WOMEN AND CHILDREN’S HEALTH

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The FJPH is a Fiji based Journal published for Public Health practitioners, public health researchers, clinicians and all allied health practitioners. Our goal is to provide evidence based information and analysis they need to enable them to make the right choices and decisions concerning their health and health services provided to ensure better health for all.

FJPH is published quarterly.

The format of FJPH accommodates three types of submissions:
1. Original Academic/Scientific Research Papers - Research-based works addressing a specific area of public health or any other general topic in health - between 3,000 and 4,500 words.
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3. Perspectives - Reviews, Opinion pieces that analyze or discuss a recent issue or development in public health - between 250 and 2,500 words.
4. Field notes - Journal-style pieces, with a more personal voice, words.

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1. All manuscripts should be prepared according to the guidelines below
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Publication Eligibility
1. For each manuscript, at least one of the authors needs to be an undergraduate, medical, or graduate student at a nationally accredited institution.
2. The submitted manuscript has not been published nor will be published in another publication at the undergraduate, graduate or professional level.
3. The manuscript is the author's own original work, and the authors are the sole authors of the manuscript.
4. The primary author is willing and able to work with FJPH editors in revising the submission if it is selected as a likely candidate for publication.

Submission Types
1. Original scientific Research - Research-based works addressing a specific area of public health or any other general topic in health
2. Abstracts - structured abstracts for original research and
3. Perspectives - Reviews, Opinion pieces that analyze or discuss a recent issue or development in public health
4. Field notes - Journal-style pieces, with a more personal voice, based on direct work in the field

Formatting
- All manuscripts should be submitted as double-spaced, size 10, Times New Roman font in microsoft Format (.doc or .docx only).
- Do not include the name of the manuscript's authors any pages except the title page.

Content Guidelines for Perspectives and Field Notes
Perspectives are opinion-based pieces. Field Notes take a more personal, informal tone that addresses public health work the author has done in the field. For both Perspectives and Field Notes, we are looking for submissions that address fresh and exciting developments in public health from an interdisciplinary perspective. Perspectives and Field Notes should be grounded in the preexisting literature base. For citations and references, use APA style. If tables and figures are used, please include them at the end of the submission.

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The appropriate structure of Academic/scientific Research Papers varies based on the topic of the manuscript. With a few exceptions, following sections: a) Abstract, b) Introduction, c) Methods, d) Results, e) Discussion, f) Acknowledgments and References, g) Tables and Figures.

Tables, Figures and Images
- Tables, figures and images should be the original work of the manuscript's authors and should be included at the end of each manuscript.
- Captions should describe what the table/figure/image shows and the conclusion that should be drawn.
- Labels and axes should be clearly marked and readable.
- All tables, figures, and images should be submitted in high resolution please.
- References

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The Australian Government’s goal in engaging with the Ministry of Health (MoH) through the Fiji Health Sector Support Program (FHSSP) is to assist the Fiji Government’s effort to comply with the strategic objectives of reducing infant mortality and improving maternal health in accordance with the Millennium Development Goals.

A Paper reviewing maternal mortality in Fiji notes the dramatic decline from the 1960s, and the slow rate of improvement since the mid 1980’s. Its findings remind us how it is possible for sound data coupled with evidence-based strategies can improve health outcomes. Better monitoring of public and hospital health services activities can be enhanced with regular reporting to the divisions is strengthened with the establishment of the public health information system (PHIS) and the hospital based patient information system (PATIS) through the Fiji Health Sector Support Program

An effective family planning program contributes to maternal and infant survival. A contraceptive prevalence rate of 56% is Fiji’s MDG target and in 2012, the rate was 44.3%. The article on family planning takes a historical journey from its establishment as a program, to its current status and future aspirations.

Cervical cancer is a major cause of mortality for women in Fiji and serious efforts has been taken to improve early detection and treatment by strengthening the Pap smear program and the recent expansion of screening to visual inspection with acetic acid (VIA). Fiji is one of few countries in the Pacific and out of 100 other countries that introduced the human papilloma virus vaccine (HPV) to its’ immunisation schedule. The evidence that a two-dose schedule is just as effective as the current three-dose schedule means a reduction in total costs and sets an opportunity to offer the same vaccine to boys as well as girls in the future.

According to World Health Organization (WHO) “immunization is today one of the safest, most cost-effective, and powerful means of preventing deaths and improving lives.” A National Immunisation coverage rate of 94.8% for all 10 antigens on the Schedule is something that Fiji should be very proud of as reported in the coverage survey 2013. In partnership with the Australian Government, the Ministry of Health introduced three new vaccines (pneumococcal, rotavirus and HPV) to its schedule in 2012 and 2013. This was a significant step forward for Fiji’s health system in the protection of infants against pneumonia, diarrhoea, sepsis and cervical cancer in young women. Furthermore a partnership between the Murdoch Children’s Research Institute (MCRI), MoH and the Australian Government, completed a baseline carriage survey that will provide further understanding on the efficacy and impact of the vaccines. This research work is on-going to provide opportunity for application and guidance for other countries in the region.

The incidence of infant and child mortality in Fiji has had little change over the last 10 years and perinatal deaths make up a significant proportion of the mortality associated with young children. Paediatric clinical service networks focus on neonatal resuscitation and newborn care in addition facilitating training in the integrated management of childhood illness (IMCI) program to all health service levels. The accuracy of information and analysis is a major issue in the interpretation of rate for stillbirths, neonatal and infants. Fijians of Indian descent were more likely to have a bad perinatal outcome and i-Taukei babies were more likely to die in the post neonatal period.

The articles in this issue of FJPH are a reminder for the need to continually strengthen health information systems to produce high quality, timely data for analysis. In conclusion, the articles in this issue provide rich information to guide future actions and decisions, especially with the delivery of Maternal and Child Health Services particularly when there are unmet needs for achieving MDG 4 and 5 targets. I encourage you to read this issue of the Fiji Journal of Public Health and commend all the contributors for their efforts in producing a high quality of work.
ABSTRACT

Components of a Comprehensive Impact Evaluation of the 10-Valent Pneumococcal Conjugate Vaccine on Carriage and Disease in Fiji

Russell F.M1,2, Rafai E3, Satzke C2,4, Kama M3, Dunne E.M1, Ratu T1, Bright K1, Reyburn R1, Porter B1, Neal E2,2,2, Camna M3, Edmunds J6, Tuivaga E3, Tihoduidua L1, Devi R1, Kado J1, Mulholland E.K2,5,6.

Background
In 2012, Fiji introduced the 10-valent pneumococcal conjugate vaccine (PCV10) using a 3+0 schedule, with Australian Aid support. After three years, the Ministry of Health (MoH) will absorb all vaccine costs. As there is no data from resource-limited settings in the Asia-Pacific region on the impact of PCV, we designed an evaluation for Fiji to measure the direct and indirect effects of PCV10 on nasopharyngeal carriage, pneumonia, and invasive pneumococcal disease (IPD).

Methods
Community Carriage: In 2012 (pre-PCV10 introduction) and annually thereafter until 2015, cross-sectional carriage surveys were undertaken in a representative sample of healthy very young infants (5-8 weeks old), vaccinated children (12-23 months old), 2-6 year olds, and their caregivers (500 per group). Risk factors for carriage are being recorded with each survey. For the 5-8-week-olds, pneumococci were detected from nasopharyngeal swabs using hylE quantitative PCR (qPCR) and serotyped by microarray. Swabs from the 12-23 month olds were cultured on selective media and pneumococci identified and serotyped using traditional methods.

Pneumococcal transmission: To understand why there is a difference in the disease burden between the two major ethnic groups in Fiji (which does not seem to be related to any obvious socio-economic factor) a detailed social contact questionnaire will be administered during the 2014 carriage survey to document the duration and frequency of face-to-face conversations and physical contacts and the social setting for each contact. The frequency and intensity of social contact will be measured and the effect this has on pneumococcal carriage between ethnic groups will be compared, as pneumococcal carriage is a prerequisite to developing pneumococcal disease.

Pneumonia: Hospital admission data from 2007-2011 (pre-PCV10) and 2014-2015 (post-PCV10) will be extracted from the Fiji national datasets, using ICD10 codes for all-cause pneumonia (ICD10-AM codes J10.0-18.9, J22). An interrupted time series analysis will be undertaken pre/post PCV10. For laboratory confirmed meningitis, we will extract all meningitis cases from the microbiology registers for the same time periods to perform a pre/post PCV10 evaluation. For IPD, we will extract all IPD cases from the microbiology registers from 2007-2011 and 2014-2015 to perform a pre/post PCV10 evaluation. Invasive bacterial vaccine preventable disease IB-VPD surveillance will monitor invasive pneumococcal serotypes in all ages but as we have no baseline IB-VPD surveillance data, we will estimate the impact of PCV10 on serotype-specific IPD, by modelling the IPD and community carriage data.

Results
Preliminary data are presented.

Carriage: 5-8 week old infants: Preliminary analysis on 319 infants in the pre-PCV10 period found 32% carried pneumococci and 10% of these infants carried a PCV10 serotype. Being i-Taukei was an independent risk factor for carriage (OR 2.97, 1.35-6.52; p=0.007). 12-23 month olds: 49.9% carried pneumococci, and 20% of these children carried a PCV10 serotype. Being i-Taukei was also found to be an independent risk factor for carriage in this age group (OR 2.46, 1.7-3.57; p<0.001).

All-cause pneumonia: The results for pneumonia are being analysed and will be presented at the Pacific Islands Health Research Symposium 2014, Suva.

Radiological and very severe pneumonia: Of all-cause pneumonia admissions in children aged 0-23 months old, preliminary results found that 52% of admissions had very severe pneumonia and 33% had severe pneumonia. 50% of very severe pneumonia admissions occurred in children less than six months of age and 50% of severe pneumonia admissions occurred in children less than seven months of age. 10% were admitted to intensive care and 24% were hypoxic (oxygen saturation <90%). The case fatality rate was low (0.4%).

Conclusions
Administrative and IPD surveillance data, and special studies, including carriage surveys and mathematical modelling, are required to fully measure the effect of PCV10 on IPD and pneumonia. This impact evaluation will provide the necessary data to justify the ongoing cost of the PCV10 program, ensure sustainability, and shed light on the reasons for ethnic differences in carriage and disease rates. We will develop a model whereby carriage data can be used to estimate the impact of PCV10 in settings where IPD surveillance has not been established prior to PCV introduction. These results will help guide other countries in the region on the value of PCV on these common childhood diseases.

References:

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Background

Global data suggests at least one third of all pneumonia deaths are attributable to pneumococci, indicating that pneumococcal pneumonia contributes substantially to the most severe forms of pneumonia. Clinical trials have shown that the pneumococcal conjugate vaccine (PCV) prevented 25-37% of radiological pneumonia and in The Gambia, the 9-valent PCV found a 16% (95%CI 3-28) reduction in all-cause mortality. Ecological studies in the USA and Australia, found a significant (29-39%) reduction in all-cause pneumonia rates following the introduction of the 7-valent PCV. Despite pneumonia being the most common cause of childhood hospital admissions and deaths globally, there are very little data on the impact of PCV on pneumonia, particularly in resource limited settings. In 2012, the Fiji Ministry of Health introduced a three dose infant PCV10 schedule. This study describes the severity of hospitalised childhood pneumonia in young children, prior to the 10-valent PCV (PCV10) introduction, in order to evaluate the impact of PCV10 on pneumonia severity.

Methods

Study site

Approximately 57% of the total population are Indigenous Fijian (i-Taukei) and 38% are of Indian descent. Immunisation rates are high (98% for DTP3 vaccine) and Hib vaccination was introduced in 1995. The majority of seriously ill children in the Central Medical division are referred and admitted to the Colonial War Memorial Hospital (CWMH), the only hospital in this division that provides health care for very sick children and paediatric intensive care services. It is uncommon for children to die at home before receiving health care, which is provided free of charge. CWMH staff use the WHO Integrated Management of Childhood Illness (IMCI) criteria for classifying pneumonia.

Study design

Data were extracted from the national hospital database (PATIS) for all-cause pneumonia admissions to CWMH, for children aged 0-23 months using ICD10 criteria (ICD10-AM codes J10.0-18.9, J22), from 2007-2011. A subset of 500 cases (~20% of all-cause pneumonia admissions) were identified by selecting every fifth case admitted by date. If the medical record of the selected case could not be found, the next case, by date, was included, until a total of 500 were reached. Demographics and clinical information were extracted from each case’s medical record. Severe pneumonia was classified according to WHO IMCI criteria. Very severe pneumonia included severe pneumonia plus one of the following: intensive care admission, artificial ventilation, septic shock, seizures, unconsciousness, death, need for supplementary oxygen, hypoxia (oxygen saturation <90%), empyema, pleural effusion, or chest drain insertion.

To calculate the annual incidence rate of severe and very severe pneumonia, the number of cases identified over the five year period was multiplied by five as only a 20% of all pneumonia admissions were selected for this study.

Results

Pneumonia admissions were more common in i-Taukei children (87%) compared with Fijians of Indian descent. The median age at pneumonia admission was six months (IQR 2-12 months). 52% of the sample had severe pneumonia and 33% had very severe pneumonia. 50% of the very severe pneumonia admissions occurred in children less than six months of age and 50% of the severe pneumonia admissions occurred in children less than seven months of age. Of the all-cause hospitalised pneumonia admissions, 10% were admitted to intensive care and almost one quarter (24%) were hypoxic. The case fatality rate was 0.4%. 440 (88%) of the cases were from the catchment area and these cases were used to calculate the incidence rate. The annual incidence of severe or very severe pneumonia was calculated to be 2,893 per 100,000 children under two years old. The annual incidence was over three-fold higher in i-Taukei children compared with Fijian children of Indian descent (3,511 vs. 1,094).

Conclusion

Very severe pneumonia is more common in infants. For unknown reasons the incidence rate is many times higher in the i-Taukei population. The contribution of RSV and other viruses to very severe pneumonia is not known. The mortality rate was low. This study forms a baseline for the evaluation of PCV10 on severe and very severe pneumonia in young children in Fiji.

Table 1: Demographic characteristics of 500 hospitalised all-cause pneumonia, severe and very severe pneumonia cases in children under two years old at CWMH, 2007-2011

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All-cause hospitalised pneumonia n=500</th>
<th>Very severe pneumonia n=258</th>
<th>Severe pneumonia n=165</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age in months (IQR)</td>
<td>6 (3-12)</td>
<td>6 (3-12)</td>
<td>7 (3-14)</td>
</tr>
<tr>
<td>Ethnicity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i-Taukei</td>
<td>433 (87)</td>
<td>225 (87)</td>
<td>143 (87)</td>
</tr>
<tr>
<td>Fijians of Indian descent</td>
<td>42 (8)</td>
<td>18 (7)</td>
<td>14 (8)</td>
</tr>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>298 (60)</td>
<td>154 (60)</td>
<td>98 (59)</td>
</tr>
<tr>
<td>Female</td>
<td>202 (40)</td>
<td>104 (40)</td>
<td>67 (41)</td>
</tr>
<tr>
<td>Low birth weight &lt;2500g (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58 (15)</td>
<td>28 (14)</td>
<td>19 (16)</td>
</tr>
<tr>
<td>Female</td>
<td>205 (45)</td>
<td>120 (45)</td>
<td></td>
</tr>
<tr>
<td>Median length of stay in days (IQR)</td>
<td>4 (3-7)</td>
<td>5 (3-8)</td>
<td>3 (2-5)</td>
</tr>
<tr>
<td>Intensive care unit admission (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>49 (10)</td>
<td>19 (10)</td>
<td>N/A</td>
</tr>
<tr>
<td>Female</td>
<td>4 (3-6)</td>
<td>4 (3-6)</td>
<td>N/A</td>
</tr>
<tr>
<td>Received supplemental oxygen (%)</td>
<td>127 (25)</td>
<td>127 (49)</td>
<td>N/A</td>
</tr>
<tr>
<td>Intermittent pleural effusion (%)</td>
<td>498 (99)</td>
<td>127 (49)</td>
<td>N/A</td>
</tr>
<tr>
<td>Hypoxia (%)</td>
<td>51 (10)</td>
<td>51 (10)</td>
<td>N/A</td>
</tr>
<tr>
<td>Ventilated (%)</td>
<td>49 (9)</td>
<td>21 (8)</td>
<td>N/A</td>
</tr>
<tr>
<td>Deaths (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2 (4)</td>
<td>2 (4)</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>257 (51)</td>
<td>53 (35)</td>
<td>N/A</td>
</tr>
</tbody>
</table>


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Volume 3, Issue 2, 2014
 Mortality Amongst Patients with Rheumatic Heart Disease in Fiji:
A National Data-Linkage Historic Cohort

Parks T 1, 2, Kado J, Miller A.E 3, Ward B 4, Heenan R 4, Colquhoun S.M 5, 6, Tukana I 3, Steer A.C 4, 5

Keywords: Rheumatic Heart Disease

Introduction
Rheumatic heart disease (RHD) is considered a major public health problem in developing countries but the risk of death associated with the condition in these settings is poorly understood. Instead, current estimates of disease burden rely on studies dating from before the decline of RHD in industrialised nations.

Objectives
We aimed to determine the risk of death amongst patients who have had at least one contact with health services from nationwide sources of routine clinical and administrative data in Fiji, where RHD is endemic.

Methods
We linked data for the period 2008-2012 from a patient information system, a database of death certificates, the national disease control programme’s (NDCP) register, and information collected from echocardiography clinic registers. We included patients if they were known to the NDCP, had been discharged from hospital with a diagnosis of RHD, or had echocardiographic evidence of the disease. We calculated standardised mortality ratios (SMR) and used multivariate Poisson regression to determine the rate ratios (RRs) for key risk factors for all-cause death within the cohort.

Results:
In total, 4,934 records were linked to identify 2,060 RHD patients observed for 6178.9 person-years. 353 patients died at a median age of 44 years (IQR 28.7-56.9). The crude death rate was 5.7% per year (95% CI 5.1-6.3). Standardised by age, gender and ethnic group, patients with RHD were at eight-fold increased risk of death (SMR 8.8, 95% CI 7.9-9.8) compared to the general population. Patients of iTaukei (indigenous) ethnicity were at greater risk than patients of Indian descent (SMR 12.4 vs SMR 5.0) and young indigenous men were at greatest risk (SMR 50.0). During follow-up 399 patients were admitted to hospital for heart failure, which was strongly associated with risk of death, an effect most pronounced in the young (RR 51.5 for patients aged 4-19 years vs RR 11.9 ≥40 years, both p < 0.001).

Conclusion
Patients with RHD are at significantly increased risk of death compared to the general population. The risk is greatest for young adults and the indigenous population, and increases considerably following hospitalisation for heart failure highlighting the importance of early detection and effective secondary prevention. With computerised patient administration systems increasingly used in developing countries, linkage of routine data provides an inexpensive and efficient means to conduct epidemiologic studies. Similar methods might be employed in other areas where RHD is endemic.

Disclosure of Interest: None Declared


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Volume 3, Issue 2, 2014
Prevalence and Incidence of Rheumatic Heart Disease known to Clinical Services in Fiji: A National Historic Data-Linkage Cohort Study

Parks T1,2, Colquhoun S.M4, 5, 6, Kado J3, Miller A.E4, Ward B4, Heenan R4, Tukana I3, Steer A.C4, 5

Keywords: Rheumatic Heart Disease

Introduction
Rheumatic heart disease (RHD) is considered a major public health problem in developing countries. Echocardiographic screening has demonstrated the condition affects at least 8.4 per 1,000 school children in Fiji but, reflecting the situation in developing countries worldwide, knowledge of the prevalence and the incidence across the age-spectrum is limited.

Objectives
We aimed to estimate the number of patients who had at least one contact with clinical services in Fiji using nationwide sources of routine clinical and administrative data.

Methods
We linked data for the period 2008-2012 from a patient information system, a database of death certificates, the national disease control programme’s (NDCP) register, and information collected from echocardiography clinic registers. The numerator for the incidence rate comprised new presentations in 2012 and for prevalence survivors to the end of 2012.

Results
In total, 4,934 records were linked to identify 2,060 RHD patients. The rate of new presentations declined as the study progressed, consistent with a trend towards the truly incident disease. In 2012, 141 patients presented for the first time giving a crude national incidence rate of 16.4 per 100,000 person-years (95% CI 13.8-19.4). Echocardiographic data were available for 88 (62%). In the Central and Eastern Divisions, where ascertainment was more complete, 85 patients presented (echocardiographic data available for 76%) giving an crude regional incidence rate of 21.7 (95% CI 17.4-26.9, Figure 1A).

In total, 1,785 patients survived to the end of the study giving a crude national prevalence of 2.1 per 1,000 persons (95% CI 2.0-2.2). Echocardiographic data were available for 1000 (56%).

Conclusion:
There is an important burden of clinically significant RHD across the age-spectrum in Fiji, the proportion of the population affected approaching the prevalence reported in screening studies. With few such data available worldwide, these results have important implications for global summary estimates of disease burden, and consequently for public health policy.

Disclosure of Interest: None Declared

Introduction
Family planning allows individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It also plays a vital role in the reduction of infant, child, and maternal morbidity and mortality by protecting women from the risk of pregnancy and its associated complications. By preventing unwanted or mistimed pregnancies, family planning can also reduce abortions by unskilled providers or under unhygienic conditions. However, the benefits of family planning go beyond improvements in maternal and child health. For girls and women, for example, family planning can result in higher educational attainment, better employment opportunities, higher socioeconomic status and empowerment.1

Despite extensive global efforts and investments to reduce maternal mortality, this remains high in many developing countries. The 22 million “unsafe” abortions that occur each year cause an estimated 47,000 maternal deaths – mostly in developing countries – and lead to short-term or lifelong disabilities in many women. It has been estimated that up to one third of maternal deaths could be averted through the use of effective contraception by women wishing to postpone or cease further childbearing. About 222 million women in developing countries are thought to have an unmet need for a modern method of family planning.2 This unmet need is particularly prevalent in certain populations, especially sexually active adolescents, individuals with low socioeconomic status, those living in rural communities and those coping with conflicts and disasters.3

In some developing countries, increased contraceptive use has already cut the annual number of maternal deaths by 40% over the past 20 years and reduced the maternal mortality ratio – the number of maternal deaths per 100,000 live births – by about 26% in little more than a decade.4 It has been estimated that a further 30% of the maternal deaths still occurring in these countries could be avoided if the unmet need for contraception could be fulfilled.5

The International Conference on Population and Development that was held in Cairo, Egypt, in 1994, agreed and called for universal access to comprehensive reproductive health services – including family planning information, services and supplies – by 2015.6 The “Family Planning 2020” initiative builds on the partnerships that were launched at the London Summit on Family Planning in July 2012 to sustain the momentum and ensure that all the “partners” are working together to achieve the main goal announced at the Summit: making contraceptive information, services and supplies available to an additional 120 million women and girls by 2020.7

The plan is to identify gaps in our relevant knowledge and the global priorities for action to address the unmet need in family planning and growing demand for contraceptives.8 The Department of Reproductive Health and Research at the World Health Organization (WHO) is committed to providing global leadership in setting the research agenda on the delivery of reproductive health services and improving access to family planning services.9

In Fiji, birth control methods used are mostly that are currently provided by or supported by the Ministry of Health.10 The three main routes of birth control to prevent or end pregnancy include contraception (the prevention of fertilization of the ovum by sperm cells), contraception (preventing the fertilized egg from implantation - morning-after-pill), and the chemical or surgical induction of abortion of the developing embryo/fetus.11

Birth Control Methods
There are two main forms of birth control methods:

i. Traditional birth control methods
   - Sexual abstinence
   - Withdrawal

ii. Modern birth control methods
   - Male condom
   - Female condom
   - Spermicides
   - Contraceptive sponge
   - Diaphragm
   - Cervical cap
   - The Lea contraceptive
   - The Pill
   - Contraceptive patch
   - Contraceptive vaginal ring (NuvaRing)
   - Contraceptive injection (The Shot)
   - Implants
   - Emergency contraception (emergency postcoital contraception)
   - Emergency contraceptive pills
   - Intrauterine device
   - Intrauterine device (IUD)
   - Male contraceptive pill
   - Tubal ligation
   - Vasectomy

The main objective of this paper was to highlight the availability and utilization of birth control methods at the Wellness Centre for Women. The center is based in Suva and majority of women accessing this center are those living and working in the Suva urban area and nearby areas.

Objectives
The main objective of this paper is to:
   - Determine the common birth control that is preferred by women/couples who attends the Wellness Center for Women
   - Discuss the reasons for women/ couples choosing this particular contraceptive method
   - Assess the correlation between the choice of contraceptives and the supply of resources.

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Methodology
Data were collected through reviews of existing research studies on birth control methods, semi-structured questionnaires, and from the Daily Count Register at the Wellness Centre for Women. Semi structured questionnaires were conducted on couples, and individuals who sought family planning services from the clinic. Furthermore, data collected were based on equal distribution with regards to gender, ethnicity, age, marital status and economic status.

Results
50 questionnaires were given out and 50 were returned. From the 50 questionnaires returned, 14% were 18-25 years old, 20% 26 - 30 years, 30% 31 - 35 years, 26% 36 - 40 years and 10% were above the 40 years. 94% responded “YES” that they are practicing Family Planning and 6% responded “NO”. For those who were practicing family planning, 70% practiced family planning to limit children numbers, 10% due to work commitment, 6% due to family commitment, and 16% due to other reasons.

The method of family planning utilized was 28% - injections, 8% - pills, 24% - loop, 6% - implants, 2% - condoms, 8% - natural method, 0% - operations, 6% - no family planning, and 20% - used more than one method. For those using injections, 76% preferred 3 months and 24% preferred the 2 months injection. For pills, 80% preferred microgynon and 20% for microlut. For natural method, 33% preferred withdrawal, 50% calendar use, and 17% for douching.

In general, when asked on the best method for family planning, 44% preferred Loop, 16% injection and implants, 10% natural methods, 8% pills, 4% were not sure, and 2% condoms. Loop was considered to be the best form of family planning or birth control method because most women felt that it was safe, effective and convenient. This is the awareness program conducted in the center to the women by the wellness staff on the advantages and disadvantages of the available methods.

However, in terms of resources utilization for the first quarter of the year 2014, IUCD (loop) and implants were the most two common methods (see Figure 1 below).

Discussions
From the results, it is clear that most women that go through the Wellness Center for Women use Family Planning. This is an indication that women in the country, in particular in the Suva area, are aware of the Family Planning services. From the findings, majority of the women interviewed utilize family planning to limit the number of their children, secondly to focus on their career rather than the role of child bearing, and thirdly because of family commitments and other reasons include spacing and delaying.

Preference on what family planning method to be used differed due to convenience, safety and effectiveness. IUCD or loop seemed to be the most popular choice for women interviewed due to its long term effectiveness, also because it does not contain hormones, thus does not disturb the menstrual cycle and weight of women. Implants and injections were the second popular options followed by natural methods, pills and condoms which were the least common. A few were unsure of which method will best suit them since they just commenced on their family planning. The daily count register at the Wellness Center for Women also showed that most women seen in the clinic were using loops.

Due to the frequency in which clients returned to the clinic for their shots (injection method), it is normal to see that if combined the average will be very high due to the fact that it is a short term contraceptive method which will repeat itself every 2-3 months. This is why there is need to stockpile a lot of injections because it is a short term form of contraceptives which required people to retake the injection after every 2-3 months.

The center was found to have more than enough stock in all form of contraceptives. Therefore, the centre can cater for any form of contraceptives needed. Furthermore, the increase in the number of women seeking family planning services shows the knowledge and attitude they have acquired on the importance of the services to individual, family, and also to the community level.

Figure 1: Average usage of contraceptives in the first quarter of 2014.
Conclusion
In conclusion, the finding shows that the up-take of family planning methods is indeed increasing due to general awareness program and education from the Ministry of Health. Most women are opting to use family planning to carefully plan the number of children that they should have due to many reasons such as careers, family commitment, health issues and so on. In addition, IUCD or loop was found to be the most common form of birth control opted for by most women coming to Wellness Centre for Women followed by implants. This will be useful information for resource allocation and management to meet the demand in the center. Finally, irrespective of the demands from women on the preferred birth control methods, there was no issue highlighted on the shortages of supply from the center.

Reference


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Singh S, Darroch JE. Adding it up: cost and benefits of contraceptive services – estimates for 2012. New York: Guttmacher Institute;


WHO; 2012; Reproductive health and research. HRP at 40: what they say, a history of scientific achievement to advance sexual and reproductive health. Geneva: World Health Organization;

Fiji National Immunisation Coverage Survey - 2013

Devi R1, Volavola L1, Jenkins K1, Comrie –Thomson L2, Stewart T3, Chan G3

Abstract

In 2013, the Fiji Ministry of Health conducted a national immunisation coverage survey. Using a two-stage household-based cluster design, the survey sampled 1,209 children aged between 15 and 26 months and 1,997 mothers who had given birth in the preceding 26 months from all four administrative divisions. Data on vaccinations and the date they were given were collected to determine national and divisional rates of immunisation coverage for the vaccinations on Fiji’s EPI schedule. For all antigens on the childhood schedule, coverage is sufficient to meet or exceed the levels for required herd immunity. However, improvement in timeliness and coverage for some vaccinations (HBV0 and MR) is still required. Coverage of maternal tetanus toxoid vaccination is estimated at 58% nationally, indicating that improvement is needed to reach women with the required number of doses of tetanus toxoid vaccine.

Introduction

Immunisation coverage for vaccines listed on the national immunisation schedule is an important measure of the performance of Fiji’s national immunisation program. In line with its EPI policy (Fiji Ministry of Health, 2013), the Fiji Ministry of Health conducts a nationwide immunisation coverage survey every 3–5 years. These surveys provide the Ministry of Health with an assessment of the national and divisional immunisation coverage rates for vaccines listed on the childhood immunisation schedule (Table 1) and for tetanus toxoid for women who have delivered a child in the preceding 26 months (Table 2). The surveys are also used to measure progress relative to prior surveys and for comparison with routine health facility reporting (administrative reports) of vaccination coverage. This article presents the findings from the immunisation coverage survey conducted in 2013, five years after the previous survey in 2008.

Table 1: Fiji national immunisation schedule for children aged less than 12 months. This schedule was superseded in late 2012 but was the applicable schedule for children aged less than 12 months. This schedule was superseded in 2013, five years after the previous survey in 2008.

<table>
<thead>
<tr>
<th>Child’s age</th>
<th>Vaccine</th>
<th>Route of administration</th>
<th>Site of injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG</td>
<td>Intradermal</td>
<td>Mid upper left arm</td>
</tr>
<tr>
<td></td>
<td>HepB0</td>
<td>Intramuscular</td>
<td>Anterolateral thigh</td>
</tr>
<tr>
<td></td>
<td>OPV0</td>
<td>Oral</td>
<td>Mouth</td>
</tr>
<tr>
<td>6 weeks</td>
<td>DTPw-Hib</td>
<td>Intramuscular</td>
<td>Anterolateral thigh</td>
</tr>
<tr>
<td></td>
<td>HepB1</td>
<td>Oral</td>
<td>Mouth</td>
</tr>
<tr>
<td></td>
<td>OPV1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DTPw-Hib</td>
<td>Intramuscular</td>
<td>Anterolateral thigh</td>
</tr>
<tr>
<td></td>
<td>HepB2</td>
<td>Oral</td>
<td>Mouth</td>
</tr>
<tr>
<td></td>
<td>OPV2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 weeks</td>
<td>DTPw-Hib</td>
<td>Intramuscular</td>
<td>Anterolateral thigh</td>
</tr>
<tr>
<td></td>
<td>Hep3</td>
<td>Oral</td>
<td>Mouth</td>
</tr>
<tr>
<td></td>
<td>OPV3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 2: Fiji tetanus toxoid immunisation schedule for women of childbearing age (Fiji Ministry of Health, 2013)

<table>
<thead>
<tr>
<th>Vaccination history</th>
<th>When to give</th>
</tr>
</thead>
<tbody>
<tr>
<td>If no previous doses in childhood or pregnancy</td>
<td>TT1 At first contact or as early as possible in pregnancy</td>
</tr>
<tr>
<td></td>
<td>TT2 At least 4 weeks after TT1</td>
</tr>
<tr>
<td></td>
<td>TT3 At least 6 months after TT2</td>
</tr>
<tr>
<td></td>
<td>TT4 At least 1 year after TT3 or during subsequent pregnancy</td>
</tr>
<tr>
<td></td>
<td>TT5 At least 1 year after TT4 or during subsequent pregnancy</td>
</tr>
<tr>
<td>Second or subsequent pregnancy with x3 doses given</td>
<td>TT4 At first contact</td>
</tr>
<tr>
<td></td>
<td>TT5 One year later or during subsequent pregnancies</td>
</tr>
<tr>
<td>If x4 doses already given</td>
<td>TT5 At first contact</td>
</tr>
<tr>
<td>If x5 doses already given</td>
<td>TT6 At presentation to antenatal clinic with first pregnancy</td>
</tr>
<tr>
<td>Subsequent doses</td>
<td>TT7 20 years after last dose</td>
</tr>
<tr>
<td>Booster doses every 20 years during childbearing years</td>
<td>TT8 5 dose schedule for TT began in 1997</td>
</tr>
</tbody>
</table>

Women who had children prior to 1997 should have doses calculated according to the schedule so that no woman should have more than 5 doses.

Methods

Approvals

The Fiji Ministry of Health commissioned and approved the survey. Ethics approval was obtained from the Fiji National Research Ethics Review Committee (FNRERC). At the village level, village leaders from survey sites were notified and local permission was obtained to conduct the study within villages.

Sampling design

The survey employed a two-stage household-based cluster design in each of Fiji’s four administrative divisions (Central, Western, Northern and Eastern). The target sample size in each division was 300 children aged between 15 months (456 days) and 26 months (821 days) and 300 mothers who had given birth in the preceding 26 months (821 days). This sample size was designed to give a precision of 5% or better and a confidence level of 95% for coverage for all vaccines in each division, using a design effect of 2 and estimated coverage of 90%. The 90% estimated coverage was based on the results of the 2008 EPI coverage survey.

Keywords: Immunisation, Coverage Survey
In each of the four divisions, the 2007 National Census enumeration areas and populations were used as the clusters in the sampling. Within each division, 30 clusters and 3 contingency clusters were randomly selected with a probability proportional to their population size.

Within each of the selected clusters, enumerators surveyed ten children aged between 15 and 26 months and ten mothers who had given birth in the preceding 26 months. Enumerators used a hierarchy of five methods to randomly select the first household to survey with the more robust equal probability methods (methods 1–3) being preferred.

- Method 1 - Using the Nurse’s Census book
- Method 2 – Using the EA map
- Method 3 – Counting and mapping households
- Method 4 – Subdivision of large clusters followed by mapping of subdivision
- Method 5 – Random walk from centre of cluster

After selecting and surveying the starting household, the enumerators then visited the next nearest house, continuing until the required sample of children and mothers for the cluster had been reached.

Enumerators administered pre-tested questionnaires amended from the WHO EPI protocol to parents and caregivers in consenting households (World Health Organization, 2006). The questionnaires focused on which vaccines from the national EPI schedule a child had received and when. Verification of vaccines and dates was attempted using health facility records for children who did not have an immunisation card. The questionnaires also asked about reasons for failure to immunise for children who were not fully immunised. Mothers were asked about doses of the tetanus toxoid vaccine received during the most recent pregnancy and doses received in the past.

For households where residents could not be located or did not consent to participate enumerators proceeded to the next nearest house. Local health staff were contacted in advance of the study and asked to alert villagers about the upcoming survey in an attempt to minimise the number of empty households encountered.

Enumerators worked in pairs. One enumerator entered the data on an Android smartphone (Alcatel One Touch 4030D) using Mobile Data Studio 7.2.0 (CreativityCorp Pty Ltd, 2013) which included checks to ensure the validity of the data being entered and the other enumerator recorded the data on a paper questionnaire. Smartphone data was transferred and paper questionnaires were collected at the end of each day.

Enumerators were Ministry of Health employed nursing officers, and graduates from Post Graduate Public Health from Fiji School Of Medicine. We specifically selected enumerators from a range of different linguistic backgrounds to be sure that surveyors could communicate with residents in all areas. Enumerators received two days’ training in field epidemiology, research methods and the survey protocol, plus one day of practical field exercises and pilot testing. Data collection took place in August and September 2013.

Statistical analysis
The paper questionnaires were double-entered into Microsoft Excel (Microsoft Corporation, 2010) and then cleaned. Prior to analysis, the paper data was compared to the Mobile Data Studio (MDS) data set and any data missing from the MDS set was added in. This combined data set was then used for analysis. All observations that contained date data for one or more vaccine doses were classified as verified by immunisation card.

Data analysis was conducted using Microsoft Excel and STATA version 12 (Statacorp, 2011). Data was analysed as a multi-stage survey in STATA and post-stratification weighting was used based on the 2007 census data.

RESULTS
In the dataset used for analysis, there were:

- 1,209 children aged 15 – 26 months who were assessed for coverage with vaccines listed on the national childhood immunisation schedule. Of these, 1,154 had a card or health facility record that was used to verify their immunisation status.
- 1,197 mothers who had given birth in the preceding 26 months were assessed for coverage of tetanus immunisation for pregnant women.

Childhood immunisations
Demographics
46% (n=561) of the sample was female and 54% was male. 73% (n=926) of children surveyed were i-Taukei, about 24% (n=240) were Fijian of Indian Descent and 2% (n=38) were Fijians of other ethnicity. The small remainder consisted of expatriates (n=1) and children whose ethnicity was not recorded (n=2).

Immunisation: full coverage
On the most conservative estimate, 91% of children nationally have received all 10 doses of the immunisation schedule and are fully immunised (Table 3). Divisionally, this coverage ranges from 87% in Eastern division to 94% in Northern. When parental reports are accepted, almost 95% of children nationally are fully immunised.

Table 3: National immunisation coverage for each vaccine on the childhood schedule

<table>
<thead>
<tr>
<th>Child’s Age</th>
<th>Vaccine</th>
<th>Cardholders (N=1,152)</th>
<th>Card (N=1,209)</th>
<th>Card + Parental Report (N=1,209)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Propor</td>
<td>95% CI</td>
<td>Propor</td>
<td>95% CI</td>
</tr>
<tr>
<td></td>
<td>tion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCG</td>
<td>99.6%</td>
<td>99 – 1,1</td>
<td>95.3</td>
<td>93.4</td>
</tr>
<tr>
<td>HBV0</td>
<td>99.6%</td>
<td>99.8 – 44</td>
<td>96.7</td>
<td>44</td>
</tr>
<tr>
<td>OPV0</td>
<td>99.6%</td>
<td>99.9 – 43</td>
<td>96.8</td>
<td>43</td>
</tr>
<tr>
<td>OPV2</td>
<td>99.3%</td>
<td>98.3 – 1,1</td>
<td>95.1</td>
<td>92.9</td>
</tr>
<tr>
<td></td>
<td>99.3%</td>
<td>98.7 – 40</td>
<td>96.6</td>
<td>40</td>
</tr>
<tr>
<td>6 Pentavalent Weeks</td>
<td>99.5%</td>
<td>98.5 – 1,1</td>
<td>93.3</td>
<td>91.1</td>
</tr>
<tr>
<td>10 Pentavalent Weeks</td>
<td>99.4%</td>
<td>98.3 – 1,1</td>
<td>95.1</td>
<td>92.9</td>
</tr>
<tr>
<td>14 Pentavalent Weeks</td>
<td>99.1%</td>
<td>99.6 – 41</td>
<td>96.4</td>
<td>41</td>
</tr>
<tr>
<td>12 Months Means</td>
<td>99.1%</td>
<td>97.7 – 42</td>
<td>96.9</td>
<td>42</td>
</tr>
<tr>
<td>Measles- Rubella 1</td>
<td>96.4%</td>
<td>94.1 – 1,1</td>
<td>92.3</td>
<td>89.4</td>
</tr>
<tr>
<td>Received all 10 vaccines</td>
<td>95.5%</td>
<td>93.1 – 1,0</td>
<td>91.4</td>
<td>88.5</td>
</tr>
</tbody>
</table>

Herd immunity
The final dose in each vaccine series was compared to the benchmarks for herd immunity. Based on verification by immunisation card alone, the estimated national and divisional coverage rates exceed the benchmark for herd immunity for polio, diphtheria and rubella (Fiji Ministry of Health, 2013; Michigan Center for Public Health Preparedness, n.d.)(Table 4). With the exception of Eastern Division, the estimated national and divisional coverage rates exceed the benchmark for herd immunity for pertussis. For measles, divisional and national coverage rates fall within, but do not exceed the benchmark. A less conservative estimate using card plus parental report results in divisional and national coverage rates that meet the benchmarks for polio, diphtheria, pertussis, measles and rubella.
Reasons for immunisation failure

Reasons for failure to immunise were categorised as Obstacles to access, Lack of Motivation to use services, and Lack of Information about services. Obstacles (35%, n=20) and Lack of Motivation (33%, n=18) were the main categories of reasons why a child was not fully immunised. The single most common reason for failure to fully immunise was “Lost card” (20.6%, n=13). 11% (n=8) of parents said that they did not know that their child needed to be immunised or were unaware that additional vaccine doses were needed. Fear of side effects was only given as a reason for two children and no responses indicated concern that vaccines are ineffective.

Timeliness of birth dose of hepatitis B vaccine (HBV0)
Nationally, at least 69% of children received their dose of HBV0 within the first 24 hours of life, based on either the recorded date and time the dose was given or, if time data was not available, based on date data indicating that the dose was given on the same date as the child’s date of birth. An additional 7% received the dose between 24-48 hours based on time and date data. 9% were known to have received the dose later than 48 hours after birth, for 4% the timing was unknown and 1% did not receive the dose at all.

Timeliness of OPV1, OPV2, OPV3
Nationally, 54% of children received all four doses of OPV at the right time and with the correct spacing. Coverage of timely doses was lowest in Eastern at 44% and highest in Northern at 60%. 62% of Fijian of Indian Descent children received all doses on time compared to 52% of i-Taukei children. This difference was statistically significant (Pearson’s test, p <0.05).

Pentavalent vaccine doses (DTPw-Hib-HepB1, DTPw-Hib-HepB2, DTPw-Hib-HepB3)
Nationally 57% of children received three valid doses of the pentavalent vaccine. Eastern was the division with the lowest proportion of children receiving all doses on time (45%) and Northern was the highest (64%) and there were no significant differences between coverage by ethnicity.

Measles-Rubella (MR) vaccine
Coverage of MR is 92.3% based on card confirmation and 95.6% based on card plus parental report. Nationally, 74% of children received MR within approximately one month of the scheduled time of 12 months from birth. Coverage of timely MR was lowest in Eastern division (66%) and highest in Northern (80%). More children received the vaccine too late (11%) than too early (6.5%).

Maternal tetanus toxoid immunisation
Deliveries – site and supervision
Nationally, over 97% of mothers had given birth in hospital. In the more remote and sparsely populated Eastern Division, a smaller proportion of women had given birth in a hospital (88%) and a larger proportion of women had given birth at a health centre, a nursing station, or at home. In Northern Division, hospital deliveries had increased compared with the 2008 survey and the proportion of hospital deliveries was equal to or greater than in the other three divisions. Nationally, a midwife or other health worker was present for 99.6% of deliveries.

Antenatal clinic utilisation
Nationally, 76.9% of women had made six or more visits to an antenatal clinic during their most recent pregnancy (Figure 1). Only 6.5% of women had made less than four visits to an antenatal clinic. The proportion of women making less than four visits was lowest in Eastern Division (3.7%) and highest in Western Division (9.4%), where a significant proportion of women (5.4%) made only three visits.

Demographic differences in coverage
Using card as the means of verification, there was a statistically significant difference (p = 0.0379) between the divisions with the highest coverage (Northern, 94.1%) and the lowest coverage (Eastern, 87%). When assessing coverage using card plus parental report (n=1,209), there was a small but statistically significant difference in coverage between male and female children and between i-Taukei and Fijian of Indian Descent children.

Immunisation providers
Almost all birth-dose vaccines are given by hospital staff: 90% of OPV0, 91% of HBV0 and 91% of BCG doses are provided at hospitals. For subsequent vaccines, health centres are the major immunisation providers for infants. This is true whether using immunisation card only or card plus parental report as the means of verification.

Features of children not vaccinated
Based on card plus parental report as the means of verification, only 61 (5.2%) of the sampled children were not fully immunised. These children were from 38 clusters spread across all four administrative divisions. 36 were female and 25 were male. Of the children not fully immunised, 64% (n=37) of these children had missed only a single vaccine. Out of these 37 children, the majority had missed the MR vaccine (89%, n = 33) and only 2% (n=21) of children missed one or more birth doses.

The dropout rates for immunisations requiring multiple doses were below 1% highlighting a continuing solid immunisation program provided, in most instances, by health centres. The total dropout rate between pentavalent 1 and pentavalent 3 and between OPV0 and OPV3 was 0.4% (n= 5). The dropout rate between HBV0 and pentavalent 3 was 0.6% (n=7).

MR vaccine coverage is 92.3%; the lowest coverage of any vaccine in the schedule. It would appear that it is more difficult to get children to return at 12 months of age than it is to provide the preceding 9 vaccines on the schedule. The first 9 vaccines in the schedule are all provided within the first 14 weeks of life.

Table 4: Final dose of vaccines and herd immunity benchmarks

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>National coverage (%)</th>
<th>Estimated coverage necessary for herd immunity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Card</td>
<td>Card + parental report</td>
</tr>
<tr>
<td>OPV3</td>
<td>94.9 (92.7 – 96.5)</td>
<td>98.3 (96.9 – 99.1) Polio: 80-86%</td>
</tr>
<tr>
<td>Penta3</td>
<td>94.9 (92.7 – 96.4)</td>
<td>98.3 (96.9 – 99.1) Diphtheria: 85%; Pertussis: 92-94%</td>
</tr>
<tr>
<td>MR</td>
<td>92.5 (90.4 – 94.4)</td>
<td>95.6 (93.2 – 97.2) Measles: 83-94%; Rubella: 83-85%</td>
</tr>
</tbody>
</table>

Table 4: Final dose of vaccines and herd immunity benchmarks

Diphtheria: 85% ; Pertussis: 92-94% ; Hepatitis B: 80-86% ; Polio: 80-86% ; Measles: 83-94% ; Rubella: 83-85%
Immunisation cards for tetanus toxoid (TT)
A minority of mothers reported having received an immunisation card during their most recent pregnancy (14%) and even fewer could find their card at the time they were interviewed (1.9%).

Immunisation coverage for tetanus toxoid (TT)
58.0% of women who had given birth in the previous 26 months had been fully immunised against tetanus according to the current national immunisation schedule: either receiving 5 doses prior to first pregnancy or a fifth dose during the most recent pregnancy or two or more doses during most recent pregnancy (Table 5). Coverage was found to be lowest in Eastern Division at 45.7% and highest in Western Division at 64.6%.

Table 5: Women protected against tetanus according to WHO guidelines and previous immunisation schedule

<table>
<thead>
<tr>
<th>Total doses of TT</th>
<th>Doses of TT received during most recent pregnancy</th>
<th>%</th>
<th>2008 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>65 - 65</td>
<td>26.0% (20.8–32.0)</td>
<td>33.0% (28.4–37.6)</td>
</tr>
<tr>
<td>1</td>
<td>1 8 3 202</td>
<td>46.0% (39.9–52.2)</td>
<td>59.2% (54.4–63.9)</td>
</tr>
<tr>
<td>2</td>
<td>9 4 89</td>
<td>28.0% (5.8–10)</td>
<td>7.9% (5.8–10)</td>
</tr>
<tr>
<td>3</td>
<td>2 187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 139</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4 102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6+</td>
<td>1 319</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,194</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key
- **Immune**: received 2 or more doses of TT during their most recent pregnancy OR a total of 3 or more doses
- **Immune**: but received more doses than necessary according to the previous national schedule
- **Non-immune**: insufficient total doses and inadequate doses during most recent pregnancy
Immunisation providers for maternal tetanus toxoid
The majority of doses were delivered at hospitals and a sizeable minority at health centres, which mirrors the provision of antenatal care.

Missed opportunities to immunize
The current national immunisation schedule stipulates that pregnant women who have received zero lifetime doses of TT be given two or three doses of TT during their recent pregnancy, and that pregnant women who have received between one and four lifetime doses of TT be given one dose during their pregnancy. Among women who had received zero doses of TT prior to their pregnancy, 60.2% received too few TT doses during their most recent pregnancy according to the national schedule. Among women who had received between one and four doses prior to pregnancy, between 6.2% and 23.8% received too few TT doses during their most recent pregnancy. Women who had received more doses of TT prior to their most recent pregnancy received less doses of TT during their most recent pregnancy (Pearson’s test, p < 0.03). However, the majority of women received a single dose of TT during their most recent pregnancy.

Reasons for failure to immunise
The majority of women who were not fully immunised and for whom responses were recorded attributed their failure to be vaccinated to a lack of information, particularly a lack of awareness of the need for TT immunisation. No statistically significant association was found between women’s immunisation status and whether a health worker had ever explained the reason for TT immunisation (Pearson’s test, p > 0.25) or whether the mother knew why TT was delivered (Pearson’s test, p > 0.8).

Discussion
Childhood immunisations
There have been significant improvements in coverage since the 2008 survey. The level of immunisation coverage with card-confirmed doses reaches requisite levels for herd immunity for all of the vaccines on the national schedule. When reports from parents are included, levels exceed those required for herd immunity for all antigens. Adherence to the age and dosing interval at which vaccines should be administered has also improved since 2008.

Timely delivery of the birth dose of hepatitis B vaccine is important for reducing maternal-child transmission of hepatitis B virus. The World Health Organization recommends that hepatitis B vaccine be given within the first 24 hours following birth (World Health Organization, 2012). Based on the 2013 coverage survey results, coverage of timely HBV0 (69%) requires further improvement.

Similarly, coverage of MR and its timely administration are areas where the immunisation program could still improve. Early administration of MR in a single-dose schedule is a particular concern as it reduces the chances that children will develop a protective immune response (World Health Organization, 2009). Some questions about the accuracy of the recorded dates for MR were raised during analysis, such as the incorrect year being recorded for the MR date. A review of dates that would be consistent with this type of error suggests that the survey could have underestimated the proportion of children receiving a timely dose of MR by up to 4%.

Finally, underlying the national rates of coverage are differences between divisions. Timely coverage in Eastern division is lower than other divisions for some vaccination doses. In reviewing the needs for EPI programme strengthening, care should be taken to ensure that the specific challenges and issues in each division are considered.

One of the main reasons given for failure to fully immunise a child was a lost immunisation card. Qualitative investigation of this and other barriers to fully immunising children could help policy makers and health workers devise strategies to further improve immunisation coverage. In addition, health workers and their managers should focus on improving the on-time delivery of vaccines, with a focus on birth doses of OPV0, HBV0 and BCG; as well as ensuring every opportunity to deliver the remainder of the childhood schedule is well utilised.

Card retention has improved since 2008, and is expected to improve further with a new card being introduced with rotavirus and pneumococcal vaccines in late 2012. The rollout of the new cards could be assessed with a small lot quality assurance sampling (LQAS) type survey in 2014 to determine how well it is being used, especially in the area of time of birth dose.

Comparison of immunisation coverage with other data sources
The 2011 Ministry of Health Annual Report (Fiji Ministry of Health, 2011) provides national level coverage for 2011 and 2010 using data from administrative reports. Compared to the coverage levels from the 2008 and 2013 coverage surveys, it appears that administrative report data on coverage underestimates the true level of coverage and may indicate a need to strengthen recording and reporting of information at health facilities.

Table 6: Immunisation coverage by information source

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<td></td>
<td></td>
<td></td>
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<tr>
<td>Birth</td>
<td>BCG</td>
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<td>96.1%</td>
<td>95.3%</td>
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<tr>
<td></td>
<td>HBV0</td>
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<td>79.7%</td>
<td>99.8%</td>
<td>101.9%</td>
<td>97.9%</td>
<td>95.4%</td>
<td>98.8%</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>99.8%</td>
<td>98.6%</td>
<td>96.3%</td>
<td>95.1%</td>
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</tr>
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<td>6 Weeks</td>
<td>Pentavalent 1</td>
<td></td>
<td>79.7%</td>
<td>99.8%</td>
<td>80.8%</td>
<td>91.3%</td>
<td>95.3%</td>
<td>98.7%</td>
</tr>
<tr>
<td></td>
<td>OPV1</td>
<td></td>
<td>79.7%</td>
<td>99.8%</td>
<td>80.7%</td>
<td>91.2%</td>
<td>95.3%</td>
<td>98.7%</td>
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<tr>
<td>10 Weeks</td>
<td>Pentavalent 2</td>
<td></td>
<td>79.4%</td>
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<td>80.5%</td>
<td>91.8%</td>
<td>95.1%</td>
<td>98.5%</td>
</tr>
<tr>
<td></td>
<td>OPV2</td>
<td></td>
<td>79.4%</td>
<td>99.5%</td>
<td>80.3%</td>
<td>91.9%</td>
<td>95.1%</td>
<td>98.5%</td>
</tr>
<tr>
<td>14 Weeks</td>
<td>Pentavalent 3</td>
<td></td>
<td>78.9%</td>
<td>98.8%</td>
<td>77.2%</td>
<td>90.7%</td>
<td>94.9%</td>
<td>98.3%</td>
</tr>
<tr>
<td></td>
<td>OPV3</td>
<td></td>
<td>79.2%</td>
<td>99.3%</td>
<td>76.7%</td>
<td>90.8%</td>
<td>94.9%</td>
<td>98.3%</td>
</tr>
<tr>
<td>12 Months</td>
<td>Measles-Rubella 1</td>
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<td>93.6%</td>
<td>71.8%</td>
<td>82.5%</td>
<td>92.3%</td>
<td>95.6%</td>
<td>94.8%</td>
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<tr>
<td>Received all 10 vaccines</td>
<td></td>
<td></td>
<td>75.2%</td>
<td>93.1%</td>
<td>n/a</td>
<td>n/a</td>
<td>91.4%</td>
<td>94.8%</td>
</tr>
</tbody>
</table>

* Using card as means of verification
# Using card plus parental report as means of verification
Maternal tetanus toxoid immunisations
Card ownership and retention among women was low as was awareness of the need to protect their child against neonatal tetanus. Few women were given cards and even fewer keep them. The low proportions of card ownership and retention made it difficult to verify the number of TT doses given to women and the timeliness of those doses. The lack of a lifelong immunisation record also means that TT doses given in childhood are hard to assess. Health services providing TT are likely to face the same lack of information when determining whether a mother needs to be immunised for TT and how many doses she requires.

In this survey, the delivery of TT doses to pregnant women generally does not reflect their vaccination history, with the majority of women receiving one dose of TT in each pregnancy regardless of parity or prior vaccine history. This results in fewer doses than recommended in their first pregnancies, and unrequired doses in later pregnancies.

Approximately two-fifths (42.0%) of women were not on track to be fully immunised with the TT vaccine. The proportion of women who are non-immune to tetanus is relatively high compared to coverage for the vaccines listed on the childhood schedule. Almost all women (98.8%) could have been fully protected against tetanus if staff at antenatal clinics had immunised them according to the recommended schedule. This represents a substantial number of missed opportunities. Antenatal staff should receive refresher training on the need to review both parity and immunisation history of pregnant women, to ensure that the appropriate number of doses are given to pregnant women. Balanced against these shortcomings, there are no known cases of neonatal tetanus and few women deliver outside hospitals.

To improve quality and coverage of TT immunisation for women, tetanus toxoid information and immunisation cards should be routinely provided through antenatal clinics as part of the normal health education given to mothers during pregnancy. Other avenues of providing information to expectant mothers should also be considered.

Survey limitations
Some limitations of the survey coverage were noted:
• Selection bias – especially with exclusions in Eastern division and a small number of excluded communities in Northern division.
• Reporting bias – a problem wherever cards were not retained and a particular problem for assessment of tetanus toxoid coverage among women.
• Issues with reporting of reasons for failure to vaccinate – the pre-set quantitative tool is not ideal for assessing these reasons. Qualitative tools can provide much richer data.

Acknowledgements
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References
CreativityCorp Pty Ltd. (2013). Mobile Data Studio. West Perth, Western Australia, Australia: CreativityCorp Pty Ltd.
Human papillomavirus (HPV) vaccines have been introduced in more than 100 countries worldwide to prevent cervical cancer. Clinical trials and observational studies have shown that HPV vaccines have been 100% effective in preventing vaccine-type pre-cancerous cervical dysplasia in mostly affluent, Western countries (FUTURE II Study Group, 2007; Kjaer et al., 2009; Paavonen et al., 2009). Moreover in countries such as Australia where vaccine coverage is high, reductions in HPV vaccine-type related infections and histologically-proven cervical intraepithelial neoplasia grade III (CIN3) have already been observed in the order of 77% (Gertig et al., 2013; Tabrizi et al., 2012). However, in resource-limited countries such as Fiji, the high cost of HPV vaccines and the challenges of implementing a three-dose schedule are significant. Reduced dose HPV schedules may be one way to overcome these issues, although current evidence to justify a change in the HPV vaccine schedule is limited. In this perspective piece, we propose that using schedules involving fewer than the recommended three doses of the HPV vaccine is worth investigating to add to the evidence from other countries which show the benefit of a reduced dose schedule, and that this may be beneficial in countries such as Fiji where there is a high burden of cervical cancer.

Burden of cervical cancer

Based on the latest statistics from the World Health Organization (WHO), cervical cancer is the fourth most common cancer in women worldwide. There are approximately 530,000 new cases every year, with 85% of these cases occurring in developing countries (GLOBOCAN 2012). In Fiji, cervical cancer rates (33.3 per 100,000) and mortality (20.6 per 100,000) are one of the highest in the world, ranking as number one for cancer mortality in women, with a higher burden in i-Taukei women compared with Fijians of Indian descent (Kuehn et al., 2012; Law et al., 2013), although these figures are likely to be a substantial underestimate. Cervical cancer rates in Fiji are approximately 10-fold higher than those of Australia or New Zealand. This is mainly due to effective comprehensive cervical cancer screening strategies which detect and treat early pre-cancerous lesions in both these countries. Prevention of cervical cancer requires a comprehensive program of providing HPV vaccine for girls prior to sexual debut to prevent infection with HPV, and cervical cancer screening which aims to pick up pre-cancerous lesions so that curative treatment can be provided early before cancer develops. The two most common genotypes associated with cervical cancer in Fiji are HPV 16 and 18 (Tabrizi et al., 2011), which are similar to the ones described worldwide. In this article we will focus on primary prevention with HPV vaccine, which provides protection against these two common cervical cancer causing genotypes.

HPV vaccines

There are currently two licensed HPV vaccines. Gardasil® (Merck & Co., USA) is a quadrivalent vaccine that protects against four HPV genotypes (6, 11, 16 and 18); HPV 6 and 11 causes 90% of genital warts cases worldwide (Garland et al., 2007; Garland et al., 2009; FUTURE II Study Group, 2007). The other vaccine is Cervarix® (GlaxoSmithKline, UK), a bivalent vaccine with the adjuvant AS04 (made up of an aluminium salt and monophosphoryl lipid A) that protects against infection with HPV 16 and 18. The introduction of one of these two HPV vaccines could potentially reduce the burden of cervical cancer (caused by HPV 16 and 18) by almost 80% within Fiji (Tabrizi et al., 2011). Both vaccines are given as a three-dose schedule intramuscularly; Gardasil® vaccine is administered at 0, 2 and 6 months, while Cervarix® vaccine is administered as a 0, 1 and 6 month schedule.

Both vaccines are highly efficacious against the genotypes included in the vaccines (Dillner et al., 2010; Herrero et al., 2011; Paavonen et al., 2009), and both stimulate long-lasting neutralising antibodies that persist for at least 5 and 8.4 years post vaccination with Gardasil® and Cervarix® vaccine, respectively (Romanowski, 2011). The vaccine efficacy against pre-cancer lesions is reported to be greater than 99%, and seroconversion occurs in 99 to 100% of those vaccinated (Bonanni et al., 2009; Harper et al., 2006; Villa et al., 2005). The magnitude of antibody responses seems to be age-dependent as significantly higher antibody titres were observed in young adolescents (9 to 13 years old), as compared to young women (16 to 26 years old) (Dobson et al., 2013). As HPV infection is very common and initially asymptomatic, it is important to vaccinate prior to HPV exposure i.e. immunise young adolescents (9-12 years old) before their sexual debut, often via a school-based program. Although the vaccine is also recommended for boys, most countries elect to only vaccinate girls due to the cost of the vaccine.

Issues with implementing a three-dose HPV schedule

In 2013, the Fiji MoH with Australian Aid support introduced the Cervarix® vaccine as a three-dose schedule (0, 1 and 6 months) to be given to all girls in the last year of primary school as part of the national immunisation program. However, the high cost of the HPV vaccine, representing a substantial cost to the Fiji MoH budget, and the issues surrounding the implementation and maintaining high coverage of a three-dose schedule is challenging. In response to these issues, recent interest has been focussed on whether reduced dose HPV schedules may be equally efficacious to the standard three-dose schedule. In fact, the European Commission has already granted the marketing authorisation for Cervarix® vaccine to be implemented as a two-dose schedule for girls aged 9-14 years old (Landes Biosciencce, 2013) based on non-inferior antibody responses (Puthanakit et al., 2013; Romanowski et al., 2014). Apart from Europe, other countries such as Panama, Chile, Canada, Pakistan and Bangladesh have already implemented a two-dose schedule for the Cervarix® vaccine at 0 and 6 months. We await the outcome of disease protection over time.
Studies of reduced dose HPV schedules

Studies of reduced dose HPV schedules demonstrating non-inferiority to the standard three-dose schedules are emerging. A trial in Costa Rica found no difference in vaccine efficacy against newly acquired HPV 16/18 infection in women aged 18-25 years old who received one, two or three doses of Cervarix™ vaccine four years after receiving the vaccine (Kreimer et al., 2011). Similarly, another study in Canada and Germany found non-inferior antibody responses in healthy girls (in the age group of 9-14 and 15-19 years old) who received the two-dose schedule (0 and 6 months) of Cervarix™ vaccine as compared to girls (15-25 years old) who received the standard three-dose schedule (0, 1 and 6 months), one month after the last vaccine dose (Romanowski et al., 2011). The antibody responses to all genotypes in the vaccine (girls aged 9-14 years old) were found to last for up to four years since the first vaccination (Romanowski et al., 2014).

The most recent study on reduced dose HPV schedules using the Gardasil® vaccine found non-inferior antibody responses to HPV types 6, 11 16 and 18 one month after the last dose in girls (aged 9-13 years old) receiving the two-dose schedule, when compared with either girls (aged 9-13 years old) or women (aged 16-26 years old) receiving the three-dose schedule. These antibody responses remained similar for all genotypes up to 36 months post-vaccination (Dobson et al., 2013).

These studies have demonstrated promising results on the potential utility of reduced dose HPV schedules in Fiji and other similar resource-limited settings. The challenges of cost, coverage rates and vaccine delivery would be alleviated by schedules requiring the administration of fewer doses, and facilitate the implementation of national HPV vaccination programs in resource-limited settings. It may also allow the additional advantage of vaccinating boys with these cost savings. However, despite inferiority in antibody responses for some HPV types reported in some studies, it is still unclear whether reduced dose HPV schedules can generate long-lasting immune responses similar to the standard three-dose schedule to reduce disease outcomes. It needs to be determined that the antibodies produced continue to provide protection over the very long exposure period. More longitudinal studies of reduced dose HPV schedules are therefore required.

Reduced dose HPV schedules: the Fijian context

In 2008/9, the MoH in Fiji accepted a one-off donation of 110,000 doses of quadrivalent HPV vaccine (Gardasil®, Merck & Co.) based on the high cervical cancer disease burden. There was enough vaccine to vaccinate four birth cohorts of girls (30,338 girls aged 9-12 years old) with a three-dose schedule via a school-based program. However, not all the girls received the three-dose schedule, mainly due to absence from school on the day the school health team were visiting. The Gardasil® vaccine coverage following the initial and the subsequent mop-up campaign was: 62%, 56%, and 55% for doses one, two, and three respectively.

With Australian Aid support, follow-up of these girls 5 years since the last HPV vaccination provides a unique opportunity to rigorously investigate the question of whether reduced dose schedules are non-inferior in terms of long-term immunity compared to the standard three-dose schedule. We have funding from the Fiji Health Sector Support Project to compare antibody responses and memory cells (specialized long-lived immune cells that produces specific antibodies upon re-exposure to the same antigen) to the four genotypes in the Gardasil® vaccine. In addition, we plan to compare the gene expression profile in immune cells from different individuals and/or dosage groups to examine genes and their pathways that may be switched on or off following a reduced dose schedule to help elucidate those critical genes involved in a protective immune response.

This study also has an additional benefit to determine the long-term immunity of the HPV genotypes that cause genital warts, as this is a neglected area of research. Genital warts are a common sexually transmitted disease caused by HPV, and although not life-threatening, it causes many social and economic issues. This is particularly so in immunocompromised individuals such as those infected with human immunodeficiency virus (HIV). In Fiji, genital warts are believed to be a very common but under reported disease.

This follow-up cohort study will contribute significantly to the growing international literature on the minimum number of HPV doses required for optimal protective immunity in high disease burden settings. The goal for exploring reduced dose HPV schedules is to reduce vaccine cost and to increase HPV vaccine coverage with the ultimate goal to reduce the burden of cervical cancer. We plan on starting the study in July 2014, with results available in the near future. Given the high burden of cervical cancer in Fiji, and the significant cost of HPV vaccines, we believe that examination of reduced dose HPV schedules is a critical area of research that has the potential to provide substantial health and economic benefit to the community.

Reference


**Introduction**

More than any other cancer, cervical cancer reflects striking global health inequity. Cervical cancer represents the second most common gynaecologic malignancy worldwide with about 510,000 new cases of cervical cancer diagnosed annually (Parkin DM et al., 2006). Of the 288,000 death due to cervical cancer each year, more than 80% occur in developing world where the least resources exist for management and this proportion is expected to increase to 90% by 2020 (WHO, 2009).

In Fiji cervical cancer is rated as the third main cause of mortality in women; the leading cause of cancer death among reproductive women; and it is the leading cause of mortality in all cancer types for the past decade. Annually in Fiji, it is estimated that up to 43% of new cases of cancer in women are due to cervical cancer, and up to 14% of female cancer related mortality is due to cervical cancer (MOH cancer registry 2001-2005). The age-standardized incidence (world population) in Fiji during 2002 was estimated at 33.4 per 100,000, with an associated mortality of 18.7 per 100,000. The incidence and mortality in the Oceania region varies from 9.4 to 42.8 per 100,000, and 5.2 to 24 per 100,000, respectively. Based on the MOH cancer registry, cervical cancer has been the most common cancer in Fiji over the past decade.

More than 99% of cervical cancers, and its precursor, cervical intraepithelial neoplasia (CIN) are due to chronic infection with Human Papillomavirus (HPV). There are more than 100 different HPV types; however HPV-16 and -18, which is known to cause approximately 70 - 75% of cervical cancer, are consistently the most common. The two current vaccines on the market cover HPV-16 and -18 and one of these vaccines provides further protection against HPV-6 and -11, which are known to cause genital warts and low grade cervical abnormalities. HPV can also contribute to anogenital, head and neck cancers (JS Smith et al., 2007).

Consequently, it has been proposed that highly sensitive HPV detection methods, such as the HPV DNA test, could enhance the efficacy of population-based and cervical carcinoma screening programs, either as a sole screening tool or as an adjunct to current cervical cytological screening. This is additional to the worldwide concern about the low sensitivity of the conventional Papanicoloau (Pap smear) test which has prompted a search for newer methods to either supplement or replace it. Internationally the sensitivity of a single Pap smear ranges from approximately 50 - 60%; thus the success of screening programs depends on repeated testing (Schiffman M et al., 2007). However, as the number of pap smears increases, so too does the risk of false positive results. Histological investigations of cone biopsies have found no histological changes in 23 - 28% of cases, and that 12 - 51% of cone biopsies were performed based on false positive cytological results (Thompson AD et al., 2002). Biopsy complications include post-operative bleeding, infections, and complications in subsequent pregnancies.

**Aim**

The overall aim of this literature review is to look at sensitivity and specificity, of the current conventional cytology (or Pap smear) method, in detecting cervical cancer precursors and progression to invasive cervical cancer. These validity parameters of Pap smear were assessed based on the previous studies been carried out against the other common screening methods identified like HPV-DNA testing, liquid-based cytology, visual examination and bio-markers.

**Parameter Definition:**

- **Sensitivity** – Is the ability of the Pap smear test to identify cervical cancer precursors (CIN/SIL).
- **Specificity** – Is the ability of the Pap smear test to exclude normal or negative cytological abnormality.
Methodology

Search Strategy

Inclusion Criteria
- English language, Published literature, Articles published in the last 10 years (i.e. 1999 – 2008), any setting (i.e. hospital, university, research centre, community and etc), includes both developed and developing countries,

Keywords:
- Pap smear; Conventional Cytology; Human Papillomavirus; Cervical Cancer; HPV Screening methods; Screening Cervical cancer/ carcinoma; Cervical Intraepithelial Neoplasia; Liquid-based cytology; Visual; Colposcopy, biomarkers.

Exclusion criteria
- Articles of out-of-cervical cancer and HPV screening methods evaluation/ study, articles published in languages apart from English, articles that are not research study, articles and studies older than 1999, all evaluations except HPV screening methods evaluation.

Core Sources
- Pub Med Central, Cochrane, Medline, Web of Science

Specialist Sources
- Cancer search, Reproductive Health Library, WHO report, Ministry of Health report (Fiji)

Additional Sources
- Google Image, Google Scholar, References cited by retrieved research papers

Results
From the literature search done, a total of 30 articles were found in the scope of the study. Of the 30 articles found, 23 were selected and 5 were excluded. After further reviewing of the selected 25 articles, 2 more articles were excluded. The exclusion of the 7 articles were due to the fact that: 1 was irrelevant to the aim of this study; 3 were not evaluating the sensitivity and specificity of the screening methods; 1 was only comparing the two HPV assay methods instead of Pap smear; and 2 were basically health commentary reports and not a research study as required by the inclusion criteria. From the 23 articles selected for this review exercise, 10 were RCT studies; 9 were prospective cohort studies; 3 were cross-sectional studies; and 1 was a modelling study/ economic evaluation study. A modelling or economic evaluation study is used for the prospective prediction of the progression of HPV infection based on the probabilities of the stages of infection and the lifetime effects, costs and cost-effectiveness of testing for HPV.

From the 23 articles selected; 15 articles evaluated the conventional cytology against the HPV-DNA testing; 3 articles evaluated conventional cytology against liquid-based cytology; 1 article evaluated conventional cytology against VIA; and 4 articles evaluating 3 different screening methods at the same time.

From the 15 articles that evaluated the conventional cytology against HPV-DNA testing - 3 were RCT studies, 6 prospective cohort studies, and one was a modelling or economic evaluation study, 3 articles evaluated conventional cytology against liquid –based cytology - 1 a RCT study, and 2 were prospective cohort studies, and the one article evaluating conventional cytology against visual examination was a cross-sectional study.

The 4 articles evaluated 3 different screening methods at the same time – 2 articles evaluated Pap smear/ VIA/ HPV-DNA (1 RCT and 1 cross-sectional), one article evaluated Pap smear/ LBC/ HPV-DNA (cross-sectional study), and one article evaluated LBC/ Computer-assisted cytology/ HPV (cohort study).

Common Cervical cancer Screening Methods
The common methods of screening cervical cancer from the review are:
- Conventional Cytology (CC) (Pap smear test - method used in Fiji);
- Liquid-Based Cytology (LBC) (4 current methods used) – Surepath/ Cytoscreen/ Lebondar EP/ This Prep;
- Visual Examination – VIA and Lugol’s Iodine (also been introduced in Fiji);
- HPV DNA testing – HC2 and PCR method; and
- Biomarkers of HPV-associated transformation (HR-HPV mRNA/ Proliferation markers/ p16 staining)

Key Findings of the Review

Conventional Cytology (Pap smear test) vs. HPV DNA testing
Based on the 15 study’s findings reviewed, it was clear that HPV-DNA testing is more sensitive for the detection of CIN 2 and CIN 3 than a repeat pap smear screening test showing ASCUS or more (Manos et al, 1999). HPV-DNA testing was able to detect significantly more histological confirmed cases of CIN 1 and 3 than did the Pap smear test showing HSIL performed at 6 months (Lytwyn et al, 2000). HPV-DNA testing as a primary screening detected more than 90% of all CIN 2 and CIN 3 or cancer cases and was 25% more sensitive than Pap smear showing ASCUS, LSIL, or HSIL, however the findings shows that HPV-DNA test was 6% relatively less specific than Pap smear test. Studies show that sole HPV-DNA test might lead to unnecessary colposcopies but most infections will regress without causing significant cellular atypia. The economic evaluation study showed that HPV-DNA testing to triage women with borderline or mild cervical smear will be more expensive than repeat Pap smear, but saves slightly more lives, however with a substantial increase in lifetime referral for colposcopy. In addition, the finding show that HPV-DNA testing contributes to a 51% increase in referral to colposcopy (Talonen et al, 2005, Nauclet et al, 2009). One “double negativity” HPV-DNA test and Pap smear test indicated a higher prognostic assurance risk of future CIN 3 than three subsequent negative Pap smear and may safely allow 3-6 years of longer screening interval for such low risk women (Lorincz et al, 2008). However it does not indicate who is in immediate need of confirmation and treatment. In other words conventional cytology information is still required to find the right person for colposcopic examination (Ahit et al, 2006).

Conventional Cytology (Pap smear) vs. Liquid-Based Cytology (LBC)
The findings from the reviewed articles show that LBC for primary screening of cervical cancer is significantly more sensitive in detecting CIN 1 but not for CIN 2 (Ronco et al, 2007). LBC reduced unsatisfactory slides, the shorter time needed for interpretation, and the possibility of using the same sample for HPV-DNA testing and the markers. LBC detected significantly more histological HSIL than did manually read conventional cytology results (Elizabeth et al, 2006). Study found that the percentage of unsatisfactory slides was 1.78% compared with 3.09% for conventional studies. Therefore fewer women might be recalled for repeat smear tests than is currently the case if LBC is introduced into population screening programmes. Cytological abnormalities less severe than grade 1 were also reported in greater numbers by LBC than by conventional cytology.
The increased detection of low grade cytological lesions by LBC might result in higher rates of further testing, on the other hand the improved detection of histological CIN 2 does raise the possibility the LBC might allow longer screening intervals. LBC detect higher grade histological disease than conventional cytology.

Conventional Cytology vs. Visual Inspection (VIA)

The findings from the review articles show that the sensitivity of VIA varied from 67-79% while specificity ranged from 49%-86% (Sankaranarayanan et al, 2005). The use of low level of magnification does not improve the performance of VIA appreciably. Some of the advantages of VIA is that; it is inexpensive, requires minimal infrastructure and if abnormal areas are observed the patient can be referred for immediate treatment, circumventing the need for the expense and infrastructure of histology. However, because VIA relies on subjective visual interpretation, it is crucial to define consistent criteria for suspicious lesions and to train providers to correctly implement these criteria (Lynne et al, 2007).

Combined Evaluation of Methods

Conventional Cytology vs. VIA vs. HPV DNA Testing

The findings depicted that the low absolute risk is largely due to the HPV-negative test result. Generally, it is the HPV-negative test results that predicted the low risks for CIN3+ regardless of cervicography and LBC results. This is also an efficient and cost-effect triage strategies that take into account the timing of the test, the order and number of tests necessary, and the specific populations tested (e.g. by age) for these women (So Wang et al, 2005).

Conventional Cytology vs. LBC vs. HPV DNA Testing

The superiority of conventional cervical smear testing, whether considered clinical readings or optimised interpretations, low or high grade lesions, or populations with low or a high incidence of abnormalities. According to the study, HPV testing, systematic or for a diagnosis of ASCUS/AGUS testing, carried out with monolayer cytology was no better than conventional cervical smear. The greater reliability of the interpretation of conventional smears rather than monolayer smears is consistent with their better diagnostic or screening performance (Coste et al, 2003).

LBC vs. Con. Cytology vs. HPV DNA Testing

Findings strongly suggested that these methods should be considered as complementary diagnostic tools and not as competing methods. Their combination has been shown to increase sensitivity and specificity and this may allow cost-effective screening strategies and improved patient management. The implementation of complementary new screening strategies could also give rise to substantial savings to the health systems as well to the community (Vassilakos et al, 2002).

Conclusion

After the full review of the selected articles, the following can be concluded from the findings of these reviewed articles:

i. HPV DNA testing is the most sensitive method in the early detection of cervical cancer lesions followed by Liquid Based Cytology. However, both the screening tests are less specific than the conventional cytology (pap smear);

ii. HPV DNA testing is more sensitive in the younger population whereas conventional cytology (Pap smear) is more sensitive in the older population;

iii. HPV DNA testing has the ability to lengthen the screening interval from 3-6 years whereas other methods cannot;

iv. In liquid based cytology (LBC) only the time required for interpretation will be shorten;

v. Visual examination is done after abnormal histological findings;

vi. HPV DNA testing and LBC increases the number of women referred for colposcopies as a result of high detection rate compares to conventional cytology (pap smear);

vii. HPV testing is more costly, however if sufficient numbers of cases of invasive cancer are prevented through improved detection of high-grade CIN, then more costly tests may become affordable because of money saved from invasive cancer management.

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REVIEW


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A Historical Context of Family Planning in Fiji and some Thoughts for Future Directions

Keywords: Family Planning

Abstract
Fiji had a dramatic reduction in fertility rates between the 1980’s and the 1990’s. This article reviews the reasons for this and discusses the need to reposition family planning programs in Fiji in the context of a decelerated population growth rate, high unplanned pregnancy rates and significant levels of poverty in the community. We also discuss the implications of the empowerment discourse in relation to family planning. The International Conference on Population Development (ICPD) in 1994 in-cooperated family planning in a new definition of reproductive health defining it as a rights issue for a fulfilling enjoyment of ones sexuality and capacity to reproduce. The ICPD recommendations have influenced the approach to family planning in Fiji. In May 2014, the United Nations Population Fund (UNFPA) Pacific Sub –Regional Office held a meeting of the Pacific Secretaries of Health on 'Achieving Universal Access to Reproductive Health, including Family Planning Services and Commodities in the Pacific.' This meeting highlighted the many challenges which Pacific Island Countries including Fiji face in the area of sexual and reproductive health and rights.

Background
In the period after the 1930’s there were widespread concerns amongst Fiji’s colonial administrators and the native Fijian leadership that the ethnic balance in Fiji’s population was showing some alarming trends. It was predicted that with the then current growth rates of the Indian ethnic population the native’s would soon be outnumbered. This prediction was indeed true. Within the next decade as figure 1 shows there were more people of Indian origin in Fiji than the population of the original natives. The census data shows that in 1881, Fiji’s population was 127,486. The first boatload of 464 Indians arrived in Fiji as indentured laborers in 1879. This was in response to Sir Arthur Gordon, the governor’s concerns about obtaining a dependable labor supply for the new British Colony. Over the next 37 years some 61,000 Indians were recruited and brought to Fiji by the Colonial Government in order to develop a viable economy. Most were involved in the sugar industry.

Transactions of the Epidemiological Society of London, 1883-1884;3;76-79 in 1896 report on behalf of a Commission appointed to inquire into the decrease of the native population, that in the latter half of the nineteenth century the Fijian population had appeared to be in fatal decline. The many epidemic related deaths and high infant mortality put the survival of the indigenous race into serious threat. The measles epidemic in 1885 wiped out almost 25% of the population. In 1884 the first whooping cough epidemic was recorded, in 1890 and 1891 there were epidemics of whooping cough, influenza and dysentery. Dysentery and influenza were considered endemic by 1892. The Fijian infant mortality rates averaged 383 per 1000 births. The Indian crude birth rate (CBR) ie births per 1000 population, exceeded the Fijian rate for the first time in 1897. The rates for both the ethnicity were between 30 and 35 for the next 3 decades. However, in the 1930’s the Indian CBR had taken had accelerated to over 40 whilst the Fijian rate increased marginally to 36. The Indian CBRs remained higher than the Fijian rates until 1966. Subsequently their CBR dropped to 34.2 whilst the Fijian CBR was 36.4. There are several explanations for this change. These include the government’s family planning policy, the differences in ethnic value systems, and political developments in the country.

Taylor et al in discussing trends and differentials in mortality in Fiji observe that “Since the 1920s, there has been a downward trend in Fijian mortality and this has gained momentum from the early 1940s. The trend in the crude death rates for Indians suggests a much more gradual decline. The decline in mortality together with rising birth rates led to an appreciable growth in both the Fijian and the Indian population. Until about the Second World War the Fijians were experiencing death rates almost 3 times that of their Indian counterparts, but Fijian rates declined more swiftly until in the 1960s the parity was reached”. The impact of crude birth and death rates and immigration was that in the 1881 census there were 114,748 Fijians, and 588 Indians. In 1891 the Fijian numbers were 127,486 whilst the Indian numbers increased to 7,468. The 1946 census recorded 120,414 Indians and 118,070 Fijians. In 1986 some 107 years after the first Indian laborers were introduced to Fiji, the Indians with a population of 348,704 continued to outnumber the Fijians whose population had grown to 329,505. However, this disparity in numbers of 1.7 % in favor of the Indians had begun to decline with each consecutive census after 1966 when Indians made up 8.1 % more of the population than the Fijians.
Even if the Indian population had continued to grow it could have been projected that by the 1996 census the Fijian numbers would have naturally increased and overtaken the Indian population size. The political events of 1987 saw a sudden, rapid reversal in the population parity. The Indian population declined rapidly in the period immediately after the Rabuka military coup when upwards of 140,000 Indians emigrated. The first post coup census in 1996 recorded 7.1% more Fijians than Indians.

It is useful to explore the differences in racial parity in Fiji since its colonization. Soon after cession there was concern that the first European arrival to Fiji may have a devastating effect on the native population. The impact of disease and child rearing practices was having a major effect on the population in the last thirty years of the 1800s. Economic imperatives led to the first Governor of the Colony to import Indian laborers. This relatively young immigrant population had a high birth rate and experienced a rapid population increase in the 37 years on the indentured labor program. The issue of the population disparity was used to ignite political debate of the times. On the one hand the native population should be encouraged to grow whilst the Indo Fijian birthrate needed to be reduced. The Legislative Council debates from 1952 report the Honorable Ben Jannif strongly advocating family planning. His arguments were based not only on political considerations but also on the socio economic needs of an emerging nation were population growth needed to be kept in check. By the late 1950’s the Fiji Family Planning Association was set up with the assistance of the International Planned Parenthood Federation. By the mid 1960’s the Ministry of Health became increasingly involved.

One of the early champions of family planning in Fiji was Dr T. U. Bavadra. In his capacity as Deputy Director Primary Health he was instrumental in providing Fiji with multi pronged strategies in reducing the crude birth rate. In 1980 he and J. Ki erski wrote on the ethnic differentials in fertility decline between indigenous Fijians and Indians as well as the ethnic differences in marriage patterns, attitudes towards fertility, knowledge and acceptance of contraceptive preferences and trends in method preference. They also commented on the government’s population goals and government and non-government family planning program activities, especially in the light of declining acceptance of family planning among Fijians12. The Government of Fiji planned to reduce the CBR to 25 by 1975 but this target seemed illusive. By 1986 the rate was 28.6. The Indian CBR had reached 26.1 whilst the Fijian rate was 31.4. However, in spite of this the population growth rate was steadily coming down from a peak of 3.23 in 1966 to 2 in 1986. This reduction was seen as a major success story in the Pacific. Dr T. U. Bavadra went on to become Fiji’s Prime minister in 1987.

In the current situation of relatively low crude birth rate and annual population growth rate there is no longer concern that Fijis population growth is out of control. Population growth rate is defined as the average annual percentage change in the population resulting from a surplus or deficit of births over deaths and the balance of migrants entering and leaving a country13. The population growth rate has a significant impact on the development of the country. If a country’s population increases rapidly it impacts on having to develop more infrastructure to support the population. This means more schools, hospitals, housing and roads have to be built and more food, water and electricity has to be provided. It also means that many more jobs have to be created so that poverty rates do not increase.

Fiji’s population growth from the year 2000 to 2009 was between 1.41 percent to 1.39 percent. In 2010 it dropped to 0.83 percent and has continued to decline since then13. The annual increase of 2 percent or more is usually considered rapid growth in a population and this is equivalent to a doubling of a population size every 4 decades. This level of growth can exacerbate poverty. The graphs in figures 1 and 2 show the population growth rate and the fact that the Fijians of Indian origin numbers caught up with the Itaukeis in the 1950’s and in the 1960’s, 1970s and 1980s overtook the native population. However, the 1996 and 2007 population statistics show that the Indian population had declined and that the Fijian population had increased. See Graph below of Annual Population Growth Rate for Fiji since 1880s till 2007 for Itaukeis and Fijians of Indian Origin.

William House, advisor on population policies and development strategies, in 1999 observed "perhaps the country which has made the greatest progress in reducing its population growth rate has been Fiji, whereby the total fertility rate fell by 3.6 in the period 1975 to 1980 to 2.7 by the first half of 1990s". In 1993 in its development plan Fiji aimed to maintain a population growth rate below 2 percent per year. Broad social programs were to be established to raise the status of women through increasing education and employment opportunities. Fiji has been successful in raising employment and educational opportunities for women as well as reducing infant mortality rate to below 20 per 1000 live births. Inspite of this Seniloli, in her article entitled "Fertility and Family Planning in Fiji", asks the question as to whether the recent decline in Fijian fertility represents a new trend or only a temporary retardation of fertility decline. She observed that the population growth rate of 1.97 percent in the early 1990s was higher than the economic growth. She made another significant point in saying that in countries with moderately high fertility rates; the population is young and consequently has potential for further growth. She goes on to say that the prevailing demographic situation in Fiji called for sustainable population growth rate through population policies incorporation behavioural and attitudinal changes. The government of Fiji had planned to reduce the crude birth rate to 25 per 1000 by 1975. In 1996 they reported that crude birth rate remained above 25 and the 1975 target was not achieved even by 2013.


Seniloli goes on to say that despite significant investment in family planning in Fiji the impact of family planning on fertility decline has been rather limiting. She noted that Indian fertility level began to decline in the late 1950s and early 1960s and the rapid decline continued into the 1980s. The Fijian total fertility rate however, rose between 1956 and 1966 and then declined only very slowly after that. She observes that fertility was higher among Fijian women who had completed primary education compared with those who had no school. However, fertility declined amongst Fijian women with secondary and tertiary education. This observation may be due to lower contraceptive uptake rate in this group of women and shorter periods of breast feeding.

Unmet need for contraception is an important indicator from several perspectives. Rapid population growth does not seem to be an issue. The health of the mother and child are important considerations. Unsafe abortions remain prevalent. But perhaps the most important issue is the rights of the woman and her family to enjoy a good quality of life. Unmet need for contraception tends to be high in unmarried women and this in spite of the fact that sexual activity starts at a younger age. Thus contraception for this group is an important imperative.

Meeting the challenge of the unmet need requires strong advocacy to motivate couples from having unplanned pregnancies. Mendoza reported that many women who were persuaded to commence contraception stopped due to side effects. Health care providers tended to be unhelpful in dealing with these concerns of the women. Concerted effort is required to reach out to women and their partners and to provide accessible, equitable, quality outreach services.
WHO in 2004 noted that limitations of a medicalised approach and the success of many programs has been closely linked to dismantling of administrative and medical barriers that impede quickly, convenient and appropriate access to methods21. Research has shown that paramedical staff can insert intra uterine devices and injectables to high clinical standards after short training periods. Evidence has also suggested that over the counter sales of pills without prescriptions are justified22.

Criticisms of many family planning programs have led to sustained efforts to define document and enhance quality21. Some aspects of quality include, continuity of supplies, presence and competence of staff, treating people with dignity and reasonable privacy. Unfortunately there is little research to support the value of extended counseling about method choice and side effects 31. Outreach and community based provision complement social marketing. It has proved most useful in rural communities where access to other services is limited when demand is fragile and women's mobility is severely constrained. One unifying feature of most community based scheme is that workers operate in their own communities, sharing the language and custom of their client and thus have high credibility. Community based approaches have had high success in raising contraceptive use in many settings 24.

Conclusion:
1. Fiji has a significant unmet need for family planning.
2. The current national family planning programs need to be reviewed and redefined to meet the needs of the population.
3. There is an urgent need to ensure that the family planning providers have the knowledge, skills and attitudes necessary to meet the needs of clients.
4. Family Planning programs need to be integrated into all clinical and primary health care settings.
5. The area of Family Planning in Fiji needs to be researched to obtain local data regarding barriers to practicing family planning.
6. The Ministry of Health's capacity to deliver family planning services needs to be reviewed and strengthened.

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Stillbirths, Neonatal and Infant Mortality in Fiji 2012: Preliminary findings of a review of medical cause of death certificates

Bythell M1, Nand D2, Tikoduadua L1, Vereti I, Kada J, Fong J, Jenkins K1, Mataitoga K2

Keywords: Infant mortality, neonatal deaths, post-neonatal deaths, Millennium Development Goals, Fiji, perinatal mortality, stillbirths, death certificate

Abstract
This paper aims to provide the baseline data needed to measure the impact of child health improvement strategies and policies and to identify areas for further investigation by giving a one-year ‘snapshot’ of the stillbirths and infant deaths that occurred in 2012. It is part of a larger retrospective study looking at all death certificates back through 2009.

Death certificates for stillbirths and infant deaths for 2012 were analysed by available demographic and risk factors as well as cause of death. We found that Fijians of Indian Descent were more likely to have a bad perinatal outcome when compared to I-Taukei babies. However, I-Taukei babies were more likely to die in the post-neonatal period than babies from the Fijians of Indian Descent community. If the comparison between ethnic groups is limited to infant mortality (all deaths under one year), there is no difference between groups, demonstrating the importance of more detailed analysis of stillbirths and infant deaths.

While we have been able to describe patterns of stillbirth and infant mortality, we cannot explain them using this data source, reinforcing the need for a systematic audit or enquiry system.

Introduction
Fiji has well-established vital statistic collection systems, though it has been acknowledged that it requires strengthening to realise its true value (Naidu, Butworth, & Aumua, 2013). This paper presents preliminary one-year findings of a much larger project which aims to give a more comprehensive picture of the information contained on medical cause of death certificates (MCDCs) for deaths (from 2009 onwards) than has been previously available.

Perinatal mortality and neonatal mortality rates are headline health indicators, directly reflecting the quality of antenatal, intrapartum and neonatal care as they capture information on stillbirths and deaths through the fourth week of life. The rate of infant mortality (IMR) includes babies that die any time up to one year of age. Again, this captures the neonatal component, but also the deaths from the age of one month to one year. The causes and risk factors associated with these deaths tend to be different from stillbirths and neonatal deaths (World Health Organization, 2006). It is vital to understand how the patterns and causes of death differ at these different stages to allow for efficient and effective clinical, public health and social interventions to be carried out.

Through the Millennium Development Goals (MDG) there has been a global drive to reduce deaths in children under the age of five. More recently focus has shifted to the neonatal period as this component of under five deaths has proven difficult to reduce and therefore has become a bigger proportion of both under five and infant mortality measures (Lawn, Cousens, & Zupan, 2005). Internationally, stillbirths have largely been ignored in development strategies and indicators (Lawn, et al., 2011).

Fiji’s neonatal and infant mortality rates are low compared to other developing countries (Pacific Islands Forum Secretariat, 2012). However, due to concerns about the lack of improvement in infant and under five mortality rates, the Paediatric Clinical Services Network requested that the Ministry of Health support a comprehensive review of children’s health in 2010. While the report was not published, much of the content was included and addressed in the current child health strategy document (Fiji Ministry of Health, 2012).

Some of the findings included that there had been little change in the infant mortality rate in the ten years preceding the study, that more effort needed to be made to improve the quality of antenatal and perinatal services and that factors affecting death in the post-neonatal differed from those during the perinatal and neonatal period.

Until 2014, not all data collected on MCDCs were transcribed into an electronic format and therefore the ability to carry out analysis on mortality was limited. The Ministry of Health is currently undertaking a project to rectify this through a programme of data entry, linkage, analysis and publication of the information found with the aim to improve baseline population mortality data and monitor trends more precisely.

This paper aims to provide the baseline data that is necessary to measure the impact of the child health improvement strategies and policies and to identify areas for further investigation by giving a one-year ‘snapshot’ of the perinatal, neonatal and infant deaths that occurred in 2012.

Methods
Data entry
Data from MCDCs for deaths occurring in babies under one and fetal losses were entered onto a spreadsheet designed to capture all information contained on the certificate. The correct assignment of fetal losses to the appropriate category of spontaneous abortion, fetal death or stillbirth based on agreed Fiji National Health Data Dictionary definitions was checked by a senior researcher (Table 1).

Table 1. Definitions of fetal loss by gestation and birth weight from the Fiji National Health Data Dictionary. Note that medical cause of death certificates should be issued for all fetal losses ≥22 weeks gestation. If gestation is uncertain, the cut off for the issuance of a MCDC is ≥500g.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Definition</th>
<th>Should death certificate be issued?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillbirth</td>
<td>A baby born at ≥22 weeks gestation or, in absence of a reliable gestational age, those with a birth weight of ≥3000g, that show no signs of life.</td>
<td>Yes</td>
</tr>
<tr>
<td>Fetal death</td>
<td>Any fetus expelled from the mother’s body at ≥22 weeks gestation, but before 28 weeks gestation that show no signs of life. In the absence of a reliable gestational age, include those with a birth weight between 500-999g</td>
<td>Yes</td>
</tr>
<tr>
<td>Induced abortion</td>
<td>Any fetus expelled from the mother’s body with no signs of life ≥22 weeks gestation that will not result in pregnancy. In the absence of a reliable gestational age, includes those with a birth weight ≤500g</td>
<td>No</td>
</tr>
</tbody>
</table>

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Assignment of underlying cause of death
A panel that included a paediatrician, a neonatologist, a nurse, a clinical epidemiologist, a clinical coder and a senior researcher assigned the underlying cause of death (UCOD) for the purpose of this study from the text contained on the death certificate. The UCOD for stillbirths were assigned on the same basis by the principal author.

Results
A total of 169 stillbirths and 334 infant deaths were reported through the MCDC system. Of the infant deaths, 172 (51.5%) occurred in the neonatal period, with the majority of those occurring in the first seven days (128, 38.3%).

The vast majority of stillbirths and neonatal deaths occurred in divisional hospitals, though only around half of the late deaths (28-364 days) occurred in divisional hospitals, with a large proportion (33.3%) of these infants dying at home. A high proportion of birth weights and gestational ages were missing, particularly for neonatal deaths. The biggest group of stillbirths were born at term (44.4%, Table 2).

Table 2. Stillbirths and infant deaths by various demographic and risk factors, including gestation and birthweight.

<table>
<thead>
<tr>
<th></th>
<th>Stillbirths</th>
<th>Early neonatal deaths (6-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td><strong>2012 deaths</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>83 (49.1%)</td>
<td>63 (49.2%)</td>
<td>25 (56.8%)</td>
<td>70 (43.2%)</td>
</tr>
<tr>
<td>M</td>
<td>87 (50.9%)</td>
<td>71 (50.8%)</td>
<td>19 (43.2%)</td>
<td>97 (56.8%)</td>
</tr>
<tr>
<td>Not known</td>
<td>4 (2.4%)</td>
<td>2 (1.8%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Ethnic group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iTaukei</td>
<td>111 (65.7%)</td>
<td>88 (68.9%)</td>
<td>22 (47.9%)</td>
<td>140 (80.4%)</td>
</tr>
<tr>
<td>Fijians of Indian Descent</td>
<td>56 (33.1%)</td>
<td>34 (26.6%)</td>
<td>12 (27.3%)</td>
<td>17 (10.5%)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (1.2%)</td>
<td>4 (3.1%)</td>
<td>0</td>
<td>5 (3.1%)</td>
</tr>
<tr>
<td>Not known</td>
<td>0</td>
<td>7 (1.0%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Gestational age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28-31</td>
<td>29 (17.2%)</td>
<td>77 (21.1%)</td>
<td>7 (15.9%)</td>
<td>-</td>
</tr>
<tr>
<td>32-36</td>
<td>56 (33.1%)</td>
<td>18 (14.1%)</td>
<td>7 (15.9%)</td>
<td>-</td>
</tr>
<tr>
<td>37+</td>
<td>75 (44.4%)</td>
<td>22 (17.2%)</td>
<td>14 (31.8%)</td>
<td>-</td>
</tr>
<tr>
<td>Not known</td>
<td>9 (5.3%)</td>
<td>37 (28.9%)</td>
<td>14 (31.8%)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Birth weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500-999</td>
<td>11 (6.0%)</td>
<td>70 (21.9%)</td>
<td>4 (9.1%)</td>
<td>-</td>
</tr>
<tr>
<td>1000-1499</td>
<td>23 (13.6%)</td>
<td>18 (14.1%)</td>
<td>5 (11.4%)</td>
<td>-</td>
</tr>
<tr>
<td>1500-1999</td>
<td>20 (11.8%)</td>
<td>10 (7.8%)</td>
<td>2 (4.5%)</td>
<td>-</td>
</tr>
<tr>
<td>2000-2499</td>
<td>25 (14.8%)</td>
<td>5 (3.9%)</td>
<td>2 (4.5%)</td>
<td>-</td>
</tr>
<tr>
<td>2500-4499</td>
<td>69 (40.9%)</td>
<td>19 (24.8%)</td>
<td>12 (27.3%)</td>
<td>-</td>
</tr>
<tr>
<td>≥5500</td>
<td>6 (3.8%)</td>
<td>2 (1.8%)</td>
<td>1 (2.3%)</td>
<td>-</td>
</tr>
<tr>
<td>Not known</td>
<td>11 (6.3%)</td>
<td>44 (34.4%)</td>
<td>10 (40.9%)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Where died</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divisional Hospital</td>
<td>143 (84.0%)</td>
<td>97 (75.8%)</td>
<td>37 (84.1%)</td>
<td>82 (50.6%)</td>
</tr>
<tr>
<td>Subdivisional Hospital</td>
<td>19 (11.2%)</td>
<td>12 (9.0%)</td>
<td>2 (4.5%)</td>
<td>12 (7.4%)</td>
</tr>
<tr>
<td>Health Centre</td>
<td>4 (2.4%)</td>
<td>3 (2.3%)</td>
<td>0</td>
<td>4 (2.3%)</td>
</tr>
<tr>
<td>Nursing Station</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 (1.2%)</td>
</tr>
<tr>
<td>Community</td>
<td>0</td>
<td>4 (3.1%)</td>
<td>0</td>
<td>7 (4.3%)</td>
</tr>
<tr>
<td>Home</td>
<td>3 (1.8%)</td>
<td>12 (9.4%)</td>
<td>4 (9.1%)</td>
<td>54 (33.3%)</td>
</tr>
<tr>
<td>Not known</td>
<td>0</td>
<td>0</td>
<td>1 (2.3%)</td>
<td>1 (0.6%)</td>
</tr>
</tbody>
</table>

*Stillbirths are defined as >28 weeks gestation in Fiji.

1Birth weight and gestation are not collected for deaths after the neonatal period.

About half of the infant deaths occurred in the first four weeks of life, with the majority of babies dying in the first week (Figure 1).
Demographic and risk factors
Fijians of Indian Descent have a higher risk for a bad perinatal outcome when compared to I-Taukei (Table 3), with a risk ratio of 1.45 (95% CI 1.1333 to 1.8567, \( p = 0.0031 \)). There is no significant difference between Fijians of Indian Descent and I-Taukei when comparing overall infant mortality (RR 0.7997, 95% CI 0.6016 to 1.0391, \( p = 0.0920 \)). However, when late deaths are looked at in isolation, I-Taukei babies are at greater risk of dying (RR 2.5187, 95% CI 1.5241 to 4.1622, \( p = 0.0003 \)).

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Stillbirths N(rate)</th>
<th>ENND (0-6 days) N(rate)</th>
<th>LNND (7-27 days) N(rate)</th>
<th>Late Death (28-364 days) N(rate)</th>
<th>Perinatal Mortality N(rate)</th>
<th>Neonatal Mortality N(rate)</th>
<th>Infant Mortality N(rate)</th>
<th>Live Births</th>
<th>Total Births (live+still)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Taukei</td>
<td>111 (7.5)</td>
<td>88 (5)</td>
<td>32 (2.2)</td>
<td>140 (9.5)</td>
<td>399 (13.4)</td>
<td>120 (8.1)</td>
<td>260 (17.6)</td>
<td>14733</td>
<td>14844</td>
</tr>
<tr>
<td>Fijians of Indian Descent</td>
<td>56 (12.2)</td>
<td>34 (7.5)</td>
<td>12 (2.6)</td>
<td>17 (3.7)</td>
<td>90 (19.6)</td>
<td>46 (10.1)</td>
<td>63 (13.9)</td>
<td>4544</td>
<td>4600</td>
</tr>
<tr>
<td>Other</td>
<td>2 (2.2)</td>
<td>4 (4.4)</td>
<td>5 (5.5)</td>
<td>6 (6.6)</td>
<td>4 (4.4)</td>
<td>9 (10)</td>
<td>901</td>
<td>903</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>169 (8.3)</td>
<td>128 (6.3)</td>
<td>44 (2.2)</td>
<td>162 (8)</td>
<td>297 (14.6)</td>
<td>172 (8.5)</td>
<td>334 (16.6)</td>
<td>20178</td>
<td>20347</td>
</tr>
</tbody>
</table>

Rates for stillbirths and perinatal deaths are by total births. All others are by live births only.

Note the differences in the perinatal and late death mortality rates. Fijians of Indian Descent are more likely to have a bad perinatal outcome, while I-Taukei babies are more likely to die in the post-neonatal period. These differences are statistically significant.

Table 4 below presents the risk factor and demographic data by ethnicity. Beyond giving the numbers and therefore describing the relative burden between and within groups, lack of the appropriate denominators prevents further analysis of this data.

Table 4. 2012 Demographic and risk factors for stillbirths and infant deaths by ethnicity.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Stillbirths</th>
<th>Early neonatal deaths (0-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012 deaths</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>169</td>
<td>128</td>
<td>44</td>
<td>162</td>
</tr>
<tr>
<td>I-Taukei</td>
<td>54</td>
<td>44</td>
<td>20</td>
<td>63</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>29</td>
<td>16</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Nat known</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M</td>
<td>57</td>
<td>65</td>
<td>19</td>
<td>97</td>
</tr>
<tr>
<td>I-Taukei</td>
<td>54</td>
<td>47</td>
<td>12</td>
<td>77</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>26</td>
<td>18</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Nat known</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I-Taukei</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gestation</th>
<th>Stillbirths</th>
<th>Early neonatal deaths (0-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Taukei</td>
<td>111</td>
<td>88</td>
<td>32</td>
<td>-</td>
</tr>
<tr>
<td>&lt;36</td>
<td>-</td>
<td>16</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>36-36</td>
<td>55</td>
<td>29</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>37+</td>
<td>50</td>
<td>17</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>6</td>
<td>25</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>56</td>
<td>34</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>&lt;36</td>
<td>-</td>
<td>7</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>36-36</td>
<td>28</td>
<td>14</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>37+</td>
<td>25</td>
<td>5</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>&lt;36</td>
<td>-</td>
<td>7</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>36-36</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>37+</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Birthweight</th>
<th>Stillbirths</th>
<th>Early neonatal deaths (0-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Taukei</td>
<td>111</td>
<td>80</td>
<td>32</td>
<td>-</td>
</tr>
<tr>
<td>&lt;2500</td>
<td>53</td>
<td>39</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>2500-4000</td>
<td>49</td>
<td>20</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>4001-5000</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>56</td>
<td>34</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>&lt;2500</td>
<td>29</td>
<td>21</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>2500-4000</td>
<td>19</td>
<td>4</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>4</td>
<td>9</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Nat known</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>&lt;2500</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>2500-4000</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

*Stillbirths are defined as <36 weeks gestation in Fiji.
*Birth weight and gestation are not collected for deaths after the neonatal period.
Patterns of death by ethnicity, timing and place of death remain relatively similar until after the neonatal period (Table 5). The majority of post-neonatal deaths in the Fijians of Indian Descent community occur in hospital (70.6%), with no late deaths occurring at home. In the I-Taukei community, 40% of post-neonatal deaths took place outside of a health facility and less than half (48.6%) of all deaths occurred in a divisional hospital. In 2012 no babies of Fijians of Indian Descent died at home after the neonatal period, while 51 (36.4%) I-Taukei babies did. Though the numbers are small (N=5), 60% of babies of ‘Other’ ethnicity died at home. Two of these babies were from the Banaban community.

Table 5. Deaths by timing, type of place of death and ethnicity.

<table>
<thead>
<tr>
<th>Where died</th>
<th>Stillbirths</th>
<th>Early neonatal deaths (0-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Taukei</td>
<td>111</td>
<td>128</td>
<td>44</td>
<td>162</td>
</tr>
<tr>
<td>Divisional Hospital</td>
<td>92 (82.9%)</td>
<td>69 (78.4%)</td>
<td>28 (87.5%)</td>
<td>68 (48.6%)</td>
</tr>
<tr>
<td>Subdivisional Hospital</td>
<td>14 (12.6%)</td>
<td>9 (10.2%)</td>
<td>2 (6.3%)</td>
<td>10 (7.1%)</td>
</tr>
<tr>
<td>Health Centre</td>
<td>4 (3.6%)</td>
<td>0</td>
<td>0</td>
<td>3 (2.1%)</td>
</tr>
<tr>
<td>Nursing Station</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2 (1.4%)</td>
</tr>
<tr>
<td>Community</td>
<td>0</td>
<td>1 (1.1%)</td>
<td>0</td>
<td>5 (3.6%)</td>
</tr>
<tr>
<td>Home</td>
<td>1 (0.9%)</td>
<td>9 (10.2%)</td>
<td>1 (3.1%)</td>
<td>51 (36.4%)</td>
</tr>
<tr>
<td>Not known</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Fijian of Indian Descent</td>
<td>56</td>
<td>34</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Divisional Hospital</td>
<td>49 (87.5%)</td>
<td>26 (76.5%)</td>
<td>9 (70%)</td>
<td>12 (70.6%)</td>
</tr>
<tr>
<td>Subdivisional Hospital</td>
<td>5 (8.9%)</td>
<td>1 (5.9%)</td>
<td>0</td>
<td>2 (11.8%)</td>
</tr>
<tr>
<td>Health Centre</td>
<td>0</td>
<td>2 (5.9%)</td>
<td>0</td>
<td>1 (5.9%)</td>
</tr>
<tr>
<td>Community</td>
<td>0</td>
<td>1 (2.9%)</td>
<td>0</td>
<td>2 (11.8%)</td>
</tr>
<tr>
<td>Home</td>
<td>2 (3.6%)</td>
<td>3 (8.8%)</td>
<td>3 (25%)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Divisional Hospital</td>
<td>2 (100%)</td>
<td>2 (50%)</td>
<td>0</td>
<td>2 (40%)</td>
</tr>
<tr>
<td>Subdivisional Hospital</td>
<td>0</td>
<td>1 (25%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Health Centre</td>
<td>0</td>
<td>1 (25%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Home</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3 (60%)</td>
</tr>
<tr>
<td>Not known</td>
<td>0</td>
<td>2 (50%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Community</td>
<td>0</td>
<td>2 (50%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The geographical distribution of late deaths at home is shown in Table 6. Due to the lack of a birth denominator by residence, rates cannot be calculated. However, Central Division has the most deaths, followed by the Western Division. Suva subdivision had the most late deaths at home, but it is also the most populous.

Table 6. Late deaths that occurred at home by subdivision of residence.

<table>
<thead>
<tr>
<th>Subdivision</th>
<th>Division</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naitasiri</td>
<td>Central</td>
<td>5</td>
</tr>
<tr>
<td>Rewa</td>
<td>Central</td>
<td>3</td>
</tr>
<tr>
<td>Suva</td>
<td>Central</td>
<td>14</td>
</tr>
<tr>
<td>Tailevu</td>
<td>Central</td>
<td>5</td>
</tr>
<tr>
<td>Total Central Division</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Kadavu</td>
<td>Eastern</td>
<td>1</td>
</tr>
<tr>
<td>Lomaiviti</td>
<td>Eastern</td>
<td>1</td>
</tr>
<tr>
<td>Total Eastern Division</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Bua</td>
<td>Northern</td>
<td>2</td>
</tr>
<tr>
<td>Cakaudrove</td>
<td>Northern</td>
<td>3</td>
</tr>
<tr>
<td>Labasa</td>
<td>Northern</td>
<td>2</td>
</tr>
<tr>
<td>Total Northern Division</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Ba</td>
<td>Western</td>
<td>2</td>
</tr>
<tr>
<td>Lautoka/Yasawa</td>
<td>Western</td>
<td>3</td>
</tr>
<tr>
<td>Nadi</td>
<td>Western</td>
<td>2</td>
</tr>
<tr>
<td>Nadroga/Navosa</td>
<td>Western</td>
<td>1</td>
</tr>
<tr>
<td>Ra</td>
<td>Western</td>
<td>4</td>
</tr>
<tr>
<td>Total Western Division</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>
The underlying cause of death by ICD-10 chapter is shown in Table 7. The cause of death for the vast majority of stillbirths are coded under the (P00-P96) certain conditions originating in the perinatal period chapter, while the leading causes of death for late deaths include diseases of the respiratory system and congenital anomalies.

Table 7. Underlying cause of death by ICD-10 chapter and timing of death.

<table>
<thead>
<tr>
<th>International Classification of Disease 10 chapter titles</th>
<th>Stillbirths</th>
<th>Early neonatal deaths (0-6 days)</th>
<th>Late neonatal deaths (7-27 days)</th>
<th>Late deaths (28-364 days)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A00-A09) Intestinal infectious diseases</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>(A30-A49) Other bacterial disease</td>
<td>0</td>
<td>12</td>
<td>10</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>(A50-A51) Intestinal with a predominantly sexual of mode transmision</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>(A60-A69) Congenital, nutritional and metabolic</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>(B00-B99) Malnutrition</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(C00-C96) Disease of the nervous system</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>(D00-D09) Disease of the respiratory system</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>(E00-E90) Diseases of the digestive system</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>55</td>
<td>57</td>
</tr>
<tr>
<td>(G00-G99) Diseases of the skin and subcutaneous tissue</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>(P00-P96) Certain conditions originating in the perinatal period</td>
<td>157</td>
<td>88</td>
<td>13</td>
<td>6</td>
<td>264</td>
</tr>
<tr>
<td>(Q00-Q99) Congenital malformations, deformations and corrections of certain nature</td>
<td>10</td>
<td>22</td>
<td>14</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>(R00-R99) Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>(S00-T98) Injury, poisoning and certain other consequences of external causes</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>(V01-Y98) External causes of morbidity and mortality</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>169</td>
<td>128</td>
<td>44</td>
<td>182</td>
<td>503</td>
</tr>
</tbody>
</table>

Congenital anomalies are the underlying cause for large proportion of all deaths. The vast majority of these are cardiac anomalies and of the cardiac anomalies, the largest anomaly subgroup is malformations of the cardiac septa (Figures 2 and 3).

The majority of stillbirths are either due to unspecified causes or due to maternal factors or complications of labour or delivery (Figure 4). When looked at as a single cause of death, it appears that congenital anomalies are the biggest cause of neonatal death (Figure 5). However, when the gestational element is included, the burden of prematurity is captured through the large number of deaths due to hyaline membrane disease and sepsis.

The main cause of late deaths is pneumonia. Congenital anomalies also make up large proportion of late deaths, with cardiac anomalies being the largest component. Deaths from intestinal infectious disease (gastroenteritis) make up just over 10% of the total (Figure 6).

Figure 4. Underlying cause of death for stillbirths in 2012.

Figure 5. Neonatal deaths by cause of death and gestational age.

Figure 6. Cause of late deaths (28-364 days).
The overwhelming cause of death for babies that died at home after the neonatal period was pneumonia and gastroenteritis. The causes of death under the “Other” category in Figure 7 include lung abscess, septic skin lesions and perinatal-related causes such as meconium aspiration syndrome and birth asphyxia.

Figure 7. Underlying cause of deaths for babies that died at home after the neonatal period.

Discussion

The global burden of stillbirths and infant mortality is high and while Fiji has relatively low rates of both for a developing country, every time a woman delivers a stillborn baby or a baby dies, a family is devastated. Medical staff are also adversely affected (Wallbank & Robertson, 2013). Efforts to reduce this burden require an understanding of what causes patterns of mortality and the baseline data to measure the effectiveness of any intervention. The extensive data reported in this paper demonstrates the capacity to generate population-based patterns of mortality and baseline data through existing routine data collection in Fiji.

The infant mortality rate reported in this paper is slightly higher than what was reported in the 2012 Ministry of Health Annual Report (16.6 vs 15.86 per 1000 live births) due to improved data entry and analysis procedures. Conversely, the new reported perinatal mortality rate is lower than that reported in the annual report (14.6 per 1000 total births vs 16.75 per 1000 live births). This is due to the ability to exclude fetal deaths and spontaneous abortions inappropriately included previously, and the use of total births instead of live births as a denominator.

Out of the 334 infant deaths, 172 (51.5%) occurred in the first four weeks of life and of those, 128 (38.3%) occurred in the first week. These neonatal deaths account for more than half of all infant deaths. If under five mortality is going to be reduced (20.96 per 1000 live births in 2012), this component will have to be addressed through improvements in antenatal, perinatal and postnatal care (World Health Organization, 2010). The current MDG4 goal to reduce the IMR from 16.6 to 5.5 per 1000 live births would require a reduction in the number of infant deaths from 334 to around 111. This is unrealistic. The IMR goal target stated in the 2014 Annual Corporate Plan (Fiji Ministry of Health, 2014) of 13 per 1000 live births would require an approximate reduction of infant deaths from 334 to 262 (72 fewer deaths).

Maternal health has a direct impact on perinatal and neonatal outcomes. Risk factors such as extremes of maternal body mass index, short time intervals between pregnancies and maternal illness such as sexually transmitted disease, diabetes, hypertension and anaemia all contribute to babies being born prematurely (World Health Organization, 2012). Fiji has high rates of some of these risk factors, including chlamydia (Cliffe, Tabrizi, & Sullivan, 2008), obesity and diabetes (Fiji Ministry of Health, unpublished) and efforts to treat these as well as other maternal conditions could potentially have a positive impact on stillbirth and infant mortality rates.

The global burden of stillbirths and infant mortality is high and while Fiji has relatively low rates of both for a developing country, every time a woman delivers a stillborn baby or a baby dies, a family is devastated. Medical staff are also adversely affected. The infant mortality rate reported in this paper is slightly higher than what was reported in the 2012 Ministry of Health Annual Report (16.6 vs 15.86 per 1000 live births) due to improved data entry and analysis procedures. Conversely, the new reported perinatal mortality rate is lower than that reported in the annual report (14.6 per 1000 total births vs 16.75 per 1000 live births). This is due to the ability to exclude fetal deaths and spontaneous abortions inappropriately included previously, and the use of total births instead of live births as a denominator.

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Analysis by area of residence was limited due to time constraints. However, there are plans to carry out more extensive mapping of deaths using newly available geocoding technology. The output from this will be available for all deaths, not just infants and stillbirths. Increased analytic capacity and structured systems for collaboration for all medical specialties with health information staff will be required to ensure that the maximum advantage of this valuable dataset can be realised.

This study has described the pattern of infant mortality and stillbirths for a single year. This is part of a much bigger project that will allow detailed trends and mapping of all deaths in Fiji to be produced. While we have been able to describe the patterns, we cannot explain them. This is because MCDCs do not allow us to understand the narrative of death – what caused a mother not to seek healthcare for her child or her baby or what caused medical staff to delay referral or deliver substandard care. This understanding can only come through a system of audit or confidential enquiry and well-designed studies.

**Recommendations**

**Medical cause of death certificates/mortality reporting**
- The continuation of this study will require additional resources, including data entry, project management and analytic capacity to ensure the maximum benefit.
- Improve the content of the MCDC and output of mortality analysis through:
  - Continued training of Medical Officers
  - Follow up of incomplete/ illegible MCDCs
  - Redesign of the stillbirth/neonatal section of the MCDC
  - Adoption of a system of reporting multiple causes of death as part of routine mortality reporting.

**Health information systems**
- All births that occur in subdivisional hospitals should be entered into PATISplus to give a population-based denominator.
- The creation of a population-based congenital anomaly register. There is support for congenital anomaly registers from organisations such as EUROCAT or the International Clearing house for Birth Defects, including low cost software.

**Clinical**
- The high rate of chlamydia in in Fiji needs to be addressed to reduce associated morbidity and mortality.
- Ministry support for the feasibility study for the delivery of exogenous surfactant to reduce the burden of lung diseases of prematurity by the Paediatric Clinical Services Network.
- Increase capacity for fetal anomaly scanning to allow for early detection of severe anomalies and improve treatment options.
- Further research into the causes of stillbirths beginning with work started in the IMPROVE training.

**Audit**
- A review of a sample of the 54 deaths that occurred at home by a small sub-group to identify themes for further exploration to be carried out as a matter of urgency.
- Audit of the Clinical Practice Guidelines (CPGs) for the delivery of steroids to mothers in preterm labour, the identification and treatment of diabetes in pregnancy and other relevant CPGs to identify obstacles to the delivery of effective treatment.
- Use this baseline data to measure the impact of such interventions as the introduction of pneumococcal and rotavirus immunisations at the end of 2012, the Birth Preparedness, Complication Readiness programme and the revitalised training scheme for Community Health workers.
- Strengthening the system for investigating all deaths in children under the age of five. It is particularly important that deaths that occur outside of health facilities be included. This may include subdivisions submitting monthly returns to a central body, including zero returns.

**Creation of an audit or confidential enquiry system to gain a better understanding of the root causes of stillbirths and infant deaths. This should be led by a core multi disciplinary group and managed by a child audit coordinator whose sole responsibility is to support the paediatric-related audit.
- Increased dialogue between researchers in Fiji's universities, the Ministry of Health, the Paediatric and Obstetric Clinical Services Networks and development partners to coordinate research into the causes of the patterns seen in this paper.

**Education**
- We recommend working with the Ministry of I-Taukei Affairs, other government agencies, Community Health Workers and non-governmental agencies to disseminate a programme of education regarding signs of serious illness in infants as a matter of urgency.

**Acknowledgements**

The authors would like to thank the staff of the Health Information Unit at the Ministry of Health for their support in accessing data sources and providing denominator data. Dr Rachel Devi kindly reviewed the manuscript.

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**References**


Abstract
Maternal mortality in Fiji has declined dramatically since the late 1960s. Around that time government policies began to encourage antenatal care at health facilities and the delivery of all babies in hospitals by nurses, midwives or doctors (Fiji Ministry of Health, 1972). While the root causes of maternal death are complex, the push to ensure deliveries were being attended to by skilled personnel and efforts by clinicians to improve local and national healthcare delivery processes and clinical care, are likely to have contributed to improvements in maternal health outcomes. Additionally, the commitment of the country and the Ministry of Health to adhere to international benchmarks for maternal mortality, such as the Millennium Development Goals (MDGs), contributed to the awareness of the maternal mortality situation and led to combined efforts to improve maternal health outcomes in pregnancy.

The rate of improvement has slowed in recent years and there has been a slight increase in the maternal mortality rate (MMR) since 2010. This suggests that further marked reductions in MMR would require additional efforts by government, clinical service networks (CSNs), the community and development partners. This paper aims to provide evidence to ensure that these efforts are as efficient and effective as possible by identifying strengths and weaknesses in the current maternal mortality surveillance cycle as well as providing a baseline understanding of the distribution of recent maternal deaths in Fiji.

Introduction
The reduction in maternal mortality is a global priority and is included in the MDGs. However, factors affecting maternal health are complex and this complexity complicates strategic efforts to improve maternal health outcomes. Globally, there is clear evidence that maternal deaths mostly occur during labour, delivery and the immediate post-partum period and that the most vulnerable women are at the highest risk (Ronsmans & Graham, 2009) (Campbell & Graham, 2006). However, it is vital that national efforts to reduce maternal mortality are based on a clear understanding of the patterns of maternal mortality within that country.

The steep rate of decline in Fiji that began in the mid-1970s was interrupted by an increase in the mid-late 1980s. Since then, there has been a steady but much slower decline, with a slight rise since 2010 (Figure 1).

Maternal death
Deaths of women while pregnant or within 42 days of the end of pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or coincidental causes.

Direct maternal death
Deaths resulting from obstetric complications of the pregnant state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above while pregnant or within 42 days of the end of pregnancy.

Indirect maternal death
Deaths resulting from previous existing disease, or disease that developed during pregnancy and which was not due to direct obstetric causes, but which was aggravated by the physiologic effects of pregnancy while pregnant or within 42 days of the end of pregnancy.

Coincidental maternal death
Deaths from unrelated causes which happen to occur during pregnancy or within 42 days of the end of pregnancy.

Late maternal death
Deaths occurring between 42 days and one year after abortion, miscarriage or delivery that are due to direct or indirect maternal causes.

Pregnancy-related deaths
Deaths occurring in women while pregnant or within one year of the end of a pregnancy, irrespective of the cause of the death.

The deaths that occur within 42 days of the end of a pregnancy (pregnancy related deaths) are subdivided into direct, indirect or coincidental deaths. Direct deaths include those that are the direct result of being or having been pregnant, such as deaths from complications of ectopic pregnancy or amniotic fluid embolism. Indirect deaths are deaths from pre-existing or new conditions that are aggravated by pregnancy, such as some cardiac conditions or infectious diseases. Coincidental deaths are deaths that would have occurred regardless of pregnancy and are not included in the overall maternal mortality statistics.

The correct classification of deaths requires diagnostic confirmation by post-mortem and detailed case evaluation by experts—especially to distinguish between indirect and coincidental deaths as the distinction can be subjective (AbouZahr, 2010).

Reporting pregnancy related deaths
The number of maternal deaths has been collected by Fiji’s Ministry of Health (MOH) for many decades (Table 1). Currently, maternal deaths are identified by the Health Information Unit (HIU) within the MOH through the submission of medical cause of death certificates (MCDC) to the MOH as part of the vital statistic registration system. These are then verified with the Obstetric and Gynaecological Clinical Service Network (ObstGSSN) Chair. The MCDC has included a section for indicating maternal deaths (maternal death tick box) since 2009.

Keywords: Maternal Mortality, Maternal Mortality Rate
As well as being captured on the vital registration system, pregnancy-related deaths that occur in health facilities, as well as those pregnancy related deaths that occurs in the community (that health staff are aware of), are reported to the OGCSN Chair. In recent years there has been ongoing case validation with the OGCSN to ensure that both parties are aware of all cases.

Late deaths (those deaths that occur more than 42 days) are not collected in the present system.

Classifying the type of maternal death

Each case is classified by the OGCSN Chair using all available documentation. A final count of direct and indirect maternal deaths to be included in the national maternal mortality ratio (number of direct and indirect maternal deaths per 100,000 live births) is confirmed by the Head of the Obstetric CSN annually and this is provided to the Health Information Unit (informally).

The clinical pregnancy-related mortality dataset that contains historic data on maternal mortality is currently only available with the Head of the OGCSN.

Methods

The dataset

The clinical pregnancy-related mortality dataset held by the OGCSN Chair was used to provide the case list for the main analysis in this study. This dataset contains mother’s name and National Health Number (where available), maternal age, ethnicity, gravida/parity, place of residence, place of death, a short summary of the cause of death, short clinical remarks when warranted and the type of maternal death as classified by the Head of the Obstetric CSN.

Medical cause of death certificates

Information from the clinical dataset, such as date of birth and place of residence, was cross-checked against medical cause of death certificates (MCDCs) when they were available.

The mortality database, which is based on MCDCs received by the HIU was interrogated for any cause of death with an ICD-10 code from the Pregnancy, Childbirth and the Puerperium Chapter. Cases identified were cross checked with the study case list.

Cross validation with PATIS

A data matching exercise using the hospital patient administration system (PATIS) was done to test the feasibility of using this system to identify maternal deaths that had not been reported through routine processes. All women who had a discharge code that indicated the delivery of a baby (Z37 or Z38, ICD-10) in a hospital in 2008-2010 and a date of death in the subsequent 365 days were identified.

Deaths were recorded on the old PATIS system (through 2010) either by medical recorders at the health facility of death or by coders in HIU as part of the processing of MCDCs.

Cases identified were then checked against the study dataset.

Classification of deaths

Analysis by type of maternal death was done by the classification originally assigned by the Head of the Obstetric CSN. Deaths were assigned to an underlying cause using information provided in the clinical dataset.

Results

In the five years between 2008 and 2012, there were 61 pregnancy-related deaths reported to the OGCSN Chair. Of these, 28 were classified as direct maternal deaths, nine as indirect and 24 as coincidental, giving an overall maternal mortality rate of 36.8 per 100000 live births. The main findings are presented in Table 2. Denominator data is available in Tables 3(a), (b) and (c).
Maternal Mortality Related Denominators

Table 2: Number of cases by maternal mortality classification, 2008-2012 including risk factors, outcomes and demographic information.

<table>
<thead>
<tr>
<th>Year of death</th>
<th>CWMH</th>
<th>Lautoka Hospital</th>
<th>Labasa Hospital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>4148</td>
<td>3818</td>
<td>7089</td>
<td>9735</td>
</tr>
<tr>
<td>2009</td>
<td>3107</td>
<td>2222</td>
<td>5355</td>
<td>5884</td>
</tr>
<tr>
<td>2010</td>
<td>5795</td>
<td>4680</td>
<td>8160</td>
<td>10535</td>
</tr>
<tr>
<td>2011</td>
<td>5795</td>
<td>4680</td>
<td>8160</td>
<td>10535</td>
</tr>
<tr>
<td>2012</td>
<td>11788</td>
<td>8246</td>
<td>16078</td>
<td>26062</td>
</tr>
</tbody>
</table>

Table 3(a): Number of live births by divisional hospitals 2008-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>CWMH</th>
<th>Lautoka Hospital</th>
<th>Labasa Hospital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>7065</td>
<td>3511</td>
<td>2105</td>
<td>12681</td>
</tr>
<tr>
<td>2009</td>
<td>7234</td>
<td>3756</td>
<td>2000</td>
<td>13090</td>
</tr>
<tr>
<td>2010</td>
<td>9151</td>
<td>4176</td>
<td>2532</td>
<td>15859</td>
</tr>
<tr>
<td>2011</td>
<td>7954</td>
<td>4007</td>
<td>2200</td>
<td>14161</td>
</tr>
<tr>
<td>2012</td>
<td>8033</td>
<td>3921</td>
<td>2153</td>
<td>14107</td>
</tr>
</tbody>
</table>

Total live births 39437 19371 10900 69708

The age range for maternal deaths was 18 to 43, with the largest number occurring in the 30-34 age group. For direct maternal deaths, the largest number occurred in the 35-39 year age group. There was no maternal age distribution by birth data available to allow rate comparisons between groups.

Twenty-two (59.5%) of the maternal deaths occurred in I-Taukei women and 13 (35.1%) in women of Fijian Indian Descent. This translates into total MMR for the five year epoch as 30.3 and 55.4 per 100,000 live births respectively.

Based on mothers' residence, the Western Division had the highest number of maternal deaths (17, 45.9%), followed by the Central Division (12, 32.4%). Based on 2012 published divisional population figures (Fiji Ministry of Health, 2013) the risk for having a maternal death in the West compared to the Central Division is not significantly different (RR 1.42, 95% CI 0.68 to 2.96, P = 0.3562).

Over 70% of maternal deaths occurred in divisional hospitals, with 16% occurring in subdivisional hospitals. The remainder died at home or en route to a healthcare facility. The divisional hospital with the most maternal deaths was Lautoka Hospital (15 deaths). CWMH had ten maternal deaths and Labasa Hospital one. This translates into health facility MMR rates of 77.4, 25.4 and 9.2 per 100,000 facility live birth, respectively.

Post-mortems were carried out on 46 (75.4%) of the pregnancy-related deaths. At least 15 cases did not have post-mortems. The majority of maternal deaths occurred in the postpartum period (59.5%). A high percentage of the parity information was missing (29.7% of maternal deaths). For those with a known parity, the largest group were women with three or four previous pregnancies.

Of the 28 direct maternal deaths, eight were caused by hypertensive disease, eight were categorised as pregnancies with abortive outcome, of which six were complications of ectopic pregnancy and two were due to septic abortion and four were due to obstetric haemorrhage. These causes account for more than 70% of all direct deaths. The deaths by World Health Organization (WHO) grouping of underlying cause are presented in Table 4 (World Health Organization, 2012).

Table 4. Maternal mortality in Fiji 2008-2012. Deaths as categorised using the WHO underlying cause of death groups.

<table>
<thead>
<tr>
<th>Group number</th>
<th>Group description</th>
<th>Type</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Pregnancies with abortive outcome - septic abortion</td>
<td>Direct</td>
<td>2</td>
</tr>
<tr>
<td>1c</td>
<td>Pregnancies with abortive outcome - ectopic pregnancies</td>
<td>Direct</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Hypertensive disorders</td>
<td>Direct</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Obstetric haemorrhage</td>
<td>Direct</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Pregnancy-related infection</td>
<td>Direct</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Other obstetric complications</td>
<td>Direct</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Unexpected complications of management</td>
<td>Direct</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Non-obstetric complications</td>
<td>Indirect</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>Coincidental causes</td>
<td>Coincidental</td>
<td>24</td>
</tr>
</tbody>
</table>

Total direct and indirect deaths 61
Overall, nine (24.3%) maternal deaths were classified as indirect. Of these, five (55.6%) were cardiac related. Other causes of indirect maternal deaths included liver disease, pneumonia and sepsis.

**Cross validation with PATIS**

Analysis of the PATIS data identified 44 potential cases of women dying less than one year after giving birth. Of these, seven cases were listed as having died before giving birth, in three cases baby’s date of death had been entered in the mother’s record as her own date of death and four cases were not supported by MCDC documentation (i.e. date of death only had been entered into PATIS with no causes of death or MCDC ID number listed). These 14 cases were excluded.

Twenty-three women were listed as dying more than 42 days after birth. Causes of death, according to the MCDC for these cases were varied, but included cardiac disease, cancer, accidents, murder and liver-related illnesses. Currently late deaths are not included in the maternal mortality data collection system so no further analysis of these deaths was done. One potential late death had a cause of death listed as ruptured fallopian tube, indicating an ectopic pregnancy with the linkage result based on a previous pregnancy. This case was not known to the study and therefore was considered an unreported maternal death.

Of the seven remaining pregnancy-related deaths, three were known to the study, leaving four additional potential maternal deaths not reported through existing systems. All four had delivered their babies in Divisional Hospitals. One outcome was a stillbirth, while the other three were live births.

Due to lack of time, the five potential maternal deaths were not investigated further. However, the information contained on the MCDCs showed two of the women died at Divisional Hospitals, one in a psychiatric hospital, one in a subdivisional hospital and one in the community. There was no theme to cause of death with all mothers dying from different causes (cardiac, puerperal sepsis, diabetic related renal failure, cerebellar haemorrhage and ectopic pregnancy). The ‘maternal death’ box for all four cases reported on the new-style form had not been ticked. The two cases of obvious potential direct maternal mortality (puerperal sepsis and ectopic pregnancy) occurred in 2008 and 2009, respectively.

**Cross validation with the mortality database and medical cause of death certificates**

Six cases with an underlying cause of death code from the Pregnancy, Childbirth and the Puerperium ICD-10 Chapter in the MOH mortality database were identified that were not in the study dataset. Of these, one was almost certainly a late death and was excluded from further study.

The remaining five could potentially be classified as direct obstetric deaths as the causes of death include blighted ovum, obstetric embolism, ectopic pregnancy and two cases of death following complications of spontaneous abortion. Of these, two had the ‘maternal death’ box ticked, one did not and the other two MCDC hardcopies were missing. Two of the deaths occurred in 2009 and 2010 and one in 2011.

Of the 61 the pregnancy-related deaths which had been originally known to the OGCSCN Lead, 23 had the ‘maternal death’ box checked, 23 did not and six were reported on old-style MCDCs without a tick box. In nine cases, the hard copy of the death certificate could not be located. Of these nine, five cases were not included on the mortality dataset held at HIU.

**Discussion**

In this study, we analysed the 61 pregnancy-related deaths that occurred between 2008-2012 known to the Ministry of Health and the OGCSCN Lead. Because of the limited information, we have only been able to give a description, rather than an explanation, of the patterns of maternal death. In doing so, we have highlighted both strengths and weakness in Fiji’s maternal mortality surveillance cycle.
Interestingly, six of the nine potentially new cases died in divisional hospitals, suggesting weaknesses in health facility reporting of maternal deaths by non-obstetric medical staff to their obstetric colleagues. The other three died at home, in a subdivisional hospital and a psychiatric hospital. All had post-mortems which demonstrates a lack of communication between pathology and obstetric staff. We would recommend that the post-mortems of all women that were pregnant at the time of death or in the year preceding their death be sent to the OGCSN Lead as a matter of routine.

Looking at the clinical database which was used as the basis of this study, it would be tempting to suggest that there were an abnormally high number of maternal deaths in 2012. However, once the seven potential direct maternal deaths are added into their respective years, the 12 deaths recorded in 2012 does not appear to be such an obvious outlier (new totals for 2008, 2009, 2010 and 2011 would be 8, 8, 7 and 9, respectively). We are uncertain if no new cases were detected for 2012 because of improved reporting or because we were unable to cross-validate with PATISplus data for 2011 or 2012.

Causes of maternal deaths
Over 70% of all direct maternal deaths are from just three causes – pregnancies with abortive outcomes, hypertensive disorders and obstetric haemorrhage. The majority of indirect deaths were attributed to cardiac disease. The symptoms indicating these illnesses are currently the subject of scenario based Emergency Obstetric and Neonatal Care (EmONC) practice guidelines and training currently being undertaken by the OGCSN.

One finding that has important implications outside of obstetric services is that eight out of 28 (28.6%) direct maternal deaths were attributed to ectopic pregnancy or complications due to ‘backstreet’ abortions. There is no evidence that these women had received antenatal care prior to their deaths. This suggests the need for cross-disciplinary clinical practice guidelines and consultation to assess women of child-bearing age that present with acute bleeding and/or abdominal pain.

Some of the available narratives indicate that women often were seriously ill or in a moribund state when they presented at health facilities before their deaths. Some of these cases had never booked for antenatal care and evidence suggests that their pregnancies were unwanted and/or concealed. Others had histories of poor health-seeking behaviour even though their pregnancies put them at high risk of a bad outcome. Reaching these vulnerable women will require improved strategies by health workers in the community, such as the Fiji’s recent revitalisation of Community Health Worker scheme and the emphasis on the Birth Preparedness/Complication Readiness interventions.

While there was no attempt to evaluate the standard of care women received, for some cases the available narratives suggested substandard care. There are examples of women not being referred appropriately at various stages of pregnancy. However the causes of substandard care are multifaceted and thorough audit is required to be able to begin to address the underlying issues. This study was not sufficient to make any recommendations about standards of care except to state that the current system is not fit to deliver an adequate surveillance and audit cycle.

A large proportion of cases of pregnancy-related deaths in Fiji are attributed to coincidental causes (39% as compared to 23% for Turkey and 18% for the UK) (Turkylmaz, Koc, Schumacher, & Campbell, 2009) (Lewis, 2007). As mentioned previously, the classification of a death to either indirect or coincidental causes can be subjective.

The correct assignation of such cases requires access to the mother’s records, including post-mortem and additional community-based information if the women did not access healthcare services appropriately. Assigning cases as coincidental without robust discussion and all available information could lead to systematic underestimation of the maternal mortality ratio and leave marginalised members of society even more vulnerable.

Study strengths and weaknesses
This study used the pregnancy-related death dataset held by the OGCSN Lead and the supporting electronic documentation where available. Electronic documentation, when it existed, tended to be restricted to a short narrative of clinical events. No medical files or post-mortems were accessed.

Cross validation was restricted to sources based on death certificates and therefore available case information was limited to basic vital statistics. Time did not allow for a full assessment of the additional case identified.

The current risk management system was not examined in this study, though the root cause analyses seen by the authors did not deal with the pathophysiological and social complexities of the causes of the maternal deaths, instead focussing on the small window of treatment opportunity after a woman is admitted and before she dies. In many of the cases, women are present for medical care in a near-moribund state. The reasons for this are many and complex. Current audit systems, including the risk management system, do not allow these themes to be identified and addressed.

Conclusion
Fiji has made great strides in reducing maternal mortality over the last few decades. Achieving further reductions will require a greater effort to understand the causes of maternal deaths and the concomitant improvement in skills and resources to address them.

This study highlighted the need for a systematised method of identifying pregnancy-related death, the maintenance of a maternal mortality dataset and the difficulty in gaining access to individual case records.

It also highlighted the paucity of information available on which to understand the reasons for the patterns of maternal mortality. The number of maternal deaths in Fiji is relatively small. The fact that there is no national expert-panel peer discussion based on an agreed framework about each case to: 1) determine the classification of death, and 2) make strategic decisions about lessons learned, could be the main factor in the inability to reduce the number of maternal deaths.

While these discussions need to be robust, they also need to be carried out in a blameless environment, allowing cases of substandard care to inform improvement. While this could be challenging it would not be impossible, though commitment from all parties would need to be forthcoming and the appropriate level of resources made available (Iljadica, 2012).

As previously stated, factors surrounding maternal death can be complex. Poverty, inequality (both in relationships and in society) and being inadequately educated all contributes to the risk of dying during or after pregnancy (UNFPA, 2012). These factors are not adequately explored in the current system and yet are vital in understanding how to tackle this issue.

While this study demonstrates the need to strengthen the identification of cases of pregnancy-related deaths, the real issue has been shown to be the ineffectiveness of the current system to understand the narrative themes of these cases. Only through consultation and consensus within the clinical community and commitment from the Ministry of Health, can these tragedies inform clinical practice and health and social policy.
Recommendations

- Formalising the process of reporting pregnancy-related deaths with the Ministry of Health, including between the Obstetric Clinical Services Network and the Health Information Unit and between pathology services and the Obstetric Clinical Services Network.
- Review and improve the effectiveness of how pregnancy-related deaths are reported through all routine data collection, including PATISplus and MCDCs.
- Hospital or forensic post-mortems of all women that were pregnant at the time of death or in the year preceding their death should be sent to the OGCSN Lead as a matter of routine.
- Improve communication with pathology services to ensure that the cause of death reported by the Ministry is as accurate as possible.
- Consult with the Register General on how to improve pregnancy-related death reporting, including recommending that a "Was this woman pregnant within the last year?" tick box be included on a new version of the MCDC.
- Establishment of a maternal audit team to discuss pregnancy-related deaths and defined near misses. This panel should include a core group of dedicated members who have the time to dedicate to the audit system. There should be a core group of obstetric, public health, anaesthetic and paediatric representatives. Members from family health, emergency medicine, psychiatry and other fields should be included on an ad hoc basis when the case details require input from these other disciplines, as should NGOs such as Empower Pacific. A member of the Health Information Unit should also be included as a core panel member. The participation of development partners should also be considered.
- The agreement by the maternal audit team of what constitutes the different classifications of maternal deaths in Fiji. For example, should suicides and violent deaths be included as indirect rather than coincidental deaths? Which, if any, late deaths should be discussed?
- A framework agreed by the maternal audit team to ensure that lessons learned are put into practice.
- The funding of a maternal health audit coordinator whose sole responsibility is to support maternal deaths and near miss audit cycle.

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The Millennium Development Goals (MDGs) were established by the United Nations to focus attention on global inequalities and to do something about them¹. Three of the MDGs (3: to promote gender equality and empower women, 4: to reduce child mortality, 5: to improve maternal health) clearly concern women and the fact that they and their offspring have been shortchanged compared with their male counterparts.

Despite enormous advances in diagnosis and treatment in the last seventy years, infectious disease remains a dreadful worldwide scourge, primarily affecting the poor and disenfranchised, and so the sixth MDG (to combat HIV/AIDS, malaria and other diseases) was established to tackle this. It is important to note that women disproportionately bear the brunt of some of the most severe and debilitating infections affecting humans.

Diseases predominantly affecting Women

There are several disease processes that are well known to have a greater impact on women compared with men including connective tissue/auto-immune conditions such as systemic lupus erythematosus and rheumatoid arthritis²,³. This imbalance extends to infectious diseases too. The difference may be seen in terms of ‘sex’ (the biological and physiological differences between males and females) or in terms of ‘gender’ (i.e. the differences pertaining to socially constructed roles, behaviours, activities and attributes that a given society considers appropriate for males and females)⁴. Gender roles (e.g. time spent at home, traditional care giver role of females) can affect exposure as well as access and females)⁴. Gender roles (e.g. time spent at home, traditional care giver role of females) can affect exposure as well as access to healthcare (including immunization) and nutritional status⁴. Generally the incidence of infectious disease in males and females differs due to exposure rather than biology⁵. However there are exceptions where differences in anatomy, physiology and immunity are important factors. For example urinary tract infections (UTIs) are well documented as more common in women than men. Anatomical reasons are largely the cause as gastrointestinal flora colonise the vaginal introitus before subsequently moving into the urethra. Here the biological difference (the shorter length of the female urethra) results in the more frequent progression to cystitis. Women have a greater than 10-fold risk of a UTI compared with men⁶.

HIV/AIDS

Globally HIV/AIDS is most commonly transmitted by heterosexual sexual intercourse. UNAIDS figures for 2012 estimate that 17.7 million of the 32.1 million adults living with HIV/AIDS are women, therefore making the largest group at 55.1% [8]. This mode of transmission has driven the pandemic in sub-Saharan Africa where two-thirds of the cases of the world’s HIV cases are found and it is here where the proportion of those infected with HIV that are women is even greater than average, at 60% [9]. One of the reasons for this is that penile-vaginal intercourse leads to different risks between discordant partners: a women is twice as likely to acquire HIV from an infected man than a man is from an infected woman [10].

It is important to note that in many parts of the world there is some measure of control being established, particularly where there is universal access to combined antiretroviral therapy. But in other regions, such as South Africa, at the present time, young women are acknowledged to be the group most vulnerable for acquiring HIV and over recent times have demonstrated increasing rates doing so this makes MDG 3 even more vital and urgent to achieve¹¹.

Other Sexually Transmitted Infections

Similarly women are at risk for other sexually transmitted infections (STIs) such as Chlamydia trachomatis and gonorrhoea¹². Infections such as these may go undiagnosed for longer in women compared with men as they are more likely to be asymptomatic or if they do cause symptoms, these may be dismissed as a common gynaecological complaint such as thrush.

Malaria

Malaria, the other named infection in MDG 6, also disproportionately affects women, though particularly in pregnancy. A pregnant woman is more susceptible to Plasmodium infection than her non-pregnant adult counterpart. She is also more attractive to mosquitoes and will have a greater density of parasitaemia compared with non-pregnant adults with the infection¹³. Plasmodium falciparum is the most dangerous to mother and foetus as it sequesters in the placenta causing significant maternal and foetal morbidity and mortality.

Infections in pregnancy

There are some very important intracellular infections that are a great concern in pregnancy – these are mainly viruses, but the list also includes bacteria (eg. Listeria monocytogenes), and some fungi (eg. coccidioidomycosis)¹⁴. A state of relative immunosuppression exists presumably arising from the need not to reject the fetus (half of whose DNA is foreign). Not only is the T-helper cell pro-inflammatory response blunted but the number of T- lymphocytes falls too. In addition natural killer and B cells’ function is also diminished¹⁵. Pregnant women are at particular risk of serious consequences from infections including varicella zoster, measles, hepatitis E, herpes simplex and, as has been recently demonstrated in the 2009 pandemic, influenza all of which are more virulent infections in pregnancy¹⁶.

Pregnancy makes a difference to HIV/AIDS too. A recent meta-analysis of maternal mortality in pregnancy looked at 23 studies (17 from sub-Saharan Africa) and found HIV/AIDS was responsible for 12% of deaths of women in pregnancy and for the first year after delivery where the HIV prevalence was 2%. This figure rose to 50% when the HIV prevalence was 15% ¹⁷.

Conclusions

There are some important situations and conditions when women are at particular risk of infectious disease. This vulnerability is global but is undoubtedly exacerbated by women and girls being largely poorer and less educated than men and boys¹⁸. While the MDGs are going some way to address what is clearly an imbalance, more can be done. For example research has traditionally been biased towards studying males¹⁹ and so, for a start, when scientists study a population they should recognize the importance of disaggregating data to identify sex/gender differences and always, from the outset, consider the potential for added impact of infectious disease on women specifically²⁰.
References


