months. Only 34% start complementary feeding at 6 months.</td>
<td>Community nutrition behavioural change program US$33-153 per DALY saved. Kitchen gardens cost US$9 per family.</td>
</tr>
<tr>
<td>Vitamin A supplementation</td>
<td>Supplementing children aged 6-59 months with 2 doses annually reduces all-cause mortality by 24%, diarrhoea incidence by 15% and measles morbidity by 50%.</td>
<td>35% fewer febrile cases of malaria in children aged 6-60 months with vitamin A supplementation every 3 months for a year.</td>
<td>26% of children under 5 years are vitamin A deficient. Coverage of supplementation with 2 doses for children 6-59 months is 12%.</td>
<td>US$3-16 per DALY averted. US$65 per death saved. US$0.04 per unit in PNG.</td>
</tr>
<tr>
<td>Zinc supplementation (preventive)</td>
<td>Zinc supplementation for 6-59 month olds reduces pneumonia incidence by 13%. Diarrhoea episodes by 14% and persistent diarrhoea by 25%. Preventive zinc reduces stunting by 15% and risk of death by 50%.</td>
<td>38% fewer malaria episodes (P. falciparum) in 6-60 month olds given 10mg elemental zinc daily for 46 weeks. No effect on P. vivax malaria.</td>
<td>26% of boys and 11% of girls aged 2-10 years from Wosera in PNG are zinc deficient and 76% have low zinc intakes.</td>
<td>US$73 per DALY saved.</td>
</tr>
<tr>
<td>Deworming</td>
<td>Single dose albendazole for children 12-59 months reduces anaemia rates by 5%-60%, and increases height and weight.</td>
<td>Not reported</td>
<td>Hookworm infestation of low level affects 4%-75% of children aged 24-59 months.</td>
<td>US$0.01 per tablet in PNG. US$0.12 per child dosed twice in school deworming.</td>
</tr>
<tr>
<td>Iodised salt fortification or iodine supplementation</td>
<td>Antenatal iodine supplements by injection in areas of severe iodine deficiency reduces the risk of congenital hypothyroidism by 73% and infant mortality by 29%.</td>
<td>Infants in Highlands given intramuscular iodinated oil had 13% greater survival rates after 15 years.</td>
<td>Iodine deficient: 30% of women, 22% of pregnant women, 68% of boys, 82% of girls aged 6-12 years. 54% of households use iodised salt, 41% do not use salt.</td>
<td>US$0.05 per child per year for iodized salt. US$2.16 per person per year for iodized oil capsules.</td>
</tr>
<tr>
<td><strong>Preventive Interventions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecticide treated nets (ITNs)</td>
<td>ITNs reduce malaria episodes by 50% more than no nets, and 39% more than untreated nets. Saves 5.5 lives for every 1000 children using ITNs. Use in pregnancy reduces LBW by 35%.</td>
<td>With regular outreach clinics over 1 year ITN use increased from 77% to 78% in Maprik and 57% to 88% in Esa’ala.</td>
<td>68% of households own mosquito nets and use them to prevent malaria. In Madang 98% of children sleep under ITNs.</td>
<td>US$13-20 per DALY saved. Unit price US$8.50 PNG.</td>
</tr>
<tr>
<td>Malaria prophylaxis – intermittent preventive treatment (IPT)</td>
<td>IPT at 2-3 months of age reduces the risk of malaria by 25-48% and of anaemia by 23-46%. 99% coverage reduces deaths in ages 0-12 months by 24%, 12-24 months by 2%, 24-36 months by 1.9%.</td>
<td>Mothers comply with home administration because of perceived benefits and pressure from health workers. Trials are now underway in PNG, led by national IMR and partners.</td>
<td>Malaria is endemic in every province. 1.5-1.8 million suspected adult and child malaria cases at health facilities annually. Case fatality is 9.7 per 100,000.</td>
<td>US$15-47 per DALY saved. Unit price US$0.03 in PNG.</td>
</tr>
</tbody>
</table>

Abbey Byrne, Chris Morgan  
Background Report – FCC in PNG
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence of impact, globally</th>
<th>Evidence of impact, in PNG</th>
<th>Prevalence and program coverage in PNG</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention of parent-to-child trans-mission (PPTCT) of HIV</td>
<td>PPTCT counselling and care, prophylactic ARVs, care at delivery and appropriate breastfeeding reduces risk of transmission from 35% down to 2%. (^{122})</td>
<td>500 women tested HIV positive at ANC and 147 infants were infected; 29.4% transmission. (^{123}) Note that this regime as tested is no longer in use.</td>
<td>18,000 women and 3,100 children are living with HIV. (^{7}) In 2009, 45 of 270 facilities provided PPTCT (^{124}); covering an estimated 14% of mothers needing it. (^{124})</td>
<td>Nevirapine costs US$2517 per HIV infection and US$84 per DALY saved. (^{125}) PPTCT in PNG US$20 each. (^{124})</td>
</tr>
<tr>
<td>Access to clean water and improved sanitation</td>
<td>Improved hand washing, water quality, and sanitation reduces diarrhea incidence by 30%. (^{35}) For every diarrhoea episode averted stunting decreases by 4%. (^{35})</td>
<td>Not reported</td>
<td>Clean drinking water accessible to 41% (87% urban, 33% rural). Sanitation facilities used by 45% (71% urban, 41% rural). (^{6})</td>
<td>Water to households US$9 – $22 per DALY saved. (^{126})</td>
</tr>
</tbody>
</table>

**Treatment Interventions**

| Community-based pneumonia management                                       | Community case management with oral antibiotics can reduce pneumonia-mortality by 70% in 0-59 month olds. \(^{122}\) | In Simbu, health workers managed ARI effectively in only 60% of cases. \(^{126}\) 2.3% of under 3 year olds had ARI in the last 2 weeks. 65% treated at a health facility. \(^{11}\) | Community-based delivery US$48–1000 per DALY saved. \(^{24}\) |
| Diarrhoeal disease management                                              | Oral rehydration solution (ORS) plus zinc can reduce the incidence of dehydration by 40%, all-cause hospital admissions by 59%, care-seeking for diarrhoea by 40%, and antibiotic use for diarrhoea by 89% compared to ORS alone. \(^{129}\) | Not reported 4.3% of under 3 year olds had diarrhoea in previous 2 weeks, 35% went untreated. \(^{11}\) In Madang, 41% received ORS, 13% extra water, 1% homemade ORS, 20% extra breast milk, 24% untreated. \(^{40}\) | Combined ORS and zinc US$48–1000 per DALY saved. \(^{24}\) Per packet in PNG US$0.07. \(^{34}\) |
| Malaria treatment                                                          | Effective malaria treatment could prevent up to 5% of child deaths. \(^{130}\) Lower efficacy of the older regime was noted in ages 6 months–7 years. \(^{131}\) The newer regime matches international efficacy. | Malaria is endemic in every province. 1.5-1.8 million suspected adult and child malaria cases at health facilities annually. Case fatality is 9.7 per 100,000. \(^{5}\) | In PNG US$6.97 per treatment success and US$58 per life year saved. \(^{132}\) |

**Nutrition Interventions**

FCC is critical to the changes of behaviour within families and communities that are essential for better nutrition.

**Breastfeeding** appropriately as children progress through stages of development improves survival. **Exclusive breastfeeding up until 6 months** is 3-5 times more likely with community-based post partum education and support by VHV or CHW, group sessions or peer counselling. \(^{35}\) \(^{133}\) **Initiating breastfeeding within 24 hours of birth** is strongly associated with exclusive breastfeeding, which could avert up to 19% of neonatal deaths. \(^{94}\) \(^{95}\) Ensuring exclusive breastfeeding until 6 months of age could avert up to 11% of deaths in 0-12 month olds, and **continued breastfeeding up to 24 months** could avert up to 9% of deaths in 24-36 month olds. \(^{35}\) **Feeding counselling and support as part of FCC** is greatly needed in PNG: even though 94% of Papua New Guinean women believe breast milk is best and invest even more when children are in poor condition, \(^{134}\) breastfeeding practices are not optimal. In one hospital study 40% of mothers had experience with bottle feeding and few knew of its dangers. \(^{135}\) while in

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\(^{122}\) This data represents the latest coverage published although the PPTCT regime in PNG no longer incorporates nevirapine prophylaxis.
broader surveys less than half of infants receive colostrum, only one-third are exclusively breastfeed until 6 months of age and just over a quarter are breastfeed for over 18 months. Cultural practices vary but it is common for babies to be ‘cleansed’ with water feeding immediately after birth and mothers introduce foods early for fear that their milk has insufficient nutrition or to boost growth.

**Infant and young child feeding (IYCF) counselling and support** reduces undernutrition, including stunting. Updating training for existing VHV’s, along with community mobilization and action, has improved health behaviours, helped establish vegetable and livestock farms, and better distribution of food for improved nutritional status. Growth monitoring may be done in conjunction but it is the counselling and community support that brings improvement. This is needed as children in PNG remain at risk as complementary feeding is initiated too early for many and too late for others rather than at 6 months as recommended. Dietary diversity in PNG is hampered by reliance on cash crops, limited arable land, remoteness and poor infrastructure. In comparison to other interventions improvements to IYCF practices require more substantial behavioural change and greater links with broader community development activities.

**Vitamin A supplementation**, biannually, has substantial impact on child mortality and morbidity, reducing deaths by 24%, and is highly cost-effective. High-coverage programs in Ghana, Nepal and Zambia, show that dosing children aged 6-59 months twice per year costs US$1.15 per child inclusive of supplies, personnel, training, travel and other capital costs. Coverage in PNG however is extremely low, at only 12%, with the primary reason cited being a lack of tablets in health centres.

**Zinc supplementation** will firstly reduce disease and deaths due to diarrhoea, but is likely to have other survival benefits for deficient populations. Trained lay health workers recruited from within communities have effectively delivered zinc supplements both therapeutically and preventively to children in settings of one worker for up to 2000 people. PNG evidence suggests high likelihood of zinc deficiency in children and while program coverage is not reported yet it is likely to be low.

**Deworming programs** centred around school-based distribution with biannual dosing of children aged 6-12 years can achieve very high coverage, and reduce iron deficiency anaemia. Ideally it can be integrated with vitamin A and immunisation as part of FCC to reach children not in school. PNG data varies, but suggests that there are areas where it is warranted for control of hookworm.

**Iodine supplementation** for children living in areas of iodine depletion reduces deaths and also improves mental and physical function. Iodine deficiency is common in PNG and iodised salt is an extremely low cost intervention but the benefits reach only half of the population due to low salt usage.

**Preventive interventions**

Widespread use of the cost effective insecticide treated nets (ITNs) could prevent up to 50% of malaria cases and 3-7% of child deaths. Possession of ITNs does not guarantee use and greater reductions in malaria are seen with concurrent health promotion, community mobilisation and intermittent preventive treatment (IPT). IPT in infants can be administered by CHWs, VHV’s or parents to reduce child mortality by 2%. Trials in PNG (see table 3) have demonstrated both the need and potential for both these to be delivered through FCC.
Prevention of parent-to-child transmission (PPTCT), with antenatal HIV testing, provision of antiretroviral treatment during labour and to infants post-natally can dramatically reduce transmission of HIV, especially if coordinated with primary prevention. FCC can successfully increase women seeking HIV testing as well as make links with primary prevention programs for men and women. PPTCT has been established in PNG since 2003, commencing in the Catholic Health Services facility at Mingende, Simbu Province, but since taken up across government and church run services. HIV prevalence is now estimated at 0.9% and 90% of all new infections in 2009 were in highland provinces, Morobe or the national capital. Knowledge remains limited and although 95% of people identify unprotected intercourse as a means of HIV transmission few are aware of parent-to-child transmission. Access to PPTCT treatment is worse in most rural areas but can be linked with other FCC interventions to improve utilisation.

Improved water, sanitation and hygiene information has a major preventive role in childhood illness, especially diarrhoea. To provide clean water through hand pumps or stand post for a community would cost approximately US$94 and through household connection US$223 per DALY averted. This is cost-effective. Households using unimproved water sources can purify water through a number of home filtration systems such as slow sand filtration, at a cost of US$23 per Sand Filter, to reduce episodes of childhood diarrhoea by 54-77%. Still more than half the population in PNG lack access to a safe water supply and improved sanitation facilities with continuing high morbidity from intestinal infectious diseases.

Treatment interventions

Community case management (CCM) for pneumonia, including assessment of severity, referral for oxygen and antibiotics if severe, and treatment with antibiotics if referral is not needed, can have a high impact on pneumonia deaths. Recent global analysis suggests that full coverage with CCM could reduce pneumonia deaths by 70%, saving more than 2,000 lives (including both newborns and children under 5) per year. CCM can be provided by either VHVs or community-based health staff, trained to assess the signs of pneumonia and provide antibiotics. The current coverage of CCM is not reported in PNG, but some data suggests that care-seeking at health facilities for childhood pneumonia has decreased in PNG in recent years, from 75% in 1996 to only 65%, even though pneumonia remains one of the major killers of children. Although global cost data ranks CCM as only moderately cost-effective, given the relative importance of pneumonia, in PNG it would be highly cost-effective.

Community treatment of diarrhoea with the use of the new formulation of oral rehydration solution (ORS), zinc and special feeding (for those with persistent diarrhoea) at full coverage could save 75% of diarrhoeal deaths – estimated at over 700 per year. ORS has been in use in PNG for some time however the WHO now recommends a newer low-osmolarity form of ORS plus zinc, for diarrhoea treatment – a therapy that can readily be distributed to families by VHVs and used in the home. The new treatment reduces diarrhoea severity and recurrence and the need for medical treatment, making this especially relevant for isolated communities. Coverage with ORS is not reported in PNG’s formal statistics, but preliminary analysis of DHS data suggests that 35% of children with diarrhoea receive no treatment, and that provision of ORS either in health facilities or communities remains inadequate. Although ORS-zinc combination is more costly per dose than ORS, the combination actually costs families less over time as the reduced incidence and severity means treatments are fewer.
**Community and home-based treatment of malaria** has been essential to rapid response to childhood fever in areas where malaria is endemic. For example, local women trained to teach neighbours to recognise and treat malaria in children has reduced under-5 mortality by 40% in Ethiopia.\(^{147}\) Community treatment in PNG has been proven feasible in the past with distribution of antimalarials through VHV. However, the situation has changed from late 2010 with the recognition that drug resistance and treatment failure rates\(^ {131}\) now require new malaria guidelines which focus on artemisinin combination treatments, and stronger use of diagnostic tests (rapid tests or microscopy). A large Global Fund grant has meant new resources for this in PNG and they have been demonstrated as efficacious and cost-effective.\(^ {132}\) The NDOH national malaria control program\(^ {42}\) includes a push for home-based treatment and community-based diagnosis, and use of artemisinin suppositories for home-based treatment of malaria in children. The suppositories were accepted by 66% of carers in one study in PNG although many found it problematic to administer (56%).\(^ {141}\) While the plan only indicates the VHV role as education and support for rapid referral, there is likely to be a strong case for promotion of VHV for distribution of home-treatment kits in places where rapid referral to an aid post or health centre is difficult. Around 90% of PNG’s population experience malaria and although many children acquire almost complete clinical immunity to P. vivax (but not for symptomatic P. falciparum malaria) by nine years of age\(^ {148, 149}\) this disease still claims more than 1,000 under 5 lives each year.\(^ {9}\)
IMPLEMENTATION OF FCC IN PNG

Current state of community health services

As noted in the introductory section, there has been a decline in rural health services over the past 10 to 15 years, most visibly in the closure of an estimated 200 aid posts\textsuperscript{13}. The gap in community health has been filled to some extent by the large number of community health programs around the country, most (but not all) run by church health services or NGOs. Many of these have long histories, indeed many pre-date the recent decline in rural health services, and most include the training of community-based health volunteers – which in international nomenclature would be termed ‘trained lay health workers’.

In PNG these have been known by many terms, indicating a variety of training and functions, such as ‘village birth attendants’, ‘community based distributors’ (of contraceptives), or ‘marasin meri/marasin man’ (distributors of antimalarials or antibiotics, usually to children under five). Work by the NDOH in 2001–2003, with AusAID support, convened 40 different community health programs to formalise a generic description of ‘village health volunteer’ (VHV, as used throughout this paper), create a national training curriculum and indicative job description, along with a point of recognition and accreditation in NDOH. This curriculum and job description has been updated several times (most recently in a consultation in 2008), but the most recent national manuals in general circulation still date back to 2003. The point of central coordination and VHV networking has been weakened in resources and function since 2008.

Despite this, a variety of community-based programs continue to function and various organisations, for example the wide network of VHVs sponsored by Catholic Health Services, and local community development organisations such as those catalysed by World Vision, continue to provide a range of community-based health education and services. Many of these programs work alongside, or as part of, integrated community development sponsored by communities, the government’s Department of Community Development or outside partners, including partnerships such as Strongim Pipol Strongim Nesen.\textsuperscript{150} Many community health programs have developed their own training manuals with a wide variety of content and not always in alignment with national health plans.

NDOH and major non-government health care providers encourage community health programs to interact closely with professional rural health services, whether run by government or church health services. This interaction varies significantly across the country in intensity and effectiveness. It often takes the form (at least nominally) of supervision or training of VHVs by professional staff (nurses or CHWs) based at rural health facilities, involvement of VHVs as assistants during outreach visits by professional rural health staff, or distribution of VHV supplies through health centres. Less commonly, such cooperation may involve inclusion of VHV structured refresher training in provincial hospitals, or incorporation of statistics on VHVs service provision into routine health information reporting by rural health facilities.

Presently, there is limited evidence on the impact, cost and effective implementation strategies of many maternal, newborn and child health interventions in PNG. It is important that both government and non-government service providers establish good data collection, evaluation and dissemination plans for a future with a stronger evidence-base for scale-up of FCC interventions.
The **new National Health Plan**\textsuperscript{16} envisages a number of major reforms, including the creation – where provinces choose – of integrated Provincial Health Authorities with combined management of hospital and public health services, as well as the creation of Community Health Posts, staffed by community-oriented professional staff. This new level of care is intended to include a professional community mobilisation/health promotion officer with responsibility for coordination with VHV\textquoterights{} in the area. This plan continues to see a role for VHV\textapos;s in community mobilisation, health education and provision of basic health services, where there is no alternative. As at 2011, the roll-out of the plan was only just beginning.

**Many community programs in PNG already include FCC services** with known effectiveness summarised in this report, most commonly:

- community mobilisation for health, such as formation and support of women\textapos;s groups;
- community education on disease prevention, nutrition, and appropriate care-seeking during illness or pregnancy;
- distribution of insecticide-treated nets;
- provision of antimalarials, antibiotics or oral rehydration for home treatment of suspected malaria, pneumonia or diarrhoeal diseases;
- attendance at home births to promote a clean delivery and referral if complications ensue.

There is considerable discussion in PNG at present regarding the **VHV incentives and roles**. Views on the appropriate \textquoteleft work-load\textquoteright{} of a VHV vary widely, with a few intensive programs creating a role that almost equates to full-time employment. Many feel that volunteerism cannot be maintained if the community service provided by the volunteer is excessive, perhaps no more than one day a week. Support from village leadership and local level governments varies, but interviews with VHV\textapos;s suggest they often feel under-appreciated and insufficiently recognised. There is also pressure, often from a VHV\textapos;s family, to provide monetary incentives or payments. Government leadership in the past has clarified that VHV\textapos;s should not receive payments, however the recent lapse of national clarity on VHV definitions and roles has led to uncertainty. There is also no standard approach to the provision of non-monetary incentives such as community benefits, gifts, or preferential consideration for future employment or training opportunities.

PNG is currently expanding other critical professional health cadres, such as midwives, nurses and CHWs, as indicated in the National Health Plan and Maternal Mortality Taskforce workplan. It is unlikely, in the authors\textapos; opinion, that VHV\textapos;s will compete with this pool of recruits. Indeed, it may well be that experienced VHV\textapos;s could ultimately aspire to retrain for some of these roles, to the ultimate benefit of the health system.
Improved delivery of evidence-based FCC interventions through existing community health programs

The variety of existing community health programs provides a solid foundation for expansion of FCC, based on the international evidence base, collated above. Five aspects that could be considered in improving the delivery of evidence-based FCC interventions are to:

- ensure the most cost-effective interventions are included in programs, wherever possible
- appropriately ‘package’ interventions for integrated delivery, noting the unique challenges of care at the time of childbirth;
- optimise local and national program linkages;
- expand the use of VHVs and improve their compensation, training and support; and
- better utilise schools and radio stations to spread FCC health messages.

There are a number of FCC interventions of proven effectiveness for maternal newborn and child survival, and that fit within the national health plan directions, which are not yet broadly incorporated into community health programs. Inclusion will require local training and possibly greater recruitment of VHVs plus supply and management developments.

Relatively under-used FCC interventions that may be easier to deploy in existing programs include:

- distribution of micronutrient supplements (eg iron/folate, zinc, calcium, vitamin A) to young women, pregnant mothers and children;
- strengthened education on nutrition to young women and pregnant mothers, breastfeeding for newborns, and good infant and young child feeding;
- provision of antihelminthics for de-worming to pregnant mothers and children;
- education on hygiene, care for low-birth weight and recognition of sepsis for newborns.

Relatively under-used FCC interventions that should prove feasible for many programs, but which will require significant coordination with health services, and new higher-level training include:

- distribution of newer antimalarials (possibly in association with rapid-diagnostic tests) for treatment in the home or community;
- distribution of antimalarials for IPT during pregnancy or infancy;
- promotion of antenatal testing for STIs and HIV, with support to provision of treatment where needed.

Under-used FCC interventions likely to have high impact on survival, but which will require significant program innovation and careful monitoring include:

- newborn resuscitation with bag and mask;
- antibiotic treatment of suspected newborn or maternal postnatal sepsis;
- provision of uterotonic (such as misoprostol) for prevention or treatment of PPH.
Packaging interventions for integrated delivery

Integrated delivery, which provides a package of services together at a single point of contact, is important to the provision of client-centred care in any setting, and particularly important in resource-limited settings such as PNG. Packaging of FCC interventions in PNG has been shown to be effective and has the potential to increase coverage of all interventions and save time, money and resources by allowing VHVs (or other health workers) to perform several activities in the one session.\textsuperscript{36} Table 4 below summarises various FCC interventions by packages appropriate to various points in the life cycle.

Table 4. Summary of potential packages for implementation of FCC

<table>
<thead>
<tr>
<th>Pre-pregnancy (young women)</th>
<th>Antenatal</th>
<th>Childbirth and newborn</th>
<th>Infancy</th>
<th>Childhood</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Antenatal (General)</td>
<td>Childbirth</td>
<td>First day and week of life</td>
<td>Promoting growth monitoring</td>
</tr>
<tr>
<td>Family planning counselling</td>
<td>Birth-preparedness counselling</td>
<td>Nutrition counselling</td>
<td>Calcium supplementation</td>
<td>Iron and folate supplementation</td>
</tr>
<tr>
<td>Nutrition counselling</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Iron and folate supplementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iodised salt</td>
<td>Birth-preparedness counselling</td>
<td>Nutrition counselling</td>
<td>Calcium supplementation</td>
<td>Iron and folate supplementation</td>
</tr>
<tr>
<td>Mosquito or Insecticide treated nets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBK distribution</td>
<td>CBK distribution</td>
<td>PPTCT of HIV</td>
<td>Misoprostol distribution</td>
<td>CBK and clean birth practices</td>
</tr>
<tr>
<td>PPTCT of HIV</td>
<td>Referral by VBAs and TBAs</td>
<td></td>
<td></td>
<td>PPTCT of HIV</td>
</tr>
<tr>
<td>Misoprostol distribution</td>
<td></td>
<td></td>
<td></td>
<td>Promotion of breast feeding</td>
</tr>
</tbody>
</table>

Home visits by VHVs are essential to the provision of all FCC interventions that go beyond community education and mobilisation. As displayed above, these are opportunities at various points in the life-cycle, for provision of life-saving FCC.

There are special considerations to note in relation to childbirth and the newborn period. Community care at childbirth, such as that provided by VHVs trained as village birth attendants, is common only in some parts of PNG. A major concern is that provision of such care may distract efforts from the essential work of strengthening obstetric services in rural health facilities and encouraging mothers to use them. However, many parts of PNG have both high home-birth and high mortality rates and change is proving slow. Consideration could be given to strengthening existing village birth attendant
services in these locations, and also possibly to late ANC visits to distribute CBKs, with or without
distribution of misoprostol. Evidence from other countries\textsuperscript{68, 102} suggests that when accompanied by birth-
preparedness counselling, such programs do not inappropriately encourage home-birth and often lead to
increased rates of child-birth in health facilities, while simultaneously working to make a home-birth safer
for those mothers who still choose this.\textsuperscript{68}

**Newborn care packages** may include hygienic delivery, skin-to-skin thermal care for low birth weight
babies, umbilical cord care, early breastfeeding and colostrum, delayed bathing, and recognition and
referral of sick newborns. Trained lay health workers (VHV equivalents) have delivered such packages of
interventions through post-natal home visits, with clear survival benefits (as noted above) reducing NMR
by 15\%-54\%. If home visits also include treatment of suspected sepsis, NMR can be reduced by up to
70\%.\textsuperscript{54, 67, 93, 98-100} Greater impact is seen with home visits on first and second days of life.\textsuperscript{151}

**Community and VHV support to health centre outreach visits** can enhance the effectiveness of
interventions provided by professional health staff by promoting community attendance and, where a
VHV is trained, by providing assistance during the outreach session. In one study in two provinces in
PNG, trained VHVs coordinated and supported outreach visits by health centre staff to increase access by
young women and pregnant mothers to multiple micronutrient supplements, IPT, ITNs, testing for STIs
and HIV, with demonstrable improvements in rates of anaemia and low birth weight.\textsuperscript{36} The various FCC
interventions involving malaria treatment, and identification of STIs or HIV, are also more effective when
linked to health system strengthening, to promote testing prior to treatment and secure access to
supplies. Welcomed participation in health centre outreach can also enhance the VHV’s local standing and
level of community support.

**Community education and mobilisation** are key delivery points for the educational components of
FCC, in addition to schools and the media, and offer the opportunity to link health with other community
development. Mothers have found VHVs to be primary sources of health information and in Madang area
have expressed desire for increased information sessions regarding children’s health and nutrition.\textsuperscript{27}
Women have conveyed that their use of health facilities would increase if families were supportive,
services were more accessible and transport were available.\textsuperscript{13, 152} Such sessions could include discussion
and solution generation of birth preparedness, newborn care, maternal and child nutrition, family planning,
and PPTCT. The life cycle table above demonstrates that ‘timed counselling’ addressing the particular
needs of various age groups may prove effective. For those places where it is relevant, communities could
be encouraged to discuss whether and how community transport resources could be made available for
maternal or child health emergencies. The local production and distribution of CBKs is another example
where community resources, perhaps through women’s groups, may be able to contribute to FCC and
community empowerment.

Community education in child health areas is well established in PNG, however newborn and postnatal care
education is possibly under-employed. Newborn outcomes in other countries have been greatly improved
by community mobilization, health education, and behaviour change communication strategies.\textsuperscript{153} Studies in
Nepal have documented a striking decline in both maternal and newborn mortality rates with formation of
women’s groups facilitated by trained lay health workers\textsuperscript{54} confirming the usefulness of this approach, which
is already used in many places across PNG.
Community health program linkages and high quality support are essential to success. Although not well documented in published literature, it is clear that many community health programs in PNG have demonstrated what is required to maintain effective VHVs and other aspects of community health programs. If VHVs are to be functional, they need support staff to provide initial and refresher training, supervision, support to monitor and record their work and administration.

Local linkages with formal health services are essential to optimise FCC provided through outreach (as noted above) and ensure consistency of health education messages. In community programs where VHVs provide FCC services (antimalarials for example) these links seem especially important to:

- engage health centre staff who can provide supervision and legitimacy;
- include services provided by VHVs in local health information systems to ensure coverage is not under-reported and provide an additional point of interaction;
- procure and distribute supplies for VHVs; and
- negotiate exposure of VHVs to health centre or hospital care to support refresher training.

Village health committees to oversee, support and promote FCC activities will increase uptake of health messages. Motivation and enthusiasm by village leaders, and rural health staff, in support of VHVs and community health, is associated with more rapid and substantial family and community health changes.21

National linkages and networks for VHV and community programs have the potential to improve FCC in a number of ways. A revitalisation of a national coordination point for VHVs within NDOH could help to review and re-establish accreditation for newly trained VHVs, refine job descriptions in light of new FCC evidence, and provide updated descriptions of minimum standards. If supplemented by a stronger national network of community health programs, including VHV programs, this could provide a platform for:

- advocacy for greater deployment of FCC and a fuller description of the place of services delivered by VHVs in national and provincial workplans;
- full discussion and mapping of options for appropriate standards for VHV support, incentives and work-load expectations;
- better acknowledgement of what is required for good quality FCC, along with sharing of approaches to supportive supervision, training materials and resources, peer support groups, and maintenance of supplies.
SUGGESTIONS FOR HEALTH MANAGERS IN USE OF THIS EVIDENCE

This paper is not intended as a community health manual, and many aspects of the implementation discussion are abbreviated. We suggest though, that this evidence can be useful to government and non-government health planners at national, provincial and local levels in the following ways.

**Use this as evidence for advocacy** where needed to influence provincial health policy. All the FCC interventions in this paper are consistent with the National Health Plan, however some national or provincial health policies may not fully promote all these. The headline statements in the summary section may help provide evidence to demonstrate the potential of FCC in difficult situations in PNG. Policy briefs on specific topics can be made available through the author, if needed to support this work.

**At a program level, use this evidence to review current inclusions.** The two main sections of this paper – on FCC interventions and on FCC implementation – represent the FCC likely to make the most difference to maternal, newborn and child survival. It is most unlikely that any community health program can or should implement all of these. However we hope that this can provide a reference point to help optimise a program’s inclusion of FCC activities with highest effectiveness, after review of the program and community’s resources, and of local needs.

**Distinguish the characteristics of the local situation.** In any situation, it will be important to make use of provincial or district data on disease prevalence (especially prevalence of malaria and of nutritional deficiencies). Mortality rates can also provide guidance on likely FCC needs. In settings characterised by high mortality rates and high home-birth rates, it is likely that the majority of maternal deaths, and a large proportion of child deaths, occur at childbirth or within the first two days after birth. Reaching families at this time is challenging but the FCC interventions delivered at this point should receive special focus. In situations where there is uncertainty as to the role or risks of new FCC interventions, such as misoprostol, a carefully designed service delivery trial may allow introduction in a form that is carefully measured to minimise and detect unforeseen consequences.

In such settings, and in settings where child mortality is moderate to high, it is likely to be important to **distinguish VHVs and other community staff with purely educational functions from those who also provide FCC treatment or preventive services.** In moderate or high mortality settings where formal health services are difficult to access, service provision of FCC interventions by trained VHVs is likely to be necessary for significant improvement in survival rates. This requires additional training and linkages with formal health services to be sustainable, as noted above. Communities often demand curative services from VHVs and roles with exclusive health promotion may cause them to be viewed unfavourably making their work difficult.

**Note the cost and cost-effectiveness information.** As described in the methodology section, the impact and cost estimates derived from international and PNG studies are intended to be used as a guide to judge the relative cost of FCC interventions one with another. They are not intended to be used in program budgets, which will vary widely according to staffing arrangements and the transport demands of a program’s setting. We believe, though, that we have collated the most cost-effective FCC interventions likely to promote maternal, newborn and child survival, and that all interventions listed here are cost-effective complements to care in the formal health system.
National estimates of costs for maternal and child health have recently highlighted the severe shortage of trained midwives and similar cadres in the formal health system, estimating a need for US$230,000 per provincial health office each year for safe motherhood health worker training. This modelling also estimates the cost per provincial health office at US$78,000 per year to maintain VHV programs, however it is likely that non-government community health programs will be able to provide more accurate data from analysis of their own situation. UNICEF and WHO have established tools for national or provincial modelling of the costs and impact of maternal and child survival strategies. These are resource- and time-intensive and have not yet been used in PNG, however a full ‘investment case’ estimating the costs per life saved of various strategies, including FCC, would be valuable to planning and advocacy in PNG.

Although this paper cannot estimate full program costs, we have collated a range of FCC material costs as part of the analysis, and provide these in Table 5 for comparative purposes.

**Table 5. The material cost per unit of interventions in PNG**

<table>
<thead>
<tr>
<th>Maternal health</th>
<th>Neonatal health</th>
<th>Child health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interventions</td>
<td>Cost per unit</td>
<td>Interventions</td>
</tr>
<tr>
<td>Iron and folate tablets</td>
<td>US$0.07</td>
<td>CBKs</td>
</tr>
<tr>
<td>Deworming</td>
<td>US$0.02 per tablet</td>
<td>Newborn care packages</td>
</tr>
<tr>
<td>IPT</td>
<td>US$0.03</td>
<td>Zinc</td>
</tr>
<tr>
<td>Birth preparedness</td>
<td>US$6</td>
<td>Deworming</td>
</tr>
<tr>
<td>Family planning service + supplies</td>
<td>US$4.93–33.42</td>
<td>Iodised salt</td>
</tr>
<tr>
<td>CBKs</td>
<td>US$0.17-0.73 per birth</td>
<td>Pneumonia case management</td>
</tr>
<tr>
<td>Misoprostol</td>
<td>US$0.42-0.68</td>
<td>Diarrhoea management</td>
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<td></td>
<td>Malaria treatment</td>
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<td>PPTCT</td>
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<tr>
<td></td>
<td></td>
<td>Clean water – Sand filter</td>
</tr>
</tbody>
</table>
A NOTE ON THE EVIDENCE USED IN THIS RESEARCH

- The data for several indicators have been drawn from the 2006 DHS however the methodology of this survey has been questioned and we have thus supplemented these measures with other estimates that are believed to be more accurate. Any use of MMR and U5MR needs to take account of the statistical uncertainties that are always involved in such measurements.\textsuperscript{155}

- Some studies in PNG have drawn on small sample sizes and therefore may not adequately represent the greater population.

- There is a paucity of studies, particularly high quality community-based randomised controlled trials, to inform public health activities in PNG. The reliance on evidence from global studies renders the suggested impact and costs in this report estimations only.

- Future work could go further to calculate specific costs and impact for particular settings in PNG, perhaps by employing health system modelling tools currently in use by WHO, UNICEF and other organisations. However this should not delay greater support for FCC given the significant maternal, newborn and child health needs in PNG and the evidence of FCC valuable for money in a wide range of settings.

- This paper summarises evidence of a wide range of interventions however, because it is focused on community-based care, does not cover the entire range of interventions with positive evidence of impact on child and maternal mortality for example IMCI, immunisations, oxygen in health facilities, skilled birth attendance and emergency obstetric care.
CONCLUSION

It is suggested that this evidence can be useful to government and non-government health planners and managers at national, provincial and local levels in the following ways:

- as evidence for advocacy where needed to influence provincial health policy;
- to review current inclusions at a program level; and
- as a guide to judge the relative cost-effectiveness of FCC interventions one with another and other forms of intervention.

This paper calls for:

- renewed national leadership on the role, standards and support of VHVs in community health programs;
- for a review of current FCC programs regarding their alignment with international evidence;
- for FCC to be seen as a vital part of local health system strengthening; and
- for greater cooperation between church and non-government community health programs to share program experiences, training materials and other resources.

The global evidence is convincing that FCC can make a major contribution to the survival and health of mothers, newborns and children in PNG. Analysis of the situation in PNG provided here demonstrates that many government and non-government programs could do more to include the most cost-effective FCC interventions in their programs. Ultimately, health improvements and progress towards the MDGs will require both family and community-based care, working in synergy with health system strengthening.
REFERENCES


October 2011

Abbey Byrne, Chris Morgan Background Report – FCC in PNG