The Ugandan Maternal and Newborn HUB: Supporting Sustainable and Effective Professional Voluntarism

Benchmarking Report, March 2013

Prepared by Andrew McKay (Social Science Volunteer) and Professor Louise Ackers

The Report could not have been prepared without the Assistance of Records Staff in each of the HUB facilities.
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# 2 Acknowledgements

The authors would like to express their gratitude to all of the people in the Facilities for their assistance with the collection and collation of the data presented in this report. The report could not have been prepared without their assistance. Key contacts in each facility are listed below:

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<th>Mulago National Referral Hospital</th>
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<tr>
<td>Head of Dept Obs and Gynae</td>
<td>Prof. Byamugisha Josepht</td>
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<tr>
<td>Sister in-charge</td>
<td>Babirye Susan</td>
</tr>
<tr>
<td>Medical records</td>
<td>Allo Denis</td>
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<td>Medical records</td>
<td>Lugolobi Swaibu</td>
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</tr>
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<tr>
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<tr>
<td>Medical records</td>
<td>Opio George Pius</td>
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<td>Mugume Moses</td>
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3 Introduction

This benchmarking report provides a comprehensive update on previous benchmarking reports conducted on behalf of the Ugandan Maternal and Newborn Hub’s (the HUB).

The benchmarking exercise is designed to provide a baseline of maternal and newborn health indicators, against which the Sustainable Volunteering Project’s (SVP) impact might be inferred. It draws on data gathered from hospitals and health centres during the final quarter of 2012 and early 2013.

Andrew McKay commenced his placement in Uganda in September 2012 and spent the first four months visiting the facilities and working alongside records staff and SVP volunteers.

We sought to collect data that was as accurate and comparable as possible. In reality this has proved a difficult task. Annex 1 reports on problems with data collection and analysis. Annex 2 outlines the methods used to collect the data to support a repeat process in Year 2.

The report focuses on those hospitals and health centres that are members of the HUB:

Mulago Hospital is the National Referral Hospital. Hoima, Mbarara and Gulu are Regional Referral Hospitals. Kisiizi is a Mission Hospital. Kawempe and Kasangati are Health Centre IV facilities and Kabubbu a Health Centre III. They form part of the referral pathway into Mulago Hospital and a focus of HUB activity (via the Liverpool Mulago Partnership).
4 Maternity Admissions

Admissions to maternity departments vary widely across the HUB reflecting physical and human factors. Average admissions figures are presented in Figure 1.\(^1\)

Even considering the acknowledged underestimate (see Annex 1), Mulago Hospital clearly accounts for the greatest mean number of admissions per month at 2602. Mbale and Mbarara RRHs recorded mean admissions 850 and 830 admissions per month respectively during 2011-2012. Interestingly, Kawempe Health Centre IV (HCIV) had the next highest mean monthly admission rate (524 per month), ahead of Gulu (401) RRH, Hoima RRH (384), Kasangati HCIV (223) and Kisiizi (207), with Kabubbu delivering considerably fewer babies per month than other facilities (19).

**Figure 1:** Mean Monthly Admissions to Maternity Departments in the HUB

With the exception of Kabubbu, within the available data from January 2011 onwards, there were no detectable linear trends in admissions at any SVP facility. It is notable that Kabubbu was upgraded to HCIII status in 2012 and has experienced a marked increase in the number of deliveries during the time period being examined (Figure 2).

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\(^1\) Due to the complexities of data collection, not all averages cover exactly the same time period. However, as the overlapping time periods for which consistent data exist are fairly short, the decision was made to take averages from the beginning of 2011 up to the most recent data available. Data were mainly taken from maternity registers, but when these data were not available, HMIS 105 forms were used.

Due to availability of data, and for consistency with the previous benchmarking report (see SVP, 2012) the figure from Mulago NRH represents deliveries data from the two public maternity wards: Labour Suite, and Ward 14 - a midwife-led maternity ward, equivalent in status to a HCIII. It is important to note firstly that deliveries data provide an underestimate of admissions (not all admissions result in delivery) and secondly that data from the private ward (6D/E) are excluded from this analysis (Figure 1). In fact, figures on total admissions which are presently only available on the HMIS 105 forms for 5 months from April to September 2012 (excluding July) indicate that admissions are considerably higher than the 2,600 presented here, averaging 3,488. The mean number of deliveries per month on the private ward in Mulago was 164 between January 2011 and October 2012, accounting for part of the disparity. As form HMIS 105 covers the whole facility, including all admissions (not only deliveries), including to the private wards; therefore these figures are likely to represent the best overall estimate of admissions to maternity units in Mulago.
The blue, solid line shown here represents the number of admissions at Kabubbu since January 2011. It is clear that there has been a marked increase in the number of admissions to the maternity department at Kabubbu.²

5 Deliveries and Births

The number of deliveries recorded is typically the number of mothers delivered and, as such, represents an underestimate in the total number of births by excluding multiple births (twins, triplets, etc.).

Many facilities have not recorded monthly data on multiple births so it is difficult to analyse this with certainty at present. However, HMIS 105 forms include data on both total deliveries and total live births fairly consistently; therefore this section reports the available data on deliveries and live births since January 2011 (see Figure 3).

As the figures for Mulago are substantially higher than at other facilities, and comprehensive admissions data are not yet accessible, these data are presented separately below for clarity (see Figure 4).

---
² The dashed black trend-line represents the linear regression equation which exhibits a moderately strong goodness of fit to the data ($R^2 = 0.88$; i.e. 88% of variance in data accounted for by the regression model). This indicates that there has likely been a genuine, increasing trend in admissions between January 2011 and October 2012.
The differences between admissions and deliveries should largely correspond with still birth (and abortion) data, though a small proportion of mothers may be admitted temporarily and discharged during pregnancy.

6 Deliveries, Total and Live Births at Mulago Hospital

The public wards in Mulago Hospital delivered on average 2602 mothers per month in the period between January 2011 and October 2012, with an average of 2651 babies born and 2543 live births. Figure 4 excludes the Private Ward which delivers around 164 mothers per month. 

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3 The term ‘abortion’ is used to describe what is known in the UK as miscarriage. However, some of these cases will represent cases of patients seeking treatment following illegal or attempted self-abortions.

4 Data for Labour Suite and Ward 14 were retrieved from the maternity register summary book held in the Obstetrics and Gynecology Department’s records office. Data available include total deliveries as well as the number of sets of twins and triplets. Multiple births were added to total deliveries to give total births. Finally, to give an estimate of live births, fresh and macerated still births (denoted FSB and MSB respectively) were subtracted from total births.

5 A more detailed breakdown of live and still births for public and private wards at Mulago are presented in Figure 14.
As Mulago’s maternity department has such a large patient volume, the numbers of multiple births contribute appreciably to the total number of births, accounting for an average of 49 births per month. Equally notable is the difference between mean total births and mean live births; over 100 births per months are not ‘live births’, representing still births\(^6\).

7 Trends in Admissions and Deliveries
To complement mean data presented above, the numbers of admissions and deliveries for each of the health facilities since Jan 2012 are plotted below to provide a reference point for trends leading up to and including the start of the Sustainable Volunteering Project.\(^7\)

7.1 Kabubbu Health Centre III
From January to October 2012, mean monthly admissions to the maternity department of Kabubbu HCIII were 23, with monthly deliveries averaging 21 (see Figure 5). It is interesting that 90% of total admissions at Kabubbu result in delivery. This is suggestive that mothers

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\(^6\) The sum of figures for still births and live births do not always equal the figure for ‘total births’ suggesting inconsistencies or variables not captured by available data.

\(^7\) In most cases when linear regression analysis was attempted, to identify any possible trends in admissions and deliveries, no statistically detectable trends were observable; possible exceptions are highlighted.
with potential complications have been identified and referred without being admitted at Kabubbu.

Figure 5: Admissions and deliveries at Kabubbu - 2012

![Graph showing admissions and deliveries at Kabubbu in 2012]

### 7.2 Kasangati Health Centre IV

Mean admissions at Kasangati HCIV were 219 per month over the period from January – October 2012.

This corresponds with a mean of 156 deliveries per month (Figure 6).

Deliveries represent 71% of total admissions at Kasangati. While it is likely that many mothers admitted are not in labour, some of 29% remaining are those complicated cases/emergencies which are referred to Mulago NRH.

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8 The Liverpool Mulago Partnership (LMP) is focusing on restoring functionality to these feeder health Centres in order to reduce congestion in Mulago (for details see www.LMPcharity.org. We hope to add more in-depth analysis of data in the Health Centre facilities to support project evaluation.
Mean admissions at Kawempe were 500 per month during the first 8 months of 2012; 423 of these (84%) of these admissions were deliveries (Figure 7).

7.3 **Kawempe Health Centre IV**

Mean admissions at Kawempe were 500 per month during the first 8 months of 2012; 423 of these (84%) of these admissions were deliveries (Figure 7).
7.4 Mbale Regional Referral Hospital
The mean number of deliveries per month at Mbale RRH was 686 while admissions totalled on average 876 (see Figure 8). Overall, deliveries account 78% of admissions to the maternity department, the lowest in the Hub after Kasangati HCIV (see Figure 4). It is unclear why admissions are proportionally higher at Mbale than at the RRHs in Mbarara and Hoima.

Figure 8: Admissions and Deliveries at Mbale - 2012

7.5 Mbarara Regional Referral Hospital
Excluding Mulago and Gulu RR, Mbarara RRH delivers the highest proportion of all admissions within the hub, with 96% of admissions resulting in delivery. Mean admissions were 851 month while the mean number of deliveries was 814 (Figure 9).

Figure 9: Admissions and Deliveries at Mbarara - 2012
7.6 **Hoima Regional Referral Hospital**

The mean number of admissions in Hoima was 387 with a mean number of deliveries per month of 348. 90% of admissions are accounted for by mothers who then deliver (Figure 10):

**Figure 10: Admissions and Deliveries in Hoima - 2012**

7.7 **Kisiizi Hospital**

On average 191 mothers are admitted to the maternity department at Kisiizi hospital every month resulting in 175 deliveries (92% of mothers admitted):

**Figure 11: Admissions and deliveries at Kisiizi - Jan-12 to Dec-12**
7.8 Gulu Regional Referral Hospital

The mean number of admissions per month to the maternity department in Gulu is 409 with the mean number of deliveries being only slightly less at 402. On average, Gulu RRH delivers a higher proportion of admissions than any other Hub site outside Mulago; 98% of mothers admitted to maternity are delivered:

![Figure 12: Admissions and deliveries in Gulu - 2012](image)

8 Maternal Mortality

Maternal Mortality is often expressed via the concept of Maternal Mortality Ratios. MMRs are calculated as the proportion of maternal deaths per 100,000 live births (United Nations, undated).³

Kawempe, Kasangati and Kabubbu have been excluded from the analysis as no maternal deaths were recorded during the time period. This feature of the data is due to the fact that all obstetric complications and emergencies in the Kampala area are currently referred to Mulago.

More detailed data on maternal mortality were available for Mulago than other facilities. Mulago data are presented after the Hub-wide analysis (Figures 20, 21 and Table 1).

Figure 13 illustrates mean monthly MMR figures with error bars representing +/- the standard deviation of the mean. While one can see there are noticeable differences in monthly mean MMR, the standard deviations for these values are also large, indicating a

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³ Guidance issued by United Nations Medical Officer for Monitoring and Evaluation in relation to measurement of Millennium Development Goal 5: ‘Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio’.
high degree of variance (spread) within each data set. Available data indicate a higher MMR in Hoima than other facilities in 2012 (Figure 13). It is notable that data collection has improved markedly in Hoima in recent years and therefore important to acknowledge that the apparently high MMR figure may be due to improvements in data quality rather than reflecting unusually high mortality. In general Mbale had a higher MMR than Mbarara with data from Kisiizi fluctuating between zero and 1,000 maternal deaths per 100,000 live births. Gulu has the lowest reported MMR:

Figure 13: Mean Maternal Mortality Ratios by Facility (MMR) - 2011-2012

9 Maternal Mortality in Mulago Hospital: Public and Private Wards Compared
There is a substantial difference in maternal mortality between Mulago’s public and private wards with only one maternal death in the private ward (Wards 6D/E) occurring between January 2011 and October 2012 compared to 183 maternal deaths on the public wards.

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10 The high degree of overlap between the error bar intervals from individual sites is indicative that it is not possible to conclude that mean MMR truly differs between facilities. Thus, while it is not possible to conclude that mean MMR rates truly differ between SVP locations, the large difference between mean values from Hoima and other facilities is strongly suggestive that MMR within Hoima RRH is genuinely higher than at other facilities. While the error intervals for Hoima and Gulu do not overlap, suggesting a true different in mean monthly MMR, the large magnitudes of the standard deviations makes it difficult to assert this with any certainty.

11 The differences may be exaggerated by low overall live birth figures with a small absolute number of maternal deaths representing a comparatively large proportional (per 100,000 live births) statistic. Attempts to carry out linear regression of trends in MMR since January 2011 in the individual facilities did not yield any results that were suggestive of any linear increase or decrease in maternal mortality over time. The lack of detectable trend is due to the high degree of variance within the data. It was therefore not possible to infer any changes over time with respect to this indicator.
Figure 14 shows the mean MMR in private and public wards with error bars representing the standard deviation:

![Figure 14: Mean Maternal Mortality Ratio (MMR) in Mulago NRH Public and Private maternity wards](image)

10 Total Numbers of Maternal Deaths by Facility

This section provides data on the actual numbers of maternal deaths by facility.

10.1 Mbale Regional Referral Hospital

The number of maternal deaths in Mbale fluctuates between zero and seven per month, with a mean of 3.9 maternal deaths per month for the recorded time period (Figure 15).

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12 Health centres at Kasangati, Kawempe and Kabubbu do not record any maternal deaths; figures for Mulago NRH are presented in more detail in a subsequent section.

13 If a zero (0) does not appear above a space, this indicates that there were no data available. Where the zero (0) appears, this was the number recorded for that month (e.g. Sep-11 in Mbale).
10.2 Mbarara Regional Referral Hospital

The number of maternal deaths in Mbarara ranges from zero to six per month with a monthly mean of 1.9 maternal deaths per month (Figure 16):

Figure 16: Numbers of Maternal Deaths - Mbarara

10.3 Hoima Regional Referral Hospital

The number of maternal deaths in Hoima ranged between zero and seven with a mean of 3.1 maternal deaths per month (Figure 17):
10.4 Kisiizi Hospital
Absolute numbers of maternal deaths in Kisiizi Hospital are relatively low, ranging from zero to two. The mean number of maternal deaths per month was 0.4 (Figure 18):
It was not possible to collect consistent data on the causes of maternal deaths from the majority of facilities. This may be an area of priority to the HUB.

10.6 Maternal Deaths at Mulago National Referral Hospital

The more detailed information on maternal deaths available in Mulago are outlined in Figures 20 and 21 and Table 1 below.

The mean number of maternal deaths per month in Mulago is 13.2, with monthly records ranging from 10 to 19 maternal deaths per month:
Mulago Hospital has engaged in an audit of maternal deaths which provides some details on causes.

Table 1: Causes and frequencies of maternal deaths in Mulago (Jan-12 to Dec-12)

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<th>Causes of death</th>
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<td>Abortion</td>
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Some additional detail was available within these categories. Abortion was recorded as ‘due to complications’; four of these abortion patients had uterine rupture. Of the patients diagnosed with post-partum haemorrhage (PPH), one had retained placenta, three had also suffered ante-partum haemorrhage (APH) and one had cancer of the cervix in labour. HIV-related complications included two mothers with severe bronchopneumonia, seven had pulmonary tuberculosis (PTB) in pregnancy and three had cryptococcal meningitis. Finally, of those patients categorized under puerperal sepsis, eight were given a clinical diagnosis of septicaemia.
**Figure 21** offers a visual representation of the proportional causes of maternal death within Mulago.

**Figure 21: Causes of maternal death in Mulago National Referral Hospital - Jan-12 to Dec-12**

A detailed, month by month breakdown of the causes of maternal death in Mulago are presented in Annex.

### 11 Caesarean Section Rates

Caesarean section (C-section) rates, calculated as a percentage of total deliveries, vary markedly between the health facilities (Figure 22). Gulu hospital has the lowest C-section rate by a substantial margin followed by Mbale, then Mulago (data from Mulago cover the main Labour Suite and Ward 14 (for low-risk mothers):

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14 The very low C-section rate at Kawempe is a result of only very few C-section operations being conducted during the time-period. Kasangati is excluded as no C-sections were conducted in the theatre there during the benchmarking period. Error bars represent the standard deviation of the mean. The overlap of error intervals indicates that it is not possible to infer a true difference in C-section rates between facilities.
Figure 23 reveals higher C-section rates in Kisiizi (25 – 40%) than other Hub facilities since January 2011. However, since August 2012 C-section rates at Kisiizi have been lower than at Mulago and Mbarara. This coincides with a particular intervention by an SVP volunteer (Rachel Ion) (Figure 24).

C-section rates at Mulago and Mbarara follow similar trends (typically remaining below 30%) while they are considerably lower in Mbale (15–20%). The PONT-Mbale Health Partnership has a specific intervention at present promoting the use of Kiwi vacuum delivery in order to reduce c-section rates. This could be part of the reasons for the figures.

Figure 23 illustrates the large degree of variance present within the dataset which generates this issue and explains the difficulty in inferring any true differences in mean values between facilities.

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15 Kasangati is absent from this graph as no C-sections have yet been performed there due to physical, financial and human resource challenges. The data from Kawempe is sparse with C-section rates representing a small fraction of those at facilities of similar size. This is due to limitations in operational capacity – an issue we are addressing in the HUB.

16 See LMPcharity.org for details of this intervention and its outcomes.

17 See discussion on the PONT project below.

18 It is again notable that any increase or decrease in C-section rate over time was undetectable using linear regression.
For future reference for Hub volunteers and other interested parties, the numbers of C-sections being conducted in the Hub facilities are presented below.

12 Number of Caesarean Sections

12.1 Mulago National Referral Hospital

Figure 24 illustrates the C-sections conducted in Mulago in the public and private wards. The number of C-sections conducted with patients from the public Labour Ward averages 518 per month with a maximum of 694 sections performed in October 2012. An average of 85 C-sections per month are performed on patients from the private ward. Thus approximately 16 % of C-sections at Mulago are done privately. It is notable that patients on the private ward are a high risk group, often including older mothers and those more likely to require a C-section due to their medical history. Furthermore, Ward 6D/E does not constitute part of the Hub; figures are included to give a more complete picture of the demand for obstetric surgery in the National Referral Hospital as a whole.
Figure 24: Number of C-sections in Labour Suite and Private Ward (6D/E) at Mulago - Jan-11 to Oct-12

Figure 25 compares the C-section rates (per 100,000 deliveries), between the two wards to show that proportionally, the C-section rate is approximately twice as high in the private ward (51.6 % on average) than on the Public Ward (25.4%):

Figure 25: C-section rates in Mulago Labour Suite and Private Ward (6D/E)
12.2 Kawempe Health Centre IV
Kawempe has been functioning with one medical officer. During the tenure of the previous Eleanor Bradley Fellow, Dr. Emilie Lewis, as many as 18 C-sections were being conducted per month, in the most part by a Medical Officer, Dr. Njoroge V.. Since Dr Njoroge returned to Mulago to undertake his MMed training, the number of C-sections has tailed off significantly due to his limited availability. The figures for August represent the work of a short term LMP volunteer (Figure 26). At present very few if any C-sections are taking place at Kawempe.

![Figure 26: Total numbers of C-Sections at Kawempe HCIV](image)

12.3 Kasangati Health Centre IV
During 2011 and 2012, no C-sections took place at Kasangati HCIV as the operating theatre was not in working order. The Liverpool Mulago Partnership (LMP) has provided substantial financial and material support to Kasangati HCIV to rehabilitate the theatre and construct a post-operative ward (see [www.LMPcharity.org](http://www.LMPcharity.org) for details of this project) which is now ready to be fully operational. Unforeseen challenges have stalled the transition to performing regular obstetric surgery, though it worth noting that several C-sections have taken place at Kasangati since the beginning of 2013 and the appointment of a second medical officer (Dr. Ivan) to Kasangati. These will be documented in a subsequent benchmarking report.

12.4 Mbale Regional Referral Hospital
The mean number of C-sections at Mbale is 119 per month, with monthly totals fluctuating widely, between 84 and 153 during 2011 and 2012 (Figure 27).
12.5 **Mbarara Regional Referral Hospital**

The mean number of C-sections at Mbarara is 208 per month, with individual monthly values ranging extensively from 150 to 344 per month (Figure 28).
12.6 Hoima Regional Referral Hospital

The number of C-sections in Hoima varies between 80 and 125 per month with a mean of 98 sections being conducted per month (Figure 29):

![Figure 29: Total Numbers of C-sections in Hoima - Jan-11 to Aug-12](image)

12.7 Kisiizi Hospital

The average number of C-sections per month is 65 at Kisiizi, with a maximum of 95 being conducted in July 2011 and a minimum of only 39 in the month of August 2012, noticeably lower than it had been in the previous 18 months (Figure 30).

![Figure 30: Total numbers of C-sections in Kisiizi - Jan-11 to Nov-12](image)
### 12.8 Gulu Regional Referral Hospital

A mean of 31 C-sections are performed monthly at Gulu with the number of C-sections varying between 23 and 47 per month (Figure 31):

![Figure 31: Total numbers of C-sections in Gulu - Jan-11 to Dec-12](image)

### 13 Vacuum Delivery

Vacuum delivery rates were calculated as percentage of total births wherever data were available. While some healthcare facilities record data on vacuum delivery, others do not. Figure 33 includes only four of the Hub’s partner institutions. Vacuum extractions represent a small proportion of the total deliveries, remaining below 5% for all facilities during the time-period.

It was not possible to fit data to trend-lines with satisfactory goodness of fit, so these data are not represented graphically. However, examination of regressions suggests that the proportion of vacuum extractions is increasing in Mbale, especially since around October 2011. Rates also appear to be increasing in Kisiizi which has been performing proportionally more vacuum extractions than other facilities.

The HUB is making a significant investment in vacuum delivery at the present time providing equipment for Mbarara and Hoima and working to produce protocols and training. It will be interesting to investigate the potential inverse correlation between vacuum extraction rates and C-section rates. As vacuum extraction become more commonplace, one might expect the C-section rate to decrease concomitantly. It is notable that vacuum delivery rates at
Mulago for this time period are relatively low because Mulago serves a high risk population for whom vacuum extractions are often inappropriate. Furthermore, vacuum extraction rates are increasing due to ongoing training and provision of equipment. Future benchmarking reports will detail the changes in vacuum extraction rates over time at Mulago (Figure 32):

**Figure 32: Mean Vacuum Extraction Rate (% of total births)**

13.1 *Mbale and PONT's KIWI Vacuum Extraction Project*

The PONT-Mbale healthcare partnership has been focusing in recent years on educating and training staff in Mbale RRH in vacuum extraction using the KIWI single-use vacuum. This initiative was implemented in light of evidence that some unnecessary C-sections were taking place and on the basis that vacuum delivery can, in certain cases, offer a safe alternative to surgery. The data presented in Figure 33 were shared by the PONT team.
Figure 33 shows a marked increase in KIWI deliveries since August 2010, though there is a large degree of variance in the data.\(^\text{19}\)

Figure 34 compares the mean numbers of KIWI vacuum deliveries at the Mbale RRH pre- and post-August 2011.\(^\text{20}\)

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\(^{19}\) The linear regression line has an R\(^2\)-value of 0.44, showing that less than half of data points are accounted for by the linear model.

\(^{20}\) Data for March to June 2011 were not available.
14 Neonatal Deaths

Routine data on neonatal deaths has only been recorded on the HMIS 105 form since the new format was adopted. The classification of neonatal death on the form includes deaths from 0-7 days.\(^2\)

14.1 Mulago National Referral Hospital

HMIS 105 data on neonatal deaths from Mulago are currently sparse, with forms only available from April 2012 to August 2012 and two of these months’ data also missing (Apr-12 and Jun-12).

Available data from this source suggests neonatal mortality (0-7 days) ranges between 70 and 100 per month but it is not possible to give more accurate or precise estimates using this data source (Figure 35):

![Figure 35: Neonatal Deaths at Mulago](image)

The following section analyses the most recent data (December 2012 and January 2013) from the Special Care Unit (SCU) in Mulago, where neonates requiring special attention are transferred. Note that not all neonatal deaths occur in the SCU and that the data presented here offer a simple snapshot of records being collected routinely on the ward.

14.2 Special Care Units (SCU) for Neonates, Mulago and Gulu

The information presented here was retrieved from the ward books in SCUs with the kind permission of ward staff in Mulago and Gulu.

The three books in use at Mulago are the Mortality Book, Pre-term Admissions and Full-term admissions.

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\(^2\) This new format HMIS 105 form was adopted by different facilities at different times and even within this set, many data points were missing at the time data were retrieved from facilities.
In Gulu the neo-natal unit was set up by an SVP volunteer (Candice Chin). Candice instituted one book for this purpose (in what is a much smaller unit). All data is recorded in one book at Gulu.

14.3 Admissions to Special Care Unit (neonate) Mulago
There are approximately 500 admissions per month to the SCU in Mulago, emphasizing the scale of the task of caring for neonates in the national referral hospital. Overall, full term admissions account for a slightly greater proportion of the total admissions than pre-term babies (Figure 36).

A breakdown of the reasons for admission is provided in Figures 37 and 38. It is clear that the main reasons for admission of full term babies are birth asphyxia and other respiratory problems (Figure 37) while the overwhelming majority of pre-term admissions were listed with prematurity as the reason for admission (Figures 38).

**Figure 36: Full term and Pre-term Admissions to SCU Mulago - Dec-12 to Jan-13**

![Bar chart showing Full term and Pre-term Admissions to SCU Mulago - Dec-12 to Jan-13](chart.png)

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22 See [www.LMPCharity.org](http://www.LMPCharity.org) for details of this project.

23 The information presented below represent Andrew McKay’s interpretation of handwritten information in the wards books – counts made by another researcher may differ slightly.
Figure 37: Reasons for admission, full term admissions SCU Mulago - Dec-12 and Jan-13

- Birth Asphyxia: 47%
- Prematurity: 1%
- Neonatal Sepsis: 13%
- Congenital abnormalities: 2%
- Breathing Difficulty (other): 16%
- Jaundice: 1%
- Failure to breast feed: 8%
- Other: 12%

Figure 38: Reasons for admission, pre-term admissions to SCU Mulago - Dec-12 and Jan-13

- Prematurity: 83%
- Birth Asphyxia: 7%
- Failure to breast feed: 1%
- Other: 1%
- Jaundice: 0%
- Congenital abnormalities: 6%
- Neonatal Sepsis: 1%
- Breathing Difficulty (other): 1%
All data from the current mortality book (from 1\textsuperscript{st} Dec 2012 to 10\textsuperscript{th} Feb 2013) are included in the following analysis. A total of 241 neonatal mortalities were recorded between these dates: 116 in December 2012, 105 in January 2013 and 20 in February 2013 (up to 9\textsuperscript{th} Feb). Causes of death are recorded in one column of the mortality book. In some cases, more than one cause of mortality is recorded (for example Prematurity and Neonatal Sepsis). In such cases, a count of one was made for each cause. Therefore, more causes of death are recorded than actual mortalities.

14.4 Neonatal Mortality in SCU Mulago

Figure 39 shows the cumulative proportions of causes of death recorded for the 241 neonatal mortalities. Together, prematurity and birth asphyxia account for more than half of the causes of death recorded though it is important to note than in some cases both prematurity and birth asphyxia may have been recorded in the cause of death column for the same neonatal death. Further, there is some doubt about the consistency with which causes of death are recorded and respiratory failure may actually refer to birth asphyxia. Therefore, these data should be interpreted with caution and are intended to provide a snapshot of the situation in SCU.

![Figure 39: Causes of neonatal mortality - 1st Dec 2012 to 10th Feb 2013](image)

14.5 Admissions to the Neonatal Unit, Gulu

The neonatal unit opened in Gulu in August 2012. By the 31\textsuperscript{st} January 2013, a total of 95 babies had been admitted. Figure 40 shows the number of monthly admissions alongside the number of deaths in the unit. A total of 23 mortalities were recorded; these account for 24\% of total admissions since the unit was opened.
Figure 40: Admissions and deaths in SCU, Gulu
Aug-12 to Jan-13

Figure 41 shows the proportions of admissions due to each cause:

Figure 41: Reasons for admission to Gulu SCU - Aug-12 to Jan-23

24 The calculation was conducted on the total number of reasons rather than the number of admissions, because for some individuals, more than one reason for admission was recorded (e.g. prematurity and neonatal sepsis).
The causes of death at Gulu SCU were also recorded. As previously, more than one cause may have been listed for an individual. Counts were made of the number of time each cause was listed (Figure 42). With the overall picture for admissions and deaths is similar, it is notable that a greater proportion of admissions deaths are due to neonatal sepsis than the proportional of deaths caused by sepsis. The converse is true for birth asphyxia and a larger proportion of babies die from congenital abnormalities than one would expect from admissions figure alone (see Figures 41 and 42).

**Figure 42: Reasons for death at Gulu SCU**
*Aug-12 to Jan013*

14.6 Kawempe Health Centre IV
It is difficult to draw any inferences about neonatal mortality at Kawempe due to a lack of data and the large variance present in the available data. It can simply be remarked that neonatal deaths do occur at Kawempe HCIV and may number between 0 and 5 per month (see Figure 43):

**Figure 43: Neonatal Deaths at Kawempe**
14.7 Kabubbu Health Centre III
Two neonatal deaths occurred at Kabubbu HCIII between Apr-12 and Oct-12, one in June and the other in October - due to these low numbers, data are not presented graphically.

14.8 Mbale Regional Referral Hospital
Neonatal deaths at Mbale ranged between 0 and 7 per month over the four month period to Jun-12 (see Figure 44):

Figure 44: Neonatal deaths at Mbale

14.9 Hoima Regional Referral Hospital
In Hoima, the number of neonatal deaths per month varied between 0 and 11 between Jan-12 and Aug-12, averaging approximately 4.7 per month (Figure 45).

Figure 45: Neonatal deaths at Hoima
14.10 Kisiizi Hospital
The dataset for Kisiizi was more detailed than other available datasets on neonatal death. (Figure 46). The mean number of neonatal deaths per month in Kisiizi over this 23-month period was 3.3:

![Figure 46: Neonatal deaths in Kisiizi](image)

14.11 Gulu Regional Referral Hospital
There were, on average, 2.75 neonatal deaths per month in Gulu, according to HMIS 105 data, though it is notable that these data do not correspond directly with the data from SCU (Figure 47). This is partly because HMIS 105 requires neonatal deaths (0-7 days) whereas data from SCU include all neonatal mortalities (0-28 days). Further, some neonatal deaths inevitably occur outside the SCU, offering another explanation for discrepancies between data sets. It is important that for future benchmarking we reconcile these data:

![Figure 47: Neonatal deaths in Gulu - Sep-11 to Dec-12](image)
15 Still Birth Rates

Still birth rates have been calculated as percentages of total deliveries. Still birth rates are highly variable within healthcare facilities over time and there is considerable overlap in still birth rates between facilities. While it was not possible to identify increasing or decreasing trends over time within these data sets for any of the facilities, it does appear that Hoima and Mbale experience higher still birth rates than the other facilities (Figure 48).

Figure 48: Mean Monthly Still Birth Rate for 2011-2012

Mean monthly still birth rates indicate that, proportionally, the still birth rate is highest at Mbale (6.1% of total births), followed by Hoima (5.8%), then Mulago (4.1%) and Mbarara (4.0%). Kisiizi hospital has a lower still birth rate of 2.9% with the health centres at Kasangati and Kawempe having significantly lower rates (1.6 and 0.8 respectively).

Though it is not included in the graph as SVP volunteers are not stationed on the private ward in Mulago, it is noteworthy that the still birth rate was only 1.1% - approximately one quarter of the rate in the public wards in Mulago (4.1%).

15.1 Still births classified by Macerated Still Birth (MSB) or Fresh Still Birth (FSB)

The data on macerated still births (MSB) and fresh still births (FSB) have not been differentiated for all health centres so reporting is limited to the available data. Although

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25 As one might expect, Kawempe and Kasangati record fewer still births as complications in labour or before, which might result in still birth, are referred directly to Mulago.
many factors are involved in still births, MSBs are often generally indicative of levels of antenatal care and FSBs, of care during delivery.

15.2 Mulago – public wards
Figure 49 shows that, on average, MSBs represent less than half (48%) of the monthly total of still births at Mulago.

The ratio of these mean figures gives 0.81 (MSB:FSB) indicating that there are proportionally fewer MSBs than FSBs at Mulago (see Figure 59, p.43).

15.3 Mulago – private ward
The still birth rate in the private maternity ward at Mulago is considerably lower than in the public wards. The numbers of still births are also much lower, totalling no more than 4 per month and averaging 1.8. There are more MSBs than FSBs by a ratio of 2.54, the highest in the Hub, indicating few FSBs are happening in the private ward (Figure 50). These differences are due to a number of factors including the socio-economic status of patients who are able to pay for treatment where facilities are better and there are more staff present.

![Figure 49: Still Births in Mulago Public Wards - Jan-11 to Oct-12](image-url)
15.4 Kawempe Health Centre IV

There are few still births at Kawempe HCIV, between 2 and 5 per month in total. The numbers MSBs and FSBs are roughly equivalent on average, with 1.07 times more MSBs than FSBs (Figure 51).
15.5 Kasangati Health Centre IV
In Kasangati HCIV, the number of still births was also low, never more than 4 per month. There were fewer MSBs than FSBs at Kasangati on average (0.88) (see Figure 52).

Figure 52: Still births in Kasangati
Jul-11 to Oct-12

15.6 Mbale Regional Referral Hospital
Note that data from September 2011 to Feb 2013 were not available. For the data that were available, there were a mean of 21.9 MSBs per month at Mbale RRH, with FSBs numbering 13.4. Thus, overall, there were 1.63 times as many MSBs as FSBs at Mbale (Figure 53).

Figure 53: Still births for Mbale - Jan-11 to Sep-12
15.7 Hoima Regional Referral Hospital
For the months shown in Figure 54 there were, on average, more MSBs than FSBs at Hoima RRH (MSB:FSB = 1.37). The monthly average for MSBs is 9.1 per month with FSB averaging 6.7 per month:

![Figure 54: Still births in Hoima](image)

15.8 Mbarara Regional Referral Hospital
For the months recorded, the mean number of MSBs per month at Mbarara was 10.9 compared to an average of 5.6 FSBs giving a ratio 1.95 MSBs to each FSB (Figure 55):

![Figure 55: Still births in Mbarara](image)
15.9 Kisiizi Hospital
The number of still births per month at Kisiizi varied between two and eleven with FSBs being more common that MSBs overall. There were only 0.61 MSBs for every FSB, the lowest ratio for any UMNH/SVP site (Figure 56).

![Figure 56: Still births at Kisiizi - Jan-11 to Nov-12](image)

15.10 Gulu Regional Referral Hospital
Figure 57 illustrates the numbers of MSBs and FSBs at Gulu RRH. There was a mean of 5.9 MSBs per month between September 2011 and December 2012 with just over half as many FSBs (3.2 per month). Gulu, like other RRHs, has a comparatively high MSB:FSB ratio (1.84);

![Figure 57: Still births at Gulu - Sep-11 to Dec-12](image)
15.11 Comparing MSB:FSB ratios across the Hub

Dividing the mean monthly number of MSBs by the number of FSBs gives a ratio indicating the relative prevalence of MSBs. Values >1.0 indicate that there are more MSBs than FSB, whereas a value <1.0 show that there are fewer MSBs than FSBs. The highest ratios are found within the regional referral hospitals: Mbarara (1.95), Gulu (1.84) and Mbale (1.63) while the lowest ratio of MSB to FSB is found at Kisiizi Mission Hospital (0.61). Second lowest, and the only other Hub facility recording more FSBs than MSBs is Mulago (MSB:FSB = 0.81) (Figure 58).

This indicator could provide a measure of certain aspects of antenatal care; one might expect that more MSBs are occurring at provincial hospitals because of lower compliance with antenatal classes than in urban areas, leading to complications leading to intra-uterine death, going undetected in the antenatal period. There is also some question over how these deaths are being recorded in the various facilities, again highlighting the need to standardize definitions and data collection in order to make meaningful use of the results.

Figure 58: Ratio of Macerated to Fresh Still Births

16 The High Dependency Unit (HDU), Mulago

The high dependency unit in the Obstetrics and Gynaecology Department at Mulago NRH was established as part of the Liverpool-Mulago Partnership collaboration in 2010 and funded by the Tropical health Education Trust (THET).
The unit was set up to care for mothers with acute care needs during/following pregnancy. Mulago, as the National Referral Hospital, deals with many more obstetric emergencies than other health facilities. The data presented in Figure 59 shows the numbers of admissions to and deaths in the HDU from January 2011 to October 2012. From 1574 admissions, there were 104 mortalities; thus 6.6% of patients admitted, died on HDU.

![Figure 59: Admissions and deaths in HDU, Mulago](image)

### 17 Referrals

Referrals in to maternity units are represented here as a percentage of total admissions, so that health facilities of different sizes could be compared proportionally. Figure 60 represents the average proportion of referrals in as a percentage of total admissions with error bars showing the standard deviation. Data on referrals in to Mulago are not available in monthly summary data, though it is possible that this information can be sought in triage were referrals are individually recorded.

As Mulago is the NRH it would be difficult to accurately quantify the number of referrals in as many self-refer or are referred without paperwork by outlying health centres. In reality it is highly likely that Mulago’s referrals-in would represent a much higher percentage of admissions than in the other health facilities.
The mean numbers of referrals in to maternity departments generally ranged between 10 and 15 % of total admissions. The exception to this is Kawempe HCIV where referrals in represent a smaller proportion of total admissions (2.2%), likely as the nearby HCIII at Kabubbu refers patients either to Kasangati HCIV or, more commonly, directly to Mulago NRH.

**Figure 60**: Referrals in to facilities as a percentage of total admissions

Figure 61, below, expresses referrals out of maternity units in a similar way, as a percentage of total admissions. The RRHs and NRH are excluded from this analysis as numbers of referrals out were low enough to make percentages meaninglessly small. Therefore, only Kampala cluster health centres had data available for this analysis. As with other indicators, attempts to detect trends over time were unsuccessful; mean data are presented as they offer the most convenient visualisation of the current benchmark.
The total numbers of referrals out of the Kampala Cluster Health Centres is represented in Figure 6 and Table 3. While Figure 6 gives an idea of the volume of referrals coming out of the health centres, there are some data missing. It can be seen that for months when data were available for all three Kampala Cluster health centres, there were somewhere in the region of 80 to 140 referrals out, all of which can be assumed to be referred to Mulago.

Table 3 shows the numbers reported and where certain data points are missing to give a more detailed picture of referral flows. Finally, it is important to note that referrals out of health centres are likely to be underreported as patients are perhaps not always issued with or accompanied by documentation from the sending facility. It is also possible that patients do not inform professionals at the receiving facility of their referral and that both sending and receiving institutions fail to keep accurate records of referrals.
Table 3: Total Number of monthly referrals from Kampala Cluster Health Centres – 2011

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While it is probable that the figures presented are an underestimate of the referrals out of the health centres’ maternity departments (and therefore in to Mulago NRH) they provide a benchmark against which to compare future referrals trends. If SVP and MoH activities...
proceed as planned and obstetric surgery is being performed at HCIVs, it is conceivable that referrals in to Mulago (and out from Kasangati and Kawempe) will decrease, conversely, one would expect to see an increase in referrals in to Kasangati and Kawempe, and potentially even out to Mulago.

18 Concluding Remarks
It is clear that for most maternal healthcare indicators investigated in this report, there is a great deal of variation within and between healthcare facilities. Despite efforts to use proportional indicators for which the various sites could be compared directly, there is little strong evidence of any upward or downward trends in these key indicators within the time period examined.

Even if a trend could be identified among these variables, within the three year project timeline, it would be very difficult to infer causation. That is, even if favourable trends were observed, it would be practically impossible to attribute the difference to the volunteers’ activities. That said, in the long run, it should be a priority of the healthcare facilities and the MoH to build capacity in record-keeping and data analysis in order to monitor broad-scale change in healthcare outcomes within Uganda. To measure individual volunteer impact using the facility-level data will be difficult, therefore it will be necessary to identify specific, higher resolution variables to record in order to measure the impact of a volunteer on a given, specific project.

19 References
Annex 1: Problems of Data Accuracy and Comparability

Due to the SVP’s geographical dispersal, data from all health facilities do not cover exactly the same time period; though every effort was made to obtain data on key indicators from January 2011 onwards. However, some data were missing or unavailable leaving gaps in the database and limiting the resolution of analysis in a number of cases.

Data Collection

Data from maternity departments are required by MoH to be recorded in the Maternity Register which is typically the responsibility of the in-charge midwife. Furthermore, similar data are required on the Health Ministry Information System (HMIS) monthly reporting forms HMIS 105 and HMIS 108. Thus, the health indicators being analysed in this Benchmarking Report are those retrieved from three main data sources:

1. **Maternity Register** - provided by the MoH and used in all maternity.
2. **HMIS 105** – MoH monthly reporting form which covers indicators from outpatient and maternity departments at the health centre/hospital level.
3. **HMIS 108** – MoH monthly reporting form for inpatients; also includes some maternity/newborn data

Admissions data appear in both locations but it is important to note that at times there are discrepancies between the figures and oftentimes monthly summaries are not calculated (accurately) in the register. Also, both within and between facilities there were inconsistencies in the variables being summarised monthly in the maternity register. Unfortunately, limitations in time and people-power precluded the calculation or verification of totals; figures are reported as they appear in facility records. An attempt has been made to standardise the data and cross analyse data from the same source-type, though missing or inconsistent data made this process challenging. Thus, at times, data sets were ‘mixed’; that is they are derived from different ‘sources’ (*Maternity Register, HMIS 105 or HMIS 108*).

An effort has been made to analyse the same indicators covered in the previous benchmarking report and those for which data are available for the maximum number of healthcare facilities possible. The data for the current benchmarking report was mostly retrieved from maternity and record-keeping departments by the SVP’s social science/evaluation volunteer, Andrew McKay. In the case of Kisiizi, the data were first crossed checked, then forwarded by the volunteer obstetrician, Dr Rachel Ion, to the evaluation volunteer electronically.

It is important to note that for the previous benchmarking report, a number of different undergraduate researchers compiled the data sets and it was not always clear if data had been acquired from *Maternity Registers* or *HMIS* forms. Therefore, when time and records permitted maternity data and monthly reporting data were collected into separate spreadsheets in order to permit comparison and distinction between data sets. As such a composite spreadsheet database for SVP data was created into which future benchmarking data can be inserted. At times, to facilitate the composition of a comprehensive data-set for analysis, data from different sources were compared (e.g. if admissions data were not summarised in the Maternity Register, they were taken
from HMIS 105). It is notable that, where data were available on the same indicator, from two sources from the same facility, figures did not always match.

Another caveat with regard to the data analysis is that records are often incomplete, inconsistent or even incorrect. It is therefore important to interpret the data presented with caution and to appreciate that measuring the impact of volunteers over the three-year project timescale may be challenging using this general dataset. It may be necessary for volunteers to collect more high-resolution data on their specific projects in order to gain a clearer picture of volunteer impact. That said, using the general data from the hospital records has the advantage that it adheres, at least in theory, to the same format, facilitating cross-site analysis.

In some instances, there were gaps in the data due to missing summaries in maternity registers, missing registers and missing/incomplete forms and in one instance, the failure to secure permission in time to access HMIS forms (Kasangati HCIV). As there are so many gaps in the database, it was not always possible to draw direct comparisons of data from the same source-type across sites. For instance no HMIS forms were available at Kasangati and one whole maternity register covering 6 months was missing from Mbale. Data were therefore pieced together from what is available and it would be imprudent to regard the analysis presented here as representative of a standardised data set.

It is also notable that analyses presented here are primarily descriptive as data sets typically did not fit a detectable distribution. Therefore, in the main it was not possible to draw statistically significant conclusions about trends observed over time and the report should be considered as representing a benchmark rather than inferring conclusions about standards of care from the data presented.

Annex 2: Methodology

Annex 2 outlines the methods used to collect the data in order to support the replication of the benchmarking Process in Year 2 (September 2013).
# Annex 3: Maternal Mortality in Mulago NRH

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<th>Cause of maternal mortality</th>
<th>Jan-12</th>
<th>Feb-12</th>
<th>Mar-12</th>
<th>Apr-12</th>
<th>May-12</th>
<th>Jun-12</th>
<th>Jul-12</th>
<th>Aug-12</th>
<th>Sep-12</th>
<th>Oct-12</th>
<th>Nov-12</th>
<th>Dec-12</th>
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