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RATIONAL INJECTION USE IN UGANDA: AN IN-DEPTH ANALYSIS OF OUTPATIENT PRESCRIPTION RECORDS IN FIVE DISTRICTS

MAKING MEDICAL INJECTIONS SAFER (MMIS) PROJECT STUDY REPORT

MAY 2009

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MMIS
Making Medical Injections Safer

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Abstract: The United States President's Emergency Plan for AIDS Relief (PEPFAR), through the United States Agency for International Development (USAID), funded John Snow, Inc. (JSI) to implement the Making Medical Injections Safer (MMIS) project in collaboration with the Ministry of Health in Uganda. JSI and its partners also implement similar projects in 10 other countries in Africa and the Caribbean. This report describes the results of a retrospective survey of prescription records conducted in January 2006 in upper- and lower-level public and private facilities in four MMIS intervention districts and one control district in Uganda.

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Abbreviations

AD	Auto-Disable (syringe)
AIDS	Acquired Immune Deficiency Syndrome
BCC	Behavior Change Communications
HIV	Human Immunodeficiency Virus
HSD	Health Subdistrict
JSI	John Snow, Inc.
MACRO	Macro International, Inc.
MMIS	Making Medical Injections Safer project
MOH	Ministry of Health
NGO	Nongovernmental Organization
OPD	Outpatient Department
PEPFAR	President's Emergency Plan for AIDS Relief
PFP	Private-For-Profit
RPAT	Rapid Pharmaceutical Assessment Tool
SIGN	Safe Injection Global Network
USAID	United States Agency for International Development
WHO	World Health Organization

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EXECUTIVE SUMMARY

According to the World Health Organization (WHO), the unsafe administration of injections in health care is responsible each year for approximately 8 to 16 million cases of hepatitis B infection, 2.3 to 4.7 million cases of hepatitis C, and 80,000 to 160,000 cases of human immunodeficiency virus (HIV) infection in the world. Certain high-risk practices add to these cases including, notably, the reuse of syringes and needles without sterilization and improper disposal of used injection equipment.

MMIS supports the MOH of Uganda in carrying out injection safety interventions. One of the primary means of improving injection safety is to reduce the number of injections given, replacing injections with oral medications. By decreasing the numbers of injections, several injection safety objectives are addressed—e.g., reducing the chances of needlestick injuries and unsafe injections; reducing the costs associated with the procurement of AD syringes, medicines, and transport costs to the facility; and reducing the amount of medical waste that must be managed.

The MMIS project's health worker training and the behavior change and communications (BCC) at the community level devote considerable attention to the reduction of the number of therapeutic injections. Health prescribers and providers are trained in proper prescribing procedures, stressing that noninjectable formulations of medications are frequently an easier, quicker, less expensive, and better way to provide therapeutic care.

This study was designed to measure the effectiveness of the training and communications activities in reducing injections for selected diseases/conditions. Data were collected from actual prescriptions, reviewing the information recorded in the patients' registers before the training compared to similar information after the intervention. The sample was designed to allow MMIS to analyze the effectiveness of the interventions by district, level, and ownership of facility, gender, age groups, and major diagnostic groups. This will permit MMIS and the MOH to identify strengths and weakness in training and communication and further strengthen interventions.

1. Objectives and Methodology of the Study

The main aim of the study was to determine if the training received by the providers and prescribers and communication activities was effective in reducing the number of injections prescribed. The specific objectives were to:

- Compare prevalence of injections preintervention (i.e., baseline) versus postintervention (i.e., follow-up) across all cases and for diagnostic groups;
- Determine if there was any difference in prescribing practices by ownership at the public, nongovernmental organization (NGO), or private health facilities;

- Determine if there was any difference by level of care (i.e., between the primary care level and hospitals);
- Ascertain if lack of oral medication alternative (measured as stockouts during any study month) was related to overprescribing of injectable medications.

In addition, results were analyzed by district, age, and gender to assess the extent to which these factors may influence prescribing patterns.

The study consisted of a retrospective review of patient prescription records. Five different categories of facilities were included in the study:

- Level II and III (public-sector primary health centers)
- Level IV and V (upper-level public-sector facilities up to district hospitals)
- NGO, Level 1 (primary health centers)
- NGO, Level 2 (hospitals)
- Private-for-profit (PFP) (storefront chemist shops and small clinics)

Only outpatient department (OPD) patient records at all the levels of care were included in the study.

The data were collected from Ibanda, Mpigi, Nebbi, and Pallisa districts, which were the four Phase 1 districts in which MMIS conducted training of prescribers and providers. Luwero district was included as control.

2. Results

A total of 12,320 prescriptions were reviewed from 51 health facilities for this study. Half of the prescriptions reviewed were from the preintervention period, while the other half were from the postintervention period. Of the study samples, about one-third were records of children under five years of age. Records from female clients accounted for approximately three out of five cases, with the rest being male.

Unlike earlier interventions (e.g., introduction of clinical guidelines) where no demonstrable reduction in injection use was achieved (Kafuko 1994), the combination of training of health workers on the dangers of unsafe injections, risks associated with unnecessary injections, and an emphasis on following treatment guidelines supported by behavior change campaigns targeting prescribers and communities to reduce demand for unnecessary injections resulted in significant reduction in prescriptions of injectable medications in MMIS intervention areas.

It is difficult to conclusively compare the magnitude of this change with earlier studies that looked at behavioral change in drug use after an intervention. The previous studies either focused on one disease or relegated injection prescribing to the periphery (Obua et al. 2004).

In this study, in spite of significant reductions, the results show that the prevalence of injection use in Uganda remains very high. In fact, it is still far above the desired target of 15% (Kafuko 1994).

3. Changes in Injection Prescribing by District

Across the entire study sample in intervention districts, there was a significant reduction in the proportion of cases being prescribed injections from 39.8% at baseline to 33.9% at follow-up ($p \leq .001$). Furthermore, in 3 out of 4 individual project districts—Pallisa, Mpigi, and Nebbi—there was a significant reduction in injection use across all cases, with Pallisa having the highest proportion of cases prescribed at least 1 injectable medication at both baseline and follow-up of any district. Ibanda—which had the lowest level of injections in both time periods—was the only intervention district that did not change significantly over time.

In contrast to the MMIS intervention districts, Luwero district (the control district in this study) had a significant increase in prescriptions of injections over time from 22.8% at baseline to 31.1% at follow-up ($p \leq .001$).

4. Changes in Injection Prescribing by Ownership and Level

When all four intervention districts are considered as a single group, all three types of ownership (government, NGO, and PFP) showed significant reductions over time. The highest rate of injection use was found in PFP facilities, while the lowest was in government facilities.

When the data are further analyzed by lower or upper level as well as ownership, all five categories described above in the Objectives and Methodology of the Study section showed significant reductions over time. PFP facilities continued to have the highest rates of injections. Among NGO facilities, lower-level facilities gave significantly more injections than upper-level facilities. Similarly, lower-level government facilities prescribed more injections than upper-level facilities.

5. Changes in Injection Prescribing by Gender

Both genders showed a significant reduction in the proportion of cases prescribed an injection in the postintervention period. Male patients were prescribed significantly more injections than females in both study periods.

When the data for all intervention areas were analyzed by level, significant decreases over time were found among both men and women in lower-level public facilities and upper-level NGO hospitals. In contrast, in upper-level public facilities, lower-level NGO facilities, and PFP facilities there were significant decreases in prescriptions of injections among only women, while the results for men remained similar in both time periods.

When lower-level and upper-level public results were combined and when lower and upper-level NGO results are combined, both genders demonstrated significant reductions in injections in these ownership groups over time.

6. Changes in Injection Prescribing by Age Group

In all four age groups, significant reductions in injections were seen over time ($p \leq .01$). The highest levels of injections were found among the youngest patients.

7. Changes in Injection Prescribing by Diagnostic Group

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment (in other words, they are not mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register) and four major groups for which an injection *may be given* as part of standard treatment (in other words, they are mentioned or recommended in treatment guidelines). The former are referred to as having "nonrational" use of injections compared to "rational" use of injections in the latter.

The diagnostic groups for which an injection is not considered part of standard treatment (i.e., nonrational treatment) are:

1. Malaria alone,
2. Malaria in combination with any secondary condition that *does not require* an injection (i.e., with no conditions that would reasonably be considered a case of complicated malaria),
3. Cough/cold alone,
4. Miscellaneous conditions that *do not require* an injection.

The diagnostic groups for which an injection may be given as part of standard (rational) treatment are:

1. Malaria in combination with any secondary condition that is treatable with an injection,
2. Malaria and pneumonia,
3. Infected wounds and trauma,
4. Miscellaneous conditions that *may merit* an injection.

Across the combination of all four project intervention districts, significant reductions in the proportion of cases receiving an injection were found for three of the four broad diagnostic groups for which injections were not a part of the standard treatment guidelines (i.e., malaria alone, malaria with secondary conditions that do not require an injection, and miscellaneous conditions that do not require an injection). Cases with cough/cold recorded as the only diagnosis formed the diagnostic group with the lowest rate of injections at both baseline and follow-up and did not change significantly over time.

Interestingly, of the diagnostic groups for which injections may be given, three of them did not change significantly over time: Malaria and pneumonia, malaria with any secondary condition other than pneumonia that is treatable with an injection, and miscellaneous conditions that may merit an injection. In fact, significant reduction was found in only the group of infected wounds and trauma. Within this group, cases of domestic violence showed significant improvements. Although the other specific subcomponents of this group (road

traffic accidents, other intentional trauma, other nonintentional trauma, and infected wounds) did not change significantly over time, their general downward trend over time contributed to the results for the larger composite group.

For the four out of eight diagnostic groups for which the overall change was significantly reduced injections in the intervention districts at follow-up (i.e., malaria alone, malaria with any secondary condition that does not require an injection, miscellaneous illnesses that do not require an injection, and infected wounds), one or more age groups also showed a significant change over time. In addition, two diagnostic groups for which the overall result did not change significantly over time had one or more age groups that did change (i.e., cough/cold alone; and malaria and pneumonia). All of the significant changes were *reductions* in the proportion of patients receiving injections. The most reductions occurred in the group of patients over 30 years of age in which reductions were seen in three diagnostic groups. In the other three age groups, there were significant reductions in two diagnostic groups.

In addition to the analysis by age group, the overall sample for the four intervention districts was also analyzed to determine whether there were any significant differences by gender.[1] The findings from this survey revealed significant *decreases* in two diagnostic groups for men and four for women.

When significance testing was conducted on the sum of all records for the four intervention districts and the two overarching categories of rational and nonrational use of injectable medications, significant *reductions* were found for both groups. Among the 1,640 cases for which conditions might require an injection (i.e., those for which an injection would be considered a rational treatment), 44.7% received 1 or more injections at baseline compared to 39.0% at follow-up. Similarly, among the cases in which injections were *not* rational (standard) treatment according to the MOH guidelines, a significant reduction was found such that 37.8% of the cases received 1 or more injections at baseline compared to 31.8% at follow-up. This general finding across the four districts, however, masked important differences that arose when each district was analyzed separately. *(Please refer to Chapters 5 to 9 on specific district-level findings for further details.)*

8. Prescribing Patterns Related to Availability of Oral Alternatives

Among the 4,070 records with 1 or more injections across all 4 intervention districts, 90.1% of the patients were prescribed an injection when an oral alternative drug was in stock at the time of the baseline study period, compared to 86.2% in the follow-up period[2]; 3.6% of the patients receiving injections at baseline and 4.2% at follow-up were the only cases in which oral alternatives were definitely not available. In the remaining cases, there were either no records or conflicting information on the availability of oral alternatives. Of the three ownership categories, PFP facilities were the most likely to have *in*complete stock records.

[1] Patients' records that lack data on the gender of the patient are excluded from this analysis.
[2] A drug was considered as "out of stock" at the facility when the stock records had remained at zero for a period of at least one week in keeping with the definition used in Uganda. The one-week window provided for possibility of the drug being available at the dispensary even if the stockcard showed no supply.

9. Analysis by Number of Injectable Doses Prescribed

The number of pricks recorded in any case within the 4 intervention districts varied from 1 to 40. The average across all districts was the same for both the preintervention and postintervention periods (3.8 and 3.9 pricks, respectively).

10. Discussion and Conclusions

Interventions implemented by MMIS included training health workers on the dangers of unsafe injections and the risks associated with unnecessary injections, coupled with behavior change campaigns targeting prescribers and communities not to demand injections, and revisions in the MOH treatment protocols (specifically the change in malaria treatment guidelines). These interventions brought about significant reductions in the prescription of injectable medications in three of the four districts (Nebbi, Mpigi, and Pallisa) included in this study. The only district that did not see a significant reduction overall (Ibanda) was the district that was closest to the MOH goal of 15% of patients receiving a prescription for an injectable medication.

In general, a higher rate of injection use was found in the primary health care facilities compared to hospitals. This could be related to the availability of better diagnostic facilities in upper-level facilities as well as having more trained personnel who may been able to make a more definitive diagnosis and recognize patients who need an injectable treatment (MOH, JSI, and MACRO 2002).

It was believed that large hospitals would be likely to see very complicated cases and would, thus, be *un*likely to achieve significant reductions in injection use. The findings of this study, however, showed reductions in the prescription of injectable medications across all levels of care and all types of ownership in the intervention districts as a whole. PFP facilities continued to prescribe the highest number of injections. Special interventions targeting the private sector may have to be developed to bring about further changes, but it was encouraging to see the reduction that was already achieved using the same strategies as in government facilities.

With the overall reduction in the prescription of injectable medications in three of the four districts, a reduction in the number of pricks or individual doses of those medications might have been expected; however, only Nebbi district decreased significantly. This study found that injections were commonly prescribed even when oral alternatives were available.

The overall analysis across all four intervention districts masked important differences when each district was considered alone. These differences are described in detail in Chapters 5 to 9 of this report, but in general, the pattern that was seen in the district-level analysis can be summarized as showing that the districts with the highest use of injectable medications (Pallisa and Mpigi) were the districts with the most reductions.

Another general conclusion is that the district of Luwero was not as good of a control as had been expected. As explained in Chapter 2, this district was selected as a control because of a prior study that showed it to be similar to the intervention district of Nebbi. However, the findings of this study showed that at baseline Luwero had significantly fewer injections than Nebbi although both districts were similar by the time of the follow-up study.

In the analysis by gender, despite significant decreases for both genders over time, male patients were prescribed significantly more injections than female patients in both studies periods when all intervention districts were combined. In Pallisa and Mpigi districts, prescriptions of injections fell significantly for both genders, while in Nebbi district only women received significantly fewer injections at follow-up than at baseline. Interestingly, in three of the four intervention districts (Ibanda, Nebbi, and Pallisa), by the time of the follow-up, men were significantly more likely to receive injectable medications than women. It is not clear whether this finding indicates a higher rate of demand for injections among men, a perception of more serious illness among male patients, or if prescribers make this choice themselves. Further investigation would be required to investigate this discrepancy.

In the analysis by age groups, it was clear that the youngest patients—children from 0 to 5 years of age in particular—received the most injections. These findings held true across all districts in spite of reductions in the prescription of injectable medications across all ages when all districts were tested as a group.

In the overall analysis by diagnostic groups, the groups consisting of cases of malaria, malaria with secondary conditions that do not require an injection, miscellaneous cases that do not require an injection, and infected wounds and trauma all decreased significantly over time across the total sample from the four intervention districts.

As reported in Chapter 4, significant reductions in the prescription of injectable medications over time were found for both rational and nonrational cases of injection use. Once again, Mpigi and Pallisa districts, which had the highest proportions of patients receiving injections, were the districts that had significant reductions in both categories, while in Nebbi reductions were only seen in the rational group, and in Ibanda no significant changes were seen.

Although the overall findings of this study are encouraging, it is important to note that the rate of injection use among nonrational cases of prescription of injections at follow-up (31.8%) is still double the MOH goal of 15% of *all* cases—rational and nonrational—receiving an injection. This is particularly striking considering that these “nonrational” cases do not have *any* symptoms associated with treatment by injections. This suggests that although progress has been made more efforts are needed to continue to educate health workers on the advantages of noninjectable treatment and to reinforce compliance with treatment protocols.

11. Recommendations

- It is recommended that the MOH revisit the targets set for the prescription of injectable medication. In addition, it appears that these districts still need more training on rational use of drugs with emphasis on reducing unnecessary injections. In particular, these efforts can focus on identifying diagnoses and conditions for which further reductions can be made without compromising patient care.

- In view of the initial success of the interventions undertaken by MMIS, it is recommended that similar interventions be implemented in all districts to reduce the existing high rate of injection use nationwide. These interventions can be further tailored and enhanced using the data from this study.

- More efforts should be made to involve the private sector in reducing unnecessary injections. Prescribers in the private sector need special attention to ensure that they adhere to treatment guidelines. If the monitory incentive is strong, educational intervention will have to be combined with sensitization of the consumers, but the results reported in this study are encouraging as they show a good response from this group.

- Further studies should be undertaken to understand the factors motivating prescribers to recommend injections even when effective oral alternatives are available and in stock. Patients' demands and individual patient's characteristics such as gender and age appear to be factors that influence prescribers' behavior. More information is needed on the prescribers' and patients' attitudes toward injections to understand the strong motivation to prescribe injections.

CHAPTER 1: INTRODUCTION

According to the WHO, the unsafe administration of injections in health care is responsible each year for approximately 8 to 16 million cases of hepatitis B infections, 2.3 to 4.7 million cases of hepatitis C infections, and 80,000 to 160,000 cases of HIV infections in the world. Certain high-risk practices add to these cases including, notably, the reuse of syringes and needles without sterilization and improper disposal of used injection equipment. Overprescription of injectable medications further exacerbates this situation as it leads to more used sharps that require safe disposal; more instances in which injection providers may be injured by accidental needlesticks; and greater need for new, sterile devices to ensure patient safety.

Given this situation, the WHO in collaboration with partners from the Safe Injection Global Network (SIGN) developed an intervention strategy aimed at reducing injections and promoting the administration of safe injections. The SIGN strategy is based on three core areas, which are

1. Behavior change of health care workers and patients to ensure safe injection practices and reduce unnecessary injections,
2. Ensure availability of equipment and supplies,
3. Manage waste safely and appropriately.

In a majority of countries, the WHO strategy is justified by the fact that, with the exception of vaccination programs, the issue of safe injections and waste management had not received much attention from the government or the community of development partners until recently. The MMIS project, which is funded by PEPFAR through USAID and Centers for Disease Control and Prevention, was specifically designed to address these issues.

The MMIS Project supports the MOH of Uganda in strengthening injection safety practices. One of the primary means of improving injection safety is reducing the number of injections given by replacing injections with noninjectable medications. By decreasing the numbers of injections, several injection safety objectives are addressed such as reducing the risk of needlestick injuries and unsafe injections; reducing the costs associated with the procurement of auto-disable (AD) syringes, medicines, and transport to the facility; eliminating the need to return to the health facility for follow-up injections; and reducing the amount of medical waste that must be managed.

The MMIS project's health worker training and behavior change and communications at the community level devote considerable attention to the reduction of the number of therapeutic injections. Health prescribers and providers are trained in proper prescribing procedures, stressing that noninjectable formulations of medications are frequently an easier, quicker, and less expensive way to provide therapeutic care. The project attempts to reduce the demand for

injections by training providers to explain to patients that in a large percentage of cases noninjectable formulations of medications are available that are as effective as the injectable drugs. Almost every injectable medication has a noninjectable alternative that can be made available. At the community level, behavior change communications (BCC) messages are focused on reducing demand for injections. It is believed that if the community demands fewer injections prescribers and providers are less likely to recommend them.

MMIS/Uganda and the MOH trained the health prescribers and providers in both the public and private sectors (including NGO and PFP providers) in the four Phase I (pilot) districts of Ibanda (Mbarara)[3], Nebbi, Mpigi, and Pallisa starting in mid-2004. Part of this training included information on the importance of not overusing therapeutic (curative) injections. At the same time, messages were developed and disseminated to the community on alternatives to injections that are often as good or, in some cases, even better than injectable medications. Concurrently with these interventions by MMIS, the MOH developed and disseminated a new policy for the treatment of malaria with noninjectable medications.

This study was designed to measure the effectiveness of the training, communications, and policy changes aimed at reducing injections in general and injections for selected diseases and conditions in particular. Data were collected retrospectively from facility-level prescription records by reviewing the information recorded in the patient registers before and after the training and other interventions took place. A sufficiently large sample was obtained to allow the project to determine the effectiveness of the interventions by district, by major diagnostic groups, by level of facility, and by type of ownership of facility. This design enabled the MOH and MMIS to identify strengths and weaknesses in training and communications activities that could be addressed as interventions continued in other districts.

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[3] Mbarara was initially named as an intervention district. It was subsequently divided into four districts, of which Ibanda was purposefully selected for this study since it was the only district where all levels of facilities needed for this analysis were found. Please refer to Section 2.2.2 for more information.

CHAPTER 2: OBJECTIVES, METHODOLOGY, AND FIELD WORK FOR THIS STUDY

2.1 OBJECTIVES

The main aim of the study was to determine if the training and other interventions received by the providers and prescribers as well as community-level communications were effective in reducing the number of injections prescribed.

The specific objectives were to

1. Compare the prevalence of injections preintervention versus postintervention across all cases and for the specific diagnostic groups which were common enough to have quantifiable results;
2. Determine if there were any differences in prescribing practices by ownership at the public, NGO, or PFP health facilities;
3. Determine if there was any difference in the prescribing practices by level of care comparing primary care (Levels II and III in the Ugandan health system) and more advanced care (Level IV and V hospitals);
4. Ascertain if stockouts of oral (or other noninjectable) medication alternatives were related to over-prescribing of injections.

2.2 METHODOLOGY

2.2.1 STUDY OVERVIEW

The study consisted of a retrospective review of patient prescription records. Five different categories of facilities were included in the study:

Group 1. Public sector Level II and III (primary health centers),
Group 2. Public sector Level IV and V (upper-level facilities up to district hospitals),
Group 3. NGO Level 1 (primary health centers similar to Levels II and III in the public sector),[4]
Group 4. NGO Level 2 (hospitals similar to Level IV and V in the public sector),
Group 5. PFP (storefront chemist shops and small clinics).

OPD prescription records at only these levels of care were included in the study. By using only outpatient records, it was hypothesized that the cases would be less complex since patients with severe illness would be likely to be referred for admission immediately rather

[4] These NGOs may be faith based or they may be run by international NGOs or community-based organizations (CBOs).

than being treated in the OPD. In addition, the national standard clinical guidelines clearly spell out the first and second line treatments for the OPD. Thus, it was felt that these cases would lend themselves to analysis as to which injections for which types of cases were likely to have been medically necessary.

2.2.2 SAMPLING OF FACILITIES

As mentioned in the Introduction, Mbarara, Nebbi, Mpigi, and Pallisa were the four Phase 1 districts in which MMIS conducted training of prescribers and providers. After MMIS began its interventions, the government of Uganda subdivided some districts. Mbarara was split into four districts: Ibanda, Kiruhura, Isingiro, and Mbarara. Of these, data collection for this study were focused on Ibanda district, which is the district where all levels of facilities needed for this analysis were found. Nebbi, Mpigi, and Pallisa district boundaries remained unchanged as of the time of this study.

In addition to collecting data in the intervention districts, the MOH requested that MMIS collect data in a control district. MMIS purposefully selected one of its expansion districts—Luwero—as the control district in order to facilitate access to the selected health facilities and because of its similarity to intervention districts. It was chosen as a control using the data from a prior study entitled *Rapid Assessment of Drug Use in Selected Districts* by Khalid Mohammed and Morris Seru, which looked at more than 15,000 patient records from 10 districts. In that study, 33% of the sample of 1,487 patient records from Luwero had 1 or more injections, compared to 31% in Nebbi District. The other MMIS Phase I districts were not included in this prior study, and the only other expansion district that was included in the study—Mbale—was quite different from Nebbi with 50% of patients receiving 1 or more injections. Mbale had also begun to have interventions, so for this reason as well, it was not a suitable control. It is important to note that only public facilities at the lower level (II and III) and at the upper level (IV and V hospitals) were studied in the Luwero control district. No data were available on private sector facilities in the control district to establish the extent to which they might be comparable to those in the intervention districts, so they were not included in this study.

In order to ensure collection of the desired sample (described in the next section), multiple facilities were randomly selected at each level of each district from a listing provided by the MOH. As a general rule, 4 facilities were selected for the lower-level public sector group, NGO Level 1, and PFP categories (i.e., Groups 1, 3, and 5 as described in Section 2.2.1) since these facilities see fewer patients. At the higher levels of public and NGO facilities (i.e., Groups 2 and 4) where there are fewer facilities and higher case loads of patients, 2 facilities were selected to complete the desired sample. The exceptions to this general plan were districts with fewer facilities or districts that did not have facilities of a particular type. These exceptions include Nebbi (which only has 1 upper Level 4 public sector facility and no government hospital), Pallisa (which has no upper-level NGO facility), and Mpigi (which had only 3 PFP facilities on the MOH listing). The number of randomly-selected facilities in each of the five districts is shown in Table 1.

As shown in Table 1, to the extent feasible, facilities representing all levels of the health structure were included in the study in each district, giving a desired total of 64 facilities in all 5 study districts. If any facility's records were found to be illegible, unavailable, or otherwise unusable, the data collectors were instructed to replace the selected facility with another randomly selected facility in the same category. Replacements were not to be used simply to complete a missing case for a particular diagnostic group or a particular quarter; they were to be used only as complete replacements of an entire facility and only when one of the conditions noted above was met. The listing of replacement facilities was prepared at the same time that the facilities selected for data collection were sampled so that data collectors would have easy access to this list during the fieldwork.

Table 1: Listing of facility categories and the planned sample

Group	Category of Facility	Number to be Selected Per District	Districts
1	Public sector Level II and III (lower level)	4 facilities	Ibanda, Mpigi, Nebbi, Pallisa, Luwero
2	Public sector Level IV and V (hospital)	2 facilities	Ibanda, Mpigi, Pallisa, Luwero
		1 facility	Nebbi
3	NGO 1 (lower level)	4 facilities	Ibanda, Mpigi, Nebbi, Pallisa
4	NGO 2 (hospital)	2 facilities	Nebbi
		1 facility	Ibanda, Mpigi
5	Private (clinics)	4 facilities	Ibanda, Nebbi, Pallisa
		3 facilities	Mpigi

2.2.3 STUDY POPULATIONS AND SAMPLE DESIGN

The sample design for each district is shown in Table 2. A sample size of 80 records per quarter and level of care was planned in each district as shown. The 80 cases for each level were to be distributed across all the selected facilities in that level in a given district. For example, if 4 facilities were sampled in a given level in a district, 20 cases would be selected from each facility to give the total desired sample of 80. If fewer facilities of a given type were available, the sample would be distributed as needed to maintain 80 records overall for that level and time period.

This sample size was based on the minimum number of cases needed to assess an assumed level of 25% injection prevalence plus an additional 10% margin of error. The goal of the MOH is to reduce the prevalence of injections to 15% (a 40% reduction over the estimated baseline). Having 80 cases per level per quarter was calculated to provide a sufficient sample size that would permit statistical testing for each facility level at 95% confidence level as well as permitting testing of changes across all cases and for common diseases or conditions.

Table 2: Sample design per time period and per level

Facility Categories and Levels		*Quarter 2*			*Total*
Public sector Level II/III	80	80	80	80	320
Public sector Level IV/V	80	80	80	80	320
NGO 1	80	80	80	80	320
NGO 2	80	80	80	80	320
PFP	80	80	80	80	320
Total	**400**	**400**	**400**	**400**	**1600**

The study population comprised OPD records for the year prior to the initiation of the injection safety training (i.e., July 2004), at which time the health workers/prescribers were instructed to follow the national clinical and Integrated Management of Childhood Illness guidelines, prescribing injections only when necessary. Therefore, the **retrospective baseline** of existing prescription records extended from July 2003 through June 2004. The cases were sampled from the first month of each of the four quarters (**July** to September, and **October** to December 2003; **January** to March, and **April** to June 2004).[5]

Data collectors reviewed the registers to select the number of cases listed in Table 2. Once the listing of cases was completed for each quarter, the data collectors then divided the number of cases on the list by the number of cases needed to determine the sampling interval. Using a random number starting point, the data collectors then systematically selected the cases to be extracted and reviewed.[6] This process was repeated in each quarter in the selected facilities to complete the sample of 320 cases that was required per level. In facilities that maintained 2 separate registers for children less than 5 years of age and for patients older than 5 years, the data collectors counted the records in both registers for the month to be sampled and then distributed the sample proportionally across the 2 registers.

The postintervention sampling begins in January 2005, by which time all the health workers had been trained. The same process that was described above for the baseline records was used to select prescription records for the follow-up from the same facilities. In this way, each randomly selected facility from the baseline serves as its own control for the follow-up

[5] The reason for dividing the year into quarters and sampling equally from them was to ensure that the study design controlled for any seasonal disease patterns (and corresponding changes in treatment patterns) in the sample. Data collection was focused on the *first month* of the quarter rather than being spread evenly across the entire quarter as a way of balancing the need to increase the efficiency of data collection while still spreading the sample across the time period. During the field testing of this methodology, some of the largest facilities were found to have up to 300 cases *a day;* systematic selection of 80 cases across 90 days with this case volume would have been impractical.

[6] Systematic selection rather than random selection was used to ensure that the cases were spread across the entire month.

survey. The records were sampled from the first month of each of the four quarters of 2005 (**January** to March, **April** to June, **July** to September, and **October** to December).

2.3 DATA COLLECTION

Data were collected from the outpatient prescription registers and entered directly into a database in a laptop computer. For every case selected, the following data were recorded in the database:

- District name,
- Facility name,
- Level of the facility (lower or upper),
- Ownership of the facility (public, NGO, or PFP),
- Month and year of the visit,
- Gender of the patient,
- Age of the patient,
- All diagnoses and conditions,
- Names and doses for all medications prescribed,
- Whether each medication listed was prescribed in an injectable or noninjectable preparation.[7]

In order to maintain the anonymity of the patients, a staff person at the selected health facility was asked to work with the data collectors to extract the relevant data items from the patients' register.

While the outpatient prescription records were being reviewed, the stock records of the facility were checked for the time periods covered in the patients' record reviews. This provided one additional piece of data for the analysis:

- Availability of oral alternatives during the baseline and follow-up study periods.

This was necessary to determine whether oral (noninjectable) medications were available at the time when injections were given and, thus, whether prescribers had any choices about the medications to prescribe for a given patient.

Prior to the field work, team members attended a two-day workshop in which they were trained in the use of the data collection tool. A pretest of the study tool was carried out on the second day of the workshop.

Four teams—one for each of the four project intervention districts—spent ten days collecting data. One team collected data from Luwero in six days.[8] Each team comprised a team leader,

[7] It should be noted that it was not possible to tell from the prescription records if any substitutions were made. This data collection were intended to assess the *prescription pattern*, not the actual pattern of compliance or consumption by patients.

a data entry specialist, a drug inspector, and a data reader from the facility. Each team had a vehicle and a laptop computer. Local consultants and MMIS staff supervised the data collection.

2.4 DATA MANAGEMENT

Data from prescription records and stockcards were directly input into the database using "Drug Quantification System" software developed by the MOH of Uganda. The software is based on Microsoft Access and is refered to as the Rapid Pharmaceutical Assessment Tool (RPAT).

Data were checked periodically by the field supervisors to correct errors. Problems encountered were communicated to central supervisors who then agreed on a course of action. Safeguards were built into the program to prevent some of the errors that were anticipated.

At the central level, the data from the districts were consolidated, cleaned, and then analyzed. Standard reports were generated by the RPAT. The data were then converted into a form that allowed export to the Statistical Package for Social Science (SPSS) program. This was necessary for statistical tests to be carried out.

2.5 GENERAL ANALYSIS

The data collected in this study were stratified and analyzed according to the following plan:

- By facility category (as per the five groups shown in Table 1);
- By ownership category (public, private, NGO);
- By health district (Ibanda [Mbarara], Nebbi, Mpigi, Pallisa, Luwero);
- By age groups (0 to 5, 6 to 14, 15 to 30 years of age, and over 30 years of age);
- By gender of the patient (male or female);
- By common disease (diagnostic) groups.

For each of these comparisons, the analysis includes the results from the baseline (preintervention) time period, the results from the follow-up time period, and a comparative analysis. Chi square and analysis of variance tests were used to measure statistical significance. Results from statistical significance testing are summarized in this report as $p \leq .001$, $p \leq .01$, and $p \leq .05$.

In this report, summary results for the 4 intervention districts are presented in Chapter 4 followed by results for each individual district in Chapters 5 to 9.

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[8] The data collection was shorter in Luwero because only public sector facilities were included as explained in Section 2.2.2.

2.6 ANALYSIS BY DIAGNOSTIC GROUP AND SUMMARY CATEGORIES OF RATIONAL AND NONRATIONAL TREATMENT

Diagnostic codes in the sampled outpatient records are distributed across a number of different diagnoses, each of which has a prescribed treatment in the standard treatment guidelines used in Uganda. In order to analyze the pattern of prescribing behavior reflected in these records and the extent to which this behavior is consistent with these guidelines, each diagnosis was first checked to assess whether the guidelines included the option of an injectable medication as a treatment. Since the order in which the diagnoses were recorded was somewhat arbitrary and the goal of this study was to assess whether the general pattern of prescriptions of injectable medications was rational, the analysis of prescribing patterns by disease did not attempt to assess whether a particular medication was given for a particular disease, but rather whether the overall pattern of prescriptions of injectable medications versus noninjectable medications was consistent with the treatment guidelines vis-à-vis the overall listing of diagnoses and conditions. (*For a complete listing of diagnoses encountered in any of the study cases, please consult Appendix 2.)*

The approach that was taken began by determining whether each of the individual diagnoses *could* be treated with an injectable medication according to the guidelines used in Uganda. In other words, this step of the analysis considered whether an injectable medication was a ***rational*** treatment option for each illness or condition encountered in the records. As mentioned earlier, the data on the condition of each individual patient was limited to the diagnoses themselves, so this analysis focused on whether the diagnoses that were *recorded* supported the use of an injectable medication. For example, malaria is discussed in the *Uganda Clinical Guidelines 2003* (pages 35 to 37). These guidelines distinguish between *uncomplicated malaria*, which may present with fever, headache, joint pains, general weakness, or backache and which is to be treated with oral medications, versus *complicated malaria*, which includes a diagnosis of difficulty breathing, severe anemia, threatened abortion, or confusion/altered consciousness. In the cases of complicated malaria, injectable medications are to be used. Thus, in the analysis of the outpatient records, cases in which "malaria" was the only diagnosis recorded were considered to be uncomplicated malaria, while diagnoses such as "malaria and pneumonia" were considered to be an instance of malaria in conjunction with difficulty breathing (i.e., a complicated case of malaria) for which injectable medications could be considered a rational treatment.

Once the individual diagnoses had been assessed, the next step of the analysis was to develop groups of diagnoses in overall categories. This step entailed several rounds of review of the cases since there were numerous combinations of the diagnoses in the outpatient records. The analysis moved toward progressively fewer groups, while still attempting to ensure that each of the patterns in subgroups that were numerous enough for analysis were tested. At the conclusion of this stage, all of the various combinations of diseases were summarized into eight diagnostic groups with enough cases for a district-level analysis. The results were then run by district using these groups to assess the extent to which increases or decreases in the use of injections are related to the patients' specific presenting illness(es) or condition(s).

After the initial round of analysis of individual diseases and conditions, eight groups were developed. These groups fell into three categories:

1. An injection is considered part of standard treatment,
2. An injection is ***not*** considered part of standard treatment,
3. No diagnosis is recorded.

Of these three categories, "no diagnosis is recorded" accounted for 27 cases at baseline and 42 at follow-up. Since no diagnosis is recorded at all in these cases, they are not included in the analysis by diagnostic group presented in this report.

Within the category of "an injection is ***not*** considered part of standard treatment" (i.e., it is *not* rational treatment), there were four major groups:

1. Malaria alone (as a single diagnosis),[9]
2. Malaria in combination with any secondary condition that is not treated with an injection (i.e., with no conditions that would reasonably be considered a case of complicated malaria),
3. Cough/cold alone,
4. Miscellaneous conditions that are not treated with an injection.

The second group—malaria in combination with any secondary condition that is *not* treated with an injection—includes any combinations of the following diagnoses:

- Back/body/limb ache,
- Cough/cold,
- Diarrhea/persistent diarrhea,
- Dysentery,
- Eye infection,
- Fungal infection,
- Genital/vaginal discharge,
- Headache,
- Hypertension,
- Intestinal worms,
- Pelvic inflammatory disease,
- Tuberculosis.

The last group—miscellaneous conditions that are *not* treated with an injection—includes less common conditions that were not numerous enough for individual analysis. Included in this list are the following:

- Abdominal pain,
- Anemia,
- Back/body/limb ache,
- Cough/cold,

[9] In Uganda, all fever cases are given a presumptive diagnosis of malaria; but in the dataset, there were diagnoses of "malaria" with another condition, which would seem to explain the fever such as typhoid or meningitis. These cases were included in the miscellaneous group rather than in the malaria group; they were rare, so they did not have an impact on the overall findings presented here.

- Diarrhea/persistent diarrhea,
- Dysentery,
- Ear infection,
- Eye infection,
- Fungal infection,
- Genital/vaginal discharge,
- Headache,
- Hypertension,
- Intestinal worms,
- Measles,
- Pelvic inflammatory disease,
- Tuberculosis,
- Urinary tract infection.

Within the category of "an injection may be given as part of standard treatment" (i.e., it *is* rational treatment), there were four major groups:

1. Malaria in combination with any secondary condition that is treatable with an injection,
2. Malaria and pneumonia,
3. Infected wounds and trauma,
4. Miscellaneous conditions that may merit an injection.

The first group—malaria in combination with any secondary condition that is treatable with an injection—includes malaria with any combinations of the following diagnoses:

- Abortion,
- Anemia,
- Complications of pregnancy/perinatal conditions,
- Dental disease,
- Diabetes,
- Ear infection,
- Gastrointestinal diseases,
- Genital ulcers,
- Infected wounds,
- Severe malnutrition,
- Severe urinary tract infection,
- Skin disease,
- Trauma—domestic violence,
- Trauma—other nonintentional.

Malaria and pneumonia were maintained as a separate group from the rest of the secondary conditions, which might be considered signs of complicated malaria because these cases were numerous enough for a separate analysis.

The group of miscellaneous conditions that may merit an injection includes the following:

- Abortion,
- Bronchial asthma,
- Complications of pregnancy/prenatal conditions,
- Dental disease,
- Diabetes,
- Gastrointestinal diseases,
- Genital ulcers,
- Meningitis,
- Mental illnesses,
- Pneumonia,
- Severe urinary tract infection (i.e., accompanied by vomiting or gastrointestinal disease),
- Skin diseases,
- Typhoid.

It is important to note that there may be cases in which prescribers react to a cluster of conditions differently than to individual ones, but the overall categorization of each patient record as a case that might necessitate an injection versus one that would not was based on having at least one condition for which an injection is considered standard treatment.

2.7 STUDY LIMITATIONS

This is a fully retrospective study using data collected in routine prescription records at health facilities included in the study sample. This data do not include any information on other factors that could affect prescription use such as patient demand for injections, ethnicity, cultural beliefs related to injections as a form of treatment, socioeconomic status, or access to services. In addition, because retrospective data were used, it was not possible to conduct interviews of prescribers who would have been working at the time that these services were provided to assess their perceptions related to treatment using injectable medications or other alternatives, and there was no system in place to measure the degree of intensity of the interventions, which may have varied in the study districts.

CHAPTER 3: CHARACTERISTICS OF THE ATTAINED SAMPLE

3.1 SAMPLE SIZE

A total of 12,320 prescriptions were reviewed for this study. Half of the prescriptions (6,160 cases) were from the preintervention period, and the other half were from the postintervention period. Each facility contributed the same number of cases to the baseline and follow-up time periods. The main cause of deviation from the planned list of facilities was lack of usable data, particularly in the PFP and lower-level NGO facilities. In Ibanda district, only one lower-level NGO facility was included instead of the planned four. In Mpigi district, data were obtained from only one of the PFP facilities instead of the planned three, which were listed on the MOH listing, and only two lower-level NGO facilities instead of the planned four. In Nebbi district, data were obtained from only one of the upper-level NGO facilities instead of the planned two. In Nebbi and Pallisa districts, usable data could only be obtained from two out of the planned four PFP facilities. As a result, the cases used for this analysis were sampled from 51 facilities instead of the planned 64. (Appendix 1 provides an overview of the changes made in selection of facilities during the data collection exercise compared to the study design described in Chapter 2.)

3.2 AGE GROUP DISTRIBUTION

The distribution of cases by age group is shown in Table 3. Across all 5 districts studied, age data were available for 95.4% of the cases at baseline and 96.9% at follow-up.

Distribution of cases among the different age groups was similar in the preintervention and postintervention sample within each district. The largest age group was that of the children from 0 to 5 years of age; 33.4% of all cases were found in this category across the combined total of all districts, but this result varied widely by district. Nebbi and Pallisa districts had the largest proportions of cases belonging to the 0 to 5 year old category of any district (39.2% and 42.6%, respectively, at baseline compared to 39.7% and 45.3% in the follow-up sample). Ibanda district had the lowest proportion in the 0 to 5 year old category (22.7% at baseline and 20% at follow-up), but at the same time, this district also had the highest number of cases with no age reported (16.1% and 11.1%, respectively).

3.3 GENDER DISTRIBUTION

As illustrated in Table 4, gender data were available for nearly all of the cases studied (99.9%). The distribution of the patients by gender remained similar in the preintervention and postintervention samples, with 58 to 59% of all cases being female patients across all 5 districts studied. The distribution of patients by gender varied by district from a high of 63.0%

females among the cases in Luwero and 62.9% in Ibanda at baseline to a low of 55.3% in Mpigi. At follow-up, Ibanda and Luwero continued to have the highest proportion of female patients of any districts (63.4% and 61.2%, respectively) compared to a low of 54.8% in Mpigi.

Table 3: Distribution of cases by district and age group in the pre-intervention and post-intervention samples

		Total Cases	0-5 Years	6-14 Years	15-30 Years	Over 30 Years	Age Not Known
Preintervention Baseline Period	Ibanda	1,600	22.7%	12.2%	27.3%	21.8%	16.1%
	Nebbi	1,440	39.2%	14.9%	27.2%	18.8%	0.0%
	Mpigi	1,200	32.5%	15.5%	27.5%	24.5%	0.0%
	Pallisa	1,280	42.6%	12.3%	25.1%	19.8%	0.2%
	Luwero	640	26.4%	16.9%	29.1%	24.2%	3.4%
Total		**6,160**	**33.0%**	**14.0%**	**27.0%**	**21.4%**	**4.6%**
Postintervention Follow-up Period	Ibanda	1,600	20.0%	11.6%	30.8%	26.6%	11.1%
	Nebbi	1,440	39.7%	12.6%	26.7%	21.0%	0.0%
	Mpigi	1,200	29.0%	17.4%	26.5%	27.1%	0.0%
	Pallisa	1,280	45.3%	14.5%	23.8%	16.3%	0.2%
	Luwero	640	25.6%	18.8%	28.8%	25.2%	1.7%
Total		**6,160**	**32.2%**	**14.3%**	**27.3%**	**23.1%**	**3.1%**

Table 4: Distribution of cases by district and age group in the pre-intervention and post-intervention samples

		Total Cases	Females	Males	Gender Unknown
Preintervention Baseline Period	Ibanda	1,600	62.9%	36.8%	0.3%
	Nebbi	1,440	57.2%	42.8%	0.0%
	Mpigi	1,200	55.3%	44.8%	0.0%
	Pallisa	1,280	58.9%	40.9%	0.2%
	Luwero	640	63.0%	37.0%	0.0%
Total		**6,160**	**59.3%**	**40.6%**	**0.1%**
Postintervention Follow-up Period	Ibanda	1,600	63.4%	36.2%	0.4%
	Nebbi	1,440	55.3%	44.7%	0.0%
	Mpigi	1,200	54.8%	45.2%	0.0%
	Pallisa	1,280	57.7%	42.0%	0.2%
	Luwero	640	61.2%	38.8%	0.0%
Total		**6,160**	**58.4%**	**41.4%**	**0.2%**

3.4 DIAGNOSTIC GROUP DISTRIBUTION

Table 5 shows the number of cases for each diagnostic group in the pre-intervention and post-intervention samples. This analysis is based on *all* diagnoses recorded in the outpatient registers at the facilities surveyed. Some patients had as many as five separate diagnoses. The order in which the diagnoses were recorded in the outpatient record was found to be arbitrary in the sense that the order did not predict which diagnoses were "primary" and which were "secondary" or "tertiary." In many cases, more serious illnesses or conditions occurred as the third, fourth, or even fifth diagnosis. For example, a patient might be diagnosed as having "headache" as the first diagnosis accompanied by "cough/cold" as the second and "malaria" as the third. It is clear that malaria is the primary diagnosis in reality, and the other conditions are secondary to that diagnosis even though they are recorded earlier. Thus, the analysis in this chapter is based on the *overall combination of all diagnostic codes* regardless of the order in which they appear in the records.

It is important to note that the diagnostic data used in this analysis is limited in that detailed notes on the condition of each patient are not available. Only the diagnoses, sex, and age of the patients are available. Some conditions such as "infected wounds" may require different treatment depending on the nature of the wound (i.e., animal bite versus laceration versus bee sting), but these details are not recorded. Similarly, cases of "trauma" do not describe the nature or severity of the trauma or the area(s) of the body that are affected. It is possible that the patients may have had some conditions that were not recorded and which influenced the decision of the prescriber as to which medications to use for treatment. For example, a patient who presented with nausea or vomiting might be more likely to receive an injection if the prescriber felt that the person would not be able to tolerate an oral dose; but unless this diagnosis was recorded, the analysis in this study assumes that the prescriber had a choice of which medication to prescribe. While it must be acknowledged that some health workers are more likely to be conscientious about recording all secondary diagnoses than others, the approach taken in this analysis was to determine whether or not the diagnostic information *as written in the facility record* demonstrated a justification for an injection that was consistent with the treatment guidelines used by the MOH of Uganda. The cases in which it was *not* consistent would then constitute the group of cases of (presumably) *un*necessary injections that should be reduced as part of the overall injection safety and health care waste management strategy being implemented in Uganda.

The two sources used as reference material for the analysis that follows were the *Uganda Clinical Guidelines* (published by the MOH, 2003 edition) and the *Acute Care: Integrated Management of Adolescent and Adult Illness: Interim Guidelines for First-Level Facility Health Workers at Health Centre and District Outpatient Clinic* (published by the WHO, October 2005 edition). These two sources were known to be circulated to the districts surveyed in this study and should, thus, be guiding the choice of treatments that health workers prescribe to their patients.

Overall, 47 diagnostic codes were recorded in the records selected for this analysis. Of the 12,320 outpatient records that were sampled, 8,319 (67.5%) had only 1 diagnosis recorded, while the others ranged from 2 to 5 diagnoses. Among the records with a single diagnosis, the most common illness reported was malaria with nearly one-half of cases. All other individual

diagnoses were much less frequent. Simple cough and cold accounted for approximately 1 in 15 prescriptions, followed by intestinal worms for around 1 in 20 cases, and gastrointestinal diseases with 1 in 25 cases. Infected wounds, pneumonia, and abdominal pain were each found in about 1 in 30 cases. The remaining individual diagnoses accounted for less than 1 in 30 cases of a single diagnosis.

Among the overall sample of all 12,320 patient records studied, the 20 most common diagnoses are presented in Table 5 by order of prevalence at baseline according to the total number of *any instance* of these codes in any diagnosis (first through fifth) in one or more patient records. As this table demonstrates, these results are similar to results for single diagnoses. Malaria was by far the most common diagnosis in both the baseline and follow-up study periods with 57.6% of all records containing this diagnosis. It is important to note, however, that in reality this diagnosis represents a composite of all fevers since any case of fever in Uganda is treated as a presumptive case of malaria.

After malaria, respiratory illnesses ranging from cough/cold to asthma to tuberculosis and pneumonia were a component of 29.7% of the cases studied across both time periods.

Different types of injuries ranging from road traffic accidents to domestic violence and other types of intentional and nonintentional injuries as well as infected wounds were reported for 7.2% of the cases studied across both time periods. Abdominal and body/limb ache were less common, with 5.9% of the sample.

Among all gastrointestinal complaints, intestinal worms were the most common followed by gastrointestinal diseases. All diarrheal diseases (including dysentery, cholera, persistent and nonbloody diarrhea, but not gastrointestinal diseases) were recorded as a diagnosis for 4% of the cases studied in both time periods.

Sexually transmitted diseases including acquired immune deficiency syndrome (AIDS), pelvic inflammatory disease, genital ulcers, and genital discharge accounted for a small proportion of all outpatients seen at the study facilities in both time periods (3.1%).

Vaccine-preventable diseases including measles, meningitis, typhoid, and neonatal tetanus were found in less than 1% of the cases studied.

The distribution of these diseases was similar in all cases for both the preintervention sample and the postintervention sample. *(For a complete listing of all diagnoses across the study districts as a whole, please refer to Appendix 2.)*

Table 5: Most common diagnoses across all districts, by study period

	Preintervention Proportion of All Cases (n=6,160)	Postintervention Proportion of All Cases (n=6,160)
Malaria	56.8%	58.4%
Cough or cold (without pneumonia)	18.0%	17.9%
Pneumonia	10.8%	10.7%
Intestinal worms	6.4%	6.1%
Infected wounds	4.3%	4.0%
Gastrointestinal diseases	3.8%	4.8%
Abdominal pain	3.6%	3.0%
Urinary tract infections	2.7%	2.7%
Body/back/limb ache	2.4%	2.9%
Dental diseases	2.3%	1.5%
Skin diseases	2.2%	2.6%
Diarrhea (nonbloody, nonpersistent)	1.9%	2.1%
Nonintentional trauma (not including road traffic accidents)	1.9%	1.4%
Ear Infections	1.6%	1.4%
Dysentery	1.5%	1.9%
Eye Infections	1.5%	1.8%
Anemia	1.4%	1.6%
Hypertension	1.2%	1.3%
Genital ulcers	1.1%	1.3%
Pelvic inflammatory diseases	0.8%	1.3%

CHAPTER 4: OVERALL RESULTS ACROSS ALL INTERVENTION DISTRICTS

Across all 4 intervention districts as a whole, there was a significant reduction in the proportion of cases being prescribed injections from 39.8% at baseline to 33.9% at follow-up ($p \leq .001$).

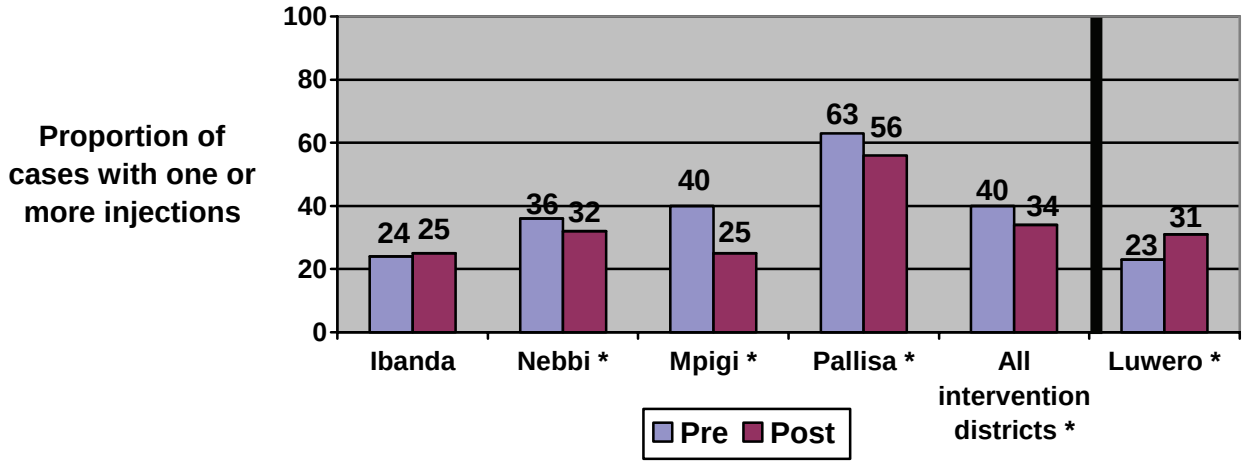
Figure 1 illustrates the change in prevalence of injection prescribing for the different districts from the preintervention to postintervention periods. In three out of four project districts—Nebbi, Mpigi, and Pallisa—there was a significant reduction in injection use over time.

Pallisa district had the highest proportion of cases prescribed at least 1 injection at both baseline (62.7%) and follow-up (56.0%) although the reduction over time was significant ($p \leq .001$). The proportion of cases receiving 1 or more injections was also significantly reduced in Nebbi district from 36.4% at baseline to 31.9% at follow-up ($p \leq .01$). Both of these districts had similar levels of reductions (11% and 12%, respectively). In contrast, prescriptions of injections in Mpigi district fell from 40.2% at baseline to 24.6% at follow-up ($p \leq .001$).

Of the four intervention districts, Ibanda had the lowest level of injections in both time periods. It was the only district in which the proportion of cases that were prescribed 1 or more injections did not change over time (24.3% at baseline, 25.1% at follow-up).

Luwero district (the control district in this study) had a low prevalence of prescriptions of injections in the preintervention sample. In contrast to the MMIS intervention districts, Luwero had a significant *increase* in prescriptions of injections over time from 22.8% at baseline to 31.1% at follow-up ($p \leq .001$). It is interesting to note that the sample obtained in this study showed that at baseline Luwero had significantly fewer injections than Nebbi ($p \leq .001$) despite the findings reported in Section 2.2.2 from an earlier study, which had shown Luwero to be a good choice as a control. By the time of the follow-up, the two districts were similar with about one-third of patients receiving one or more injections.

Figure 1: Change in injection prescribing by district



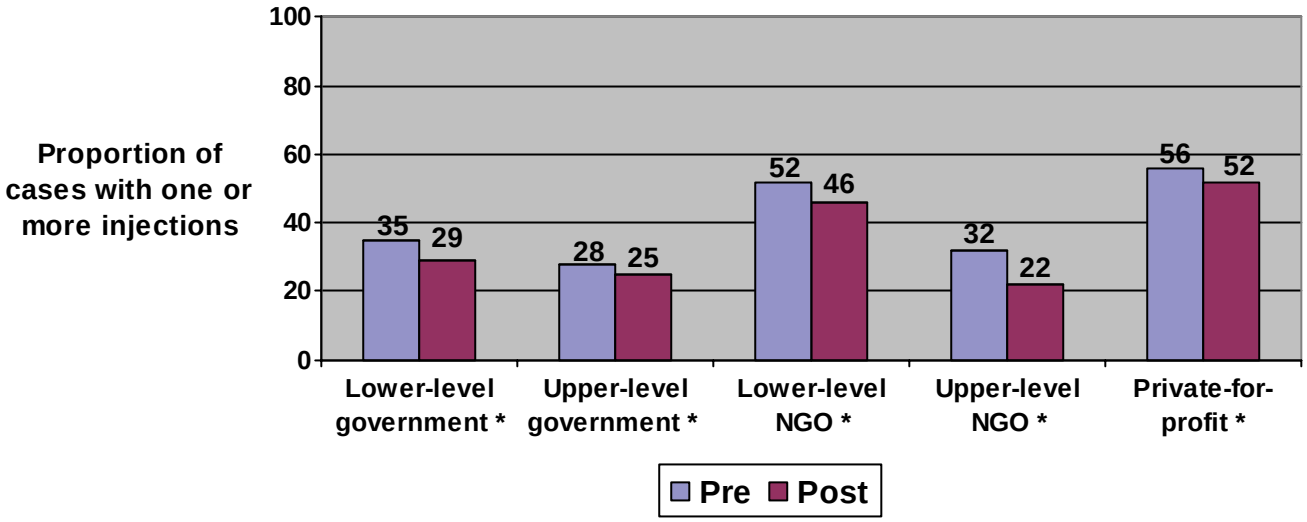
*** The change over time is significant in this district.**

4.1 FINDINGS BY OWNERSHIP AND LEVEL

When all four intervention districts are considered as a group, all three types of ownership (government, NGO, and PFP) showed significant reductions over time. The highest rates of injections were found in PFP facilities, which decreased from a rate of 56% of cases receiving 1 or more injections at baseline to 51.8% at follow-up ($p \leq .05$). Second to PFP facilities were the NGO facilities, which decreased from 42.8% at baseline to 35.0% at follow-up ($p \leq .001$). The lowest rate of injections was found in government facilities. Across all government facilities, the proportion of cases that were prescribed injections decreased from 31.8% at baseline to 26.9% at follow-up ($p \leq .001$).

When the data are further analyzed by lower-level or upper-level facilities as well as ownership facilities, all five levels showed significant reductions over time. PFP facilities (which were not distinguished by level) continued to have the highest rates of injections (i.e., 56.0% at baseline, 51.8% at follow-up). Among NGO facilities, lower-level facilities gave significantly more injections than upper-level facilities in both baseline (51.8% versus 32.4%) and in follow-up (46.3% versus 21.9%, respectively) ($p \leq .001$). Similarly, lower-level government facilities prescribed more injections than upper-level facilities at both baseline (35.2% versus 28.4%) and in follow-up (29.2% versus 24.5%, respectively) ($p \leq .01$). (Figure 2)

Figure 2: Changes in injection prescribing by level and ownership across all intervention districts



*** The change over time is significant at this level.**

4.2 AVAILABILITY OF ORAL ALTERNATIVES BY OWNERSHIP AND LEVEL

Table 6 shows the proportions of injections prescribed when an oral alternative was available, not available, or when there were no records to determine availability of orals. It is important to note that the data on stockouts reflect the monthly situation at each facility, in other words, whether a stockout occurred at any time during the month. It is not possible to link treatment practices on specific days within a month to the availability of medications.

Among the 4,070 records with 1 or more injections across all 4 intervention districts, 90.1% were prescribed an injection when an oral alternative drug was in stock at the time of the baseline study period, compared to 86.2% in the follow-up period.[10] For another 6.4% at baseline and 9.6% at follow-up, there were either no records or conflicting information on the availability of oral alternatives. The remaining 3.6% of the patients receiving injections at baseline and 4.2% at follow-up were the only cases in which oral alternatives were definitely not available. This finding was consistent across all study districts.

When analyzed by level and type of ownership of the facilities, both lower-level and upper-level government facilities were similar to the overall average for public facilities as a whole, with 94.8% of cases having an alternative to injections at baseline and 93.9% at follow-up.

Among NGO facilities, lower-level and upper-level facilities were less likely than public sector facilities to have good stock data at follow-up. In fact, the difference over time between

[10] In keeping with the MOH policy, a drug was considered as out of stock at the facility when the stock level as read on the stock records had remained at zero for a period of no less than one week. The one-week window provided for possibility of the drug being available at the dispensary even if the stockcard showed no supply.

the proportion of 85.4% of NGO patients receiving an injection at follow-up when oral alternatives were available compared to 94.1% at baseline is largely explained by the higher level of missing or unclear records at follow-up (Table 6).

Of the three ownership categories, PFP facilities were the most likely to have incomplete stock records. In these facilities, 75.3% of the patients at baseline and 75.9% at follow-up received an injection when oral alternatives were available, but these data should be interpreted with caution given the missing information on 20.9% of baseline cases and 19.9% of follow-up cases (Table 6).

Table 6: Proportions of injections when orals are available, by ownership of facility

		Proportion of injections prescribed when oral alternative was available	Proportion of injections prescribed when oral alternative was not available	Proportion of injections prescribed when there was no stock record or incomplete data	Total number of injections prescribed
Baseline	Government	94.8%	5.0%	0.2%	814
	NGO	94.1%	2.1%	3.8%	891
	PFP	75.2%	3.9%	20.9%	493
	Total for all Intervention Districts	90.1%	3.6%	6.4%	2,198
Follow-up	Government	93.9%	4.5%	1.6%	688
	NGO	85.5%	3.8%	10.7%	728
	PFP	75.9%	4.2%	19.9%	456
	Total for all Intervention Districts	86.2%	4.2%	9.6%	1,872

4.3 FINDINGS BY GENDER

Overall, when all levels of facilities and all types of ownership are considered as a whole in the intervention districts, both genders show a significant reduction in the proportion of cases prescribed an injection in the postintervention period ($p \leq .001$). Male patients were prescribed significantly more injections than female patients in both the pre-intervention (42.4% versus 38.1%) ($p \leq .01$) and post-intervention periods (37.1% versus 31.7%, respectively)($p \leq .001$).

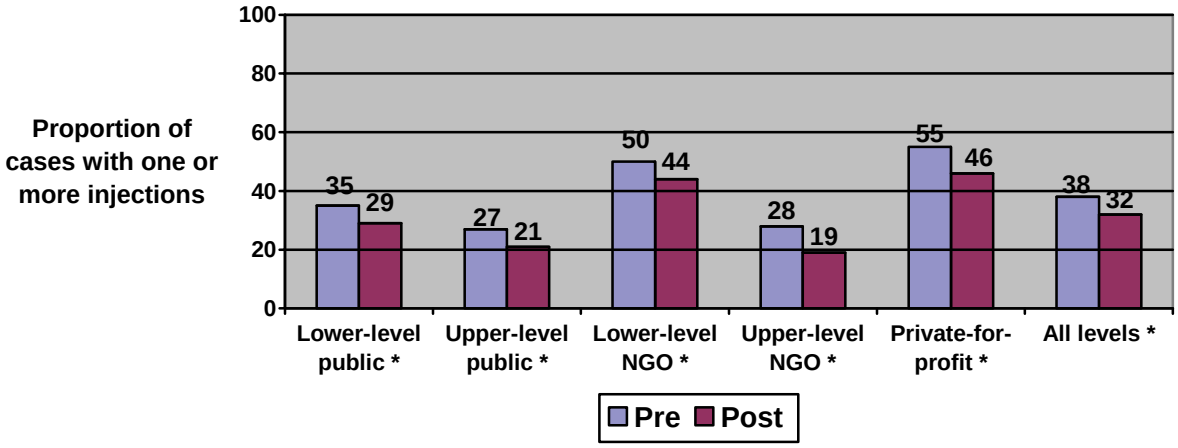
When the data for all intervention areas are analyzed by level, significant decreases over time were found among both men and women in lower-level public facilities and upper-level NGO hospitals. In contrast, in upper-level public facilities, lower-level NGO facilities, and PFP facilities, there were significant decreases in prescriptions of injections among only women, while the results for men remained similar in both time periods (Figures 3 and 4).

The differences in changes between the two genders resulted in significantly higher levels of prescriptions of injections in men than in women in both the baseline and follow-up study

periods in upper-level NGO facilities and at follow-up in only upper-level public facilities and PFP facilities.

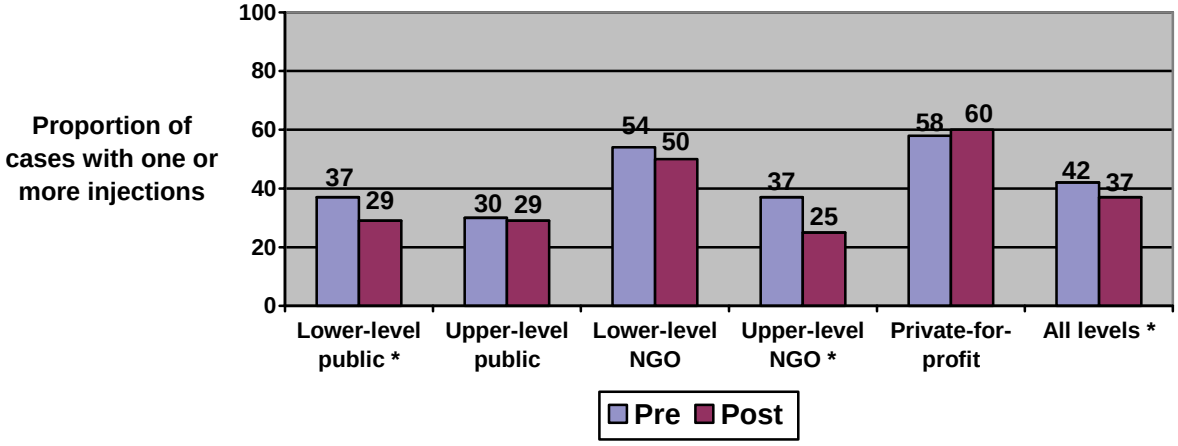
When lower-level and upper-level results were combined, both genders demonstrated significant reductions in injections for both public and NGO facilities over time.

Figure 3: Changes in injection prescribing for women by level across all intervention districts



*** The change over time is significant at this level.**

Figure 4: Changes in injection prescribing for men by level across all intervention districts



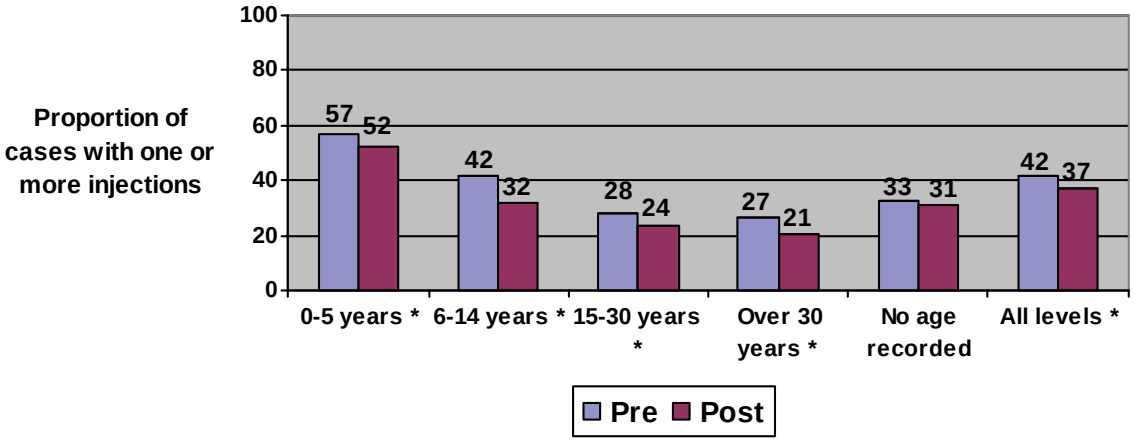
*** The change over time is significant at this level.**

4.4 FINDINGS BY AGE GROUP

Figure 5 shows the changes in injection prescribing by age category for all intervention districts. In all four age groups (0 to 5, 6 to 14, 15 to 30, and over 30 years), significant reductions in injections were seen over time ($p \leq .01$).

The highest levels of injections were found among the youngest patients, with 57.4% of the children under 5 years of age receiving 1 or more injections at baseline compared to 52.2% at follow-up. Similarly, 42.3% of the older children and teenagers from 6 to 14 years of age received injections at baseline compared to 31.9% at follow-up. Young adults from 15 to 30 years of age and adults over age 30 were similar at baseline (27.5% and 27.4%, respectively) and at follow-up (23.9% and 21.0%, respectively). ($p \leq .01$).

Figure 5: Changes in injection prescribing by age group across all intervention districts



*** The change over time is significant in this age group.**

4.5 FINDINGS BY DIAGNOSTIC GROUP

In the following analysis, results will be presented initially across the entire set of study cases using the diagnostic groups described in Chapter 2 followed by an analysis by district. As mentioned in that chapter, there are 4 major groups for which an injection is ***not*** considered part of standard (rational) treatment:

1. Malaria alone (as a single diagnosis),
2. Malaria in combination with any secondary condition that is not treated with an injection (i.e., with no conditions that would reasonably be considered a case of complicated malaria),
3. Cough/cold alone,
4. Miscellaneous conditions that are not treated with an injection.

There are also four major groups for which an injection may be given as part of standard (rational) treatment:

1. Malaria in combination with any secondary condition that is treatable with an injection,
2. Miscellaneous conditions that may be treated with an injection,
3. Malaria and pneumonia,
4. Infected wounds and trauma.

Across the combination of all four project intervention districts—Ibanda, Nebbi, Mpigi, and Pallisa—significant reductions in the proportion of cases receiving an injection were found for three of the four broad diagnostic groups for which injections are not a part of the standard treatment guidelines (i.e., malaria alone, malaria with secondary conditions that do not require an injection, and miscellaneous conditions that are not treated with an injection). For ***malaria alone***, the decrease was from 45.6% of patients at baseline receiving 1 or more injections to 41.3% at follow-up ($p \leq .01$). ***Malaria with secondary conditions that are not treated with an injection*** decreased even more markedly from 47.9% at baseline to 36.4% at follow-up ($p \leq .001$). Similarly, ***miscellaneous cases that are not treated with an injection*** decreased from 21.2% at baseline to 17% at follow-up ($p \leq .05$). Cases with ***cough/cold*** recorded as the only diagnosis formed the diagnostic group with the lowest rate of injections at both baseline (18.8%) and follow-up (14%). While there was some evidence of a small decrease, the difference over time was not significant ($p \leq .08$) (Table 7).

Interestingly, of the diagnostic groups for which injections may be given (i.e., they *are* part of the standard treatment guidelines under some circumstances), the only significant reduction was found in the group of ***infected wounds and trauma***. As a whole, this group decreased from 64.9% at baseline to 55.2% at follow-up ($p \leq .01$) (Table 7). Within this group, the 105 cases of domestic violence out of the 794 cases of infected wounds and trauma showed significant improvements. The other specific subcomponents of this group (road traffic accidents, other intentional trauma, other nonintentional trauma, and infected wounds) did not change significantly over time although their general downward trend over time contributed to the results for the larger composite group.

In the group comprised of ***malaria and pneumonia*** cases, there was some evidence of a decrease from 54.1% of patients at baseline receiving 1 or more injections to 48.7% at follow-up ($p=.08$).

The remaining categories of ***malaria with any secondary condition other than pneumonia that is treatable with an injection*** remained similar over time (43.6% baseline, 38.3% follow-up) as did ***miscellaneous cases that are not treated with an injection*** (28.0% baseline, 26.1% follow-up) (Table 7).

Table 7: Findings across all intervention districts combined

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	45.6%	1657	41.3%	1657	Reduced (p≤.01)
Malaria with any secondary condition that is not treated with an injection	47.9%	935	36.4%	960	Reduced (p≤.001)
Cough/cold only	18.8%	288	14.0%	293	Some evidence of downward trend (p=.08)
Miscellaneous conditions that are not treated with an injection	21.2%	977	17.0%	941	Reduced (p≤.05)
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	43.6%	172	38.3%	230	No change
Malaria and pneumonia	54.1%	405	48.7%	384	Some evidence of downward trend (p=.08)
Infected wounds and trauma	64.9%	382	55.2%	328	Reduced (p≤.01)
Miscellaneous conditions may be treated with an injection	28.0%	681	26.1%	686	No change

4.6 ANALYSIS BY TREATMENT GUIDELINES AND RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS

In addition to the analysis by the eight diagnostic groups described above, all cases were also assigned to one of two broader categories based on the MOH treatment guidelines available in Uganda at the time of this study, i.e., "rational" or "nonrational" use of injections. Significance testing was conducted on the sum of all records for the four intervention districts and for each individual district. Across the total of all four intervention districts, significant *reductions* were found for both rational and nonrational cases of injection use. Among the 1,640 cases for which conditions might require an injection as a rational treatment, 44.7% received 1 or more injections at baseline compared to 39.0% of the 1,628 cases at follow-up (p≤.001). Similarly, among the cases in which injections were *not* rational (standard) treatment according to the MOH guidelines, a significant reduction was found such that 37.8% of the 3,880 cases at baseline received 1 or more injections compared to 31.8% of the 3,892 cases at follow-up (p≤.001). This general finding across the four districts, however,

masked important differences that arose when each district was analyzed separately as shown in Figures 6 and 7.

Figure 6: Summary of changes over time among cases for which injections are standard treatment from baseline to follow-up in all districts

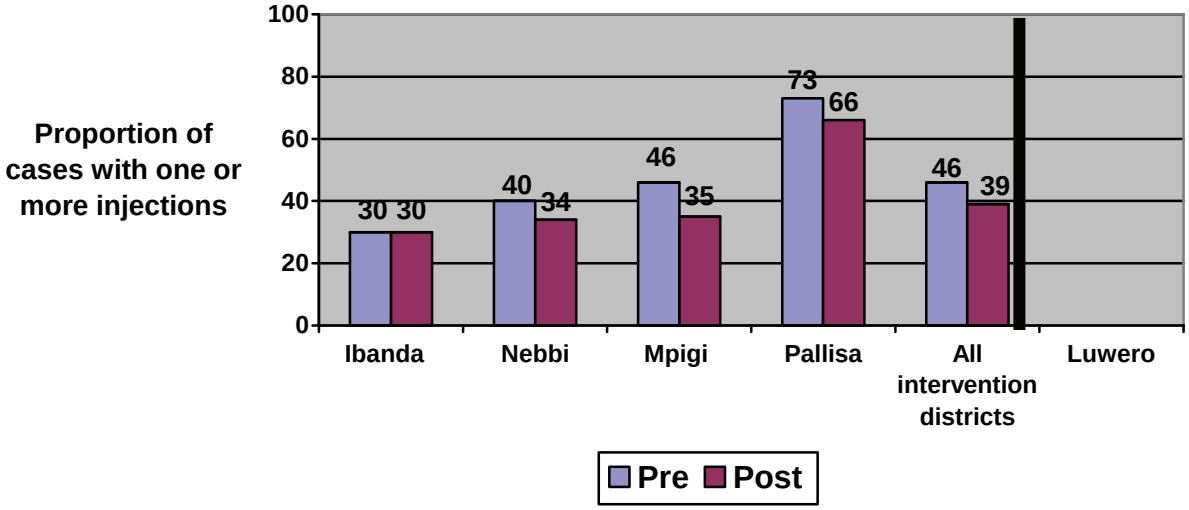
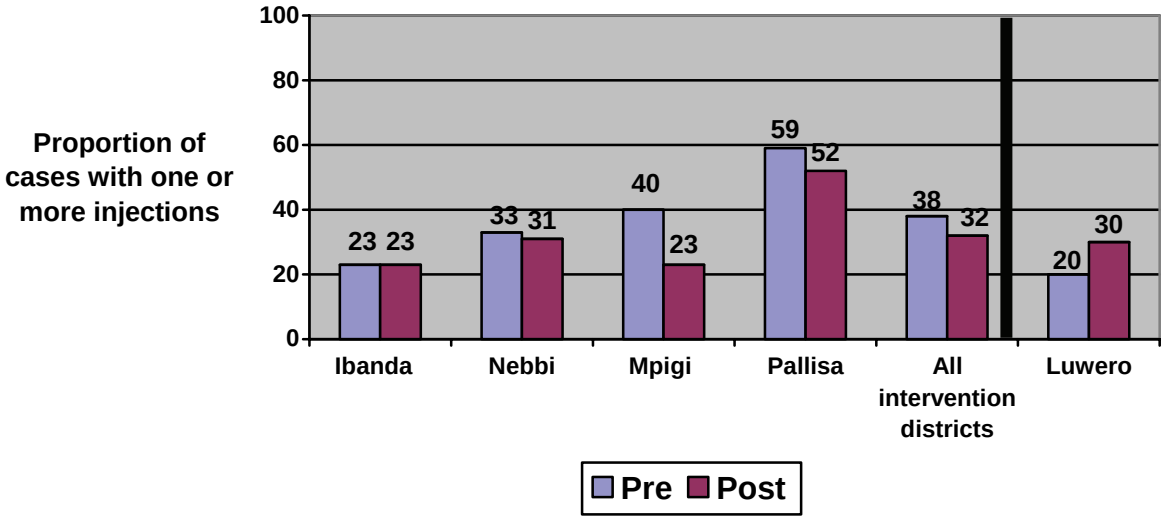


Figure 7: Summary of changes over time among cases for which injections are not standard treatment, from baseline to follow-up in all districts

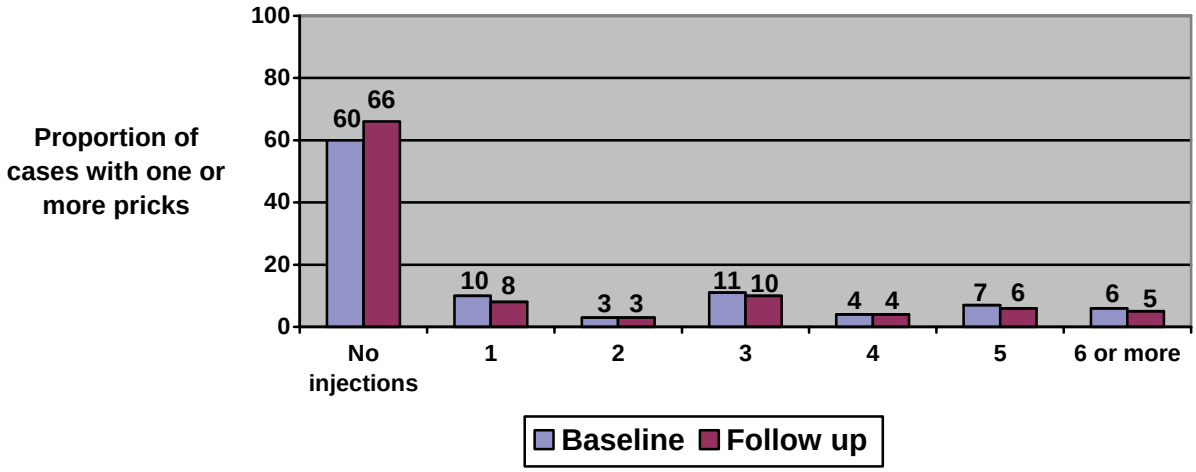


4.7 ANALYSIS BY NUMBER OF INJECTABLE DOSES PRESCRIBED

Up to this point, the analysis presented in this report has focused on the proportion of patients receiving one or more injections of any injectable medication. During this study, data were also collected on the details related to the number of *doses* of those medications. These doses are referred to in this section as individual injections or "pricks."

The number of pricks recorded in any case within the 4 intervention districts varied from 1 to 40. Figure 8 shows the proportion of patients that were not prescribed an injection as well as the proportion that were prescribed 1 through 5 pricks, and 6 pricks and above.

Figure 8: Proportion of cases by number of pricks across all intervention districts, by study period



When the results are analyzed by diagnostic group, there were no significant changes within any diagnostic group between baseline and follow-up. There were, however, significant differences *between* diagnostic groups. Cases with malaria alone averaged 3.2 pricks at baseline and 3.3 at follow-up. Interestingly, malaria with any secondary condition that is *not* treated with an injection had a significantly *higher* average number of pricks at baseline (3.6) and follow-up (3.9) than that of malaria alone ($p \leq .01$). Similarly, while the average number of pricks in cases of malaria with any secondary condition other than pneumonia that *is* treatable with an injection was similar at baseline (4.4) and follow-up (4.1), in both time periods these averages were significantly *higher* than those of malaria alone ($p \leq .01$ and $p \leq .05$, respectively). The same was true for cases of malaria and pneumonia, which averaged 5.0 pricks at both baseline and follow-up with both results being significantly higher than the average for malaria alone ($p \leq .001$) (Table 8).

Not surprisingly, there was some evidence that the average number of pricks in cases of malaria with a secondary condition that *is* treatable with an injection was higher at baseline than the average in cases of malaria with any secondary condition that is not treated with an injection ($p=.06$); but at follow-up, both groups were similar (Table 8).

The average number of pricks in cases of malaria and pneumonia was significantly higher at both baseline and follow-up than cases of malaria with any secondary condition that is not treated with an injection ($p \leq .001$). Although the average number of pricks in cases of malaria and pneumonia appeared to be higher than that of malaria with a secondary condition that *is* treatable with an injection in both time periods, the differences were not statistically significant (Table 8).

Among other diagnostic groups not related to malaria, cases with a diagnosis of cough/cold averaged 3.0 pricks in both the baseline and follow-up study periods, while cases of trauma and infected wounds averaged 4.4 pricks in both periods. Miscellaneous conditions that are not treated with an injection averaged 4.1 pricks at baseline and 3.8 at follow-up; this difference was not significant. Miscellaneous conditions that may merit an injection showed similar results with an average of 4.8 pricks at baseline and 4.3 at follow-up; this difference was not significant (Table 8).

Table 8: Average injections per case, by diagnostic group in MMIS intervention districts

	Baseline			Follow-up		
District	**Total Number of Cases with Any Injections**	**Average Injections per Case**	**Standard Deviation**	**Total Number of Cases with Any Injections**	**Average Injections per Case**	**Standard Deviation**
Malaria alone	756	3.2	3.1	685	3.3	2.8
Malaria with any secondary condition that is not treated with an injection	448	3.6	2.7	349	3.9	3.3
Malaria with any secondary condition other than pneumonia that *is* treatable with an injection	75	4.4	4.7	88	4.1	3.7
Malaria and pneumonia	219	5.0	4.4	187	5.0	4.2
Cough/cold only	54	3.0	1.8	41	3.0	2.0
Infected wounds and trauma	248	4.4	2.1	181	4.4	2.6
Miscellaneous conditions that are not treated with an injection	207	4.1	3.1	160	3.8	2.1
Miscellaneous conditions that are treated with an injection	191	4.8	5.6	179	4.3	4.2
No diagnosis recorded	0	NA	NA	2	NA	NA
Total of All Intervention Areas	2198	3.8	3.5	1872	3.9	3.2

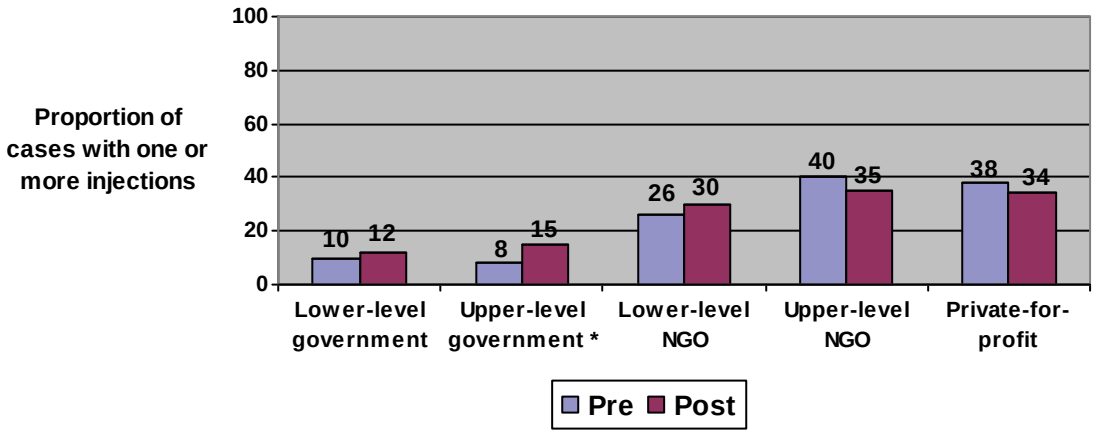
CHAPTER 5: RESULTS FOR IBANDA DISTRICT

Across all four intervention districts as a whole, there was a significant reduction in the proportion of cases being prescribed injections. Ibanda district—in contrast to the other three intervention districts—had the lowest level of injections in both time periods. Ibanda was the only district in which the proportion of cases that were prescribed one or more injections did not change over time (24.3% at baseline, 25.1% at follow-up).

5.1. FINDINGS BY OWNERSHIP AND LEVEL

In Ibanda district, although the proportion of cases that were prescribed injections did not change over time when considered as a whole for this district, there was a significant *increase* in the prescription of injections among public sector facilities ($p \leq .01$). It is important to note, however, that this group had by far the lowest rate of injections overall at baseline. This change in public sector facilities was found to be concentrated in public hospitals, which increased from 8.1% at baseline to 14.7% at follow-up ($p \leq .01$). There were no significant changes over time in lower-level government facilities (9.7% versus 12.2%), NGO facilities (25.6% versus 30% for lower-level and 40.3% versus 34.7% for upper-level), or PFP facilities (37.8% versus 33.8%) (Figure 9).

Figure 9: Changes in injection prescribing by level and ownership in Ibanda district



*** The change over time is significant at this level.**

5.2. FINDINGS BY GENDER

At the time of the baseline study period in Ibanda district, comparable proportions of men and women received injections (24.8% and 23.9%, respectively). By the time of the follow-up, men appeared to be receiving more injections ($p=.06$) than they had at baseline. The apparent *increase* in the prescription of injections among men to 29.1% while women stayed stable at 22.9% resulted in a significant difference between the two genders ($p\leq.01$) at follow-up.

5.3. FINDINGS BY AGE GROUP

In Ibanda district, the only age group with a significant change was the group of children under 5 years of age, which *increased* over time from 36.9% to 43.8% ($p\leq.05$). This group had more frequent prescriptions of injections than the other groups. Among the older children and teenagers from 6 to 14 years of age, 20.5% received injections at baseline compared to 18.9% at follow-up. Similarly, among young adults from 15 to 30 years of age, 15.6% received an injection at baseline and 18.5% at follow-up, while among adults over 30 years of age 18.1% received an injection at baseline and 18.8% at follow-up.

Among patient records with no age recorded, 32.7% and 31.1% received injections at baseline and follow-up, respectively.

5.4. FINDINGS BY DIAGNOSTIC GROUP

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment and four major groups for which an injection *may be given* as part of standard treatment. (Please refer to Section 2.6 for a detailed description of these categories.)

In Ibanda district, the only specific diagnostic group that showed a significant change over time was the ***malaria*** group, which *increased* from 30.7% of patients at baseline receiving 1 or more injections to 35.3% at follow-up ($p\leq.05$). The group of ***malaria with secondary conditions that are not treated with an injection*** remained similar with 21.5% at baseline and 18.0% at follow-up. Interestingly, in both time periods, these cases were significantly *less* likely to receive an injection than cases that had *malaria* as the only diagnostic code ($p\leq.01$) (Table 9).

The ***cough/cold*** group, which was considerably lower than the result for the combination of all intervention districts, remained stable over time with 8% at baseline and 5.7% at follow-up as did the group containing ***miscellaneous cases that are not treated with an injection***, which remained similar over time with 13.7% baseline and 9.5% at follow-up (Table 9).

Among the diagnostic groups for which injections are part of the standard treatment guidelines, ***malaria with any secondary condition that is treatable with an injection*** (28.8% baseline, 33.0% follow-up) and ***malaria and pneumonia*** (31.6% baseline, 34.4% follow-up)

were similar in both study periods. The group of cases with diagnoses related to ***infected wounds and trauma*** appeared to increase (30.8% baseline, 43.7% follow-up), but the change was not significant (p=.07). ***Miscellaneous conditions that may be treated with an injection*** remained stable over time with 29.6% at baseline and 24.6% at follow-up (Table 9).

Table 9: Findings by diagnostic group in Ibanda district

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	30.7%	606	35.3%	564	Increased (p≤.05)
Malaria with any secondary condition that is not treated with an injection	21.5%	246	18.0%	250	No change
Cough/cold only	8.0%	163	5.7%	159	No change
Miscellaneous conditions that are not treated with an injection	13.7%	204	9.5%	179	No change
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	28.8%	52	33.0%	97	No change
Malaria and pneumonia	31.6%	38	34.4%	32	No change
Infected wounds and trauma	30.8%	78	43.7%	71	No change
Miscellaneous conditions that may be treated with an injection	29.6%	196	24.6%	228	No change

5.5. ANALYSIS BY RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS

In addition to the analysis by the 8 diagnostic groups described in Section 2.6, all cases were also assigned to one of 2 broader categories based on the MOH treatment guidelines available in Uganda at the time of this study: "Rational" cases for which injections were mentioned or recommended in treatment guidelines and "nonrational" cases for which injections were *not* mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register.

In Ibanda district, the global analysis using the overarching categories of “rational” or “nonrational” did not reveal any significant changes over time. The group of rational injection cases remained the same with 29.9% receiving 1 or more injections at baseline (n=364) compared to 30.4% at follow-up (n=428). Among the cases for which injections were *not* considered standard treatment, 22.7% at baseline (n=1,236) and 23.1% at follow-up (n=1,172) received 1 or more injections.

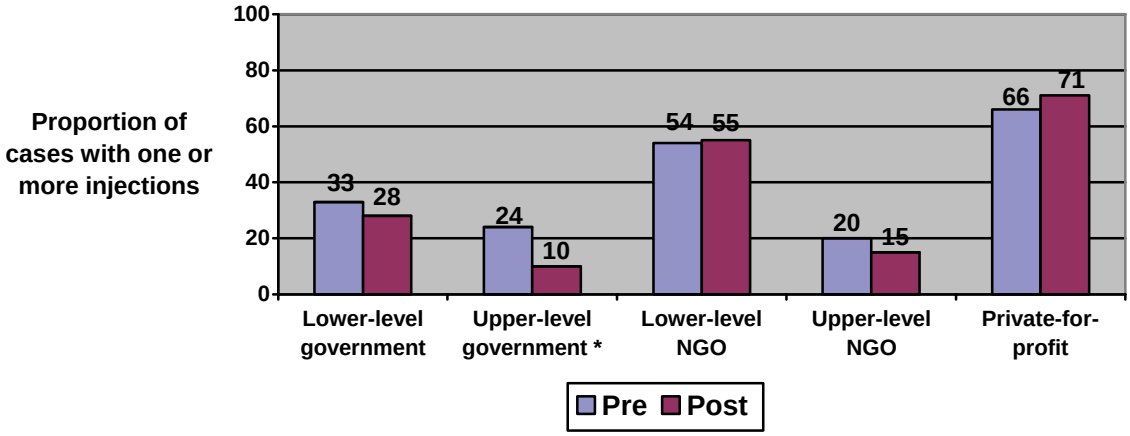
CHAPTER 6: RESULTS FOR NEBBI DISTRICT

As reported in the global Executive Summary, across all four intervention districts as a whole, there was a significant reduction in the proportion of cases being prescribed injections. Nebbi district was 1 of the 3 out of 4 individual project districts in which a significant reduction in injection use was found across all cases, from 36.4% at baseline to 31.9% at follow-up ($p \leq .01$).

6.1. FINDINGS BY OWNERSHIP AND LEVEL

In Nebbi district, there was a significant decrease in injection prescribing in upper-level government facilities from 23.8% at baseline to 9.7% at follow-up ($p \leq .001$). No other individual category showed a statistically significant change over time although there was some evidence of a decrease in upper-level NGO facilities (19.7% at baseline, 14.7% at follow-up:) ($p=.06$). In contrast to the upper-level facilities, in both baseline and follow-up periods, injection use was a common treatment in *lower-level* government facilities (33.1% and 28.4%) and in NGO facilities (54.1% and 55.0%). Overall, PFP facilities had the highest rate of prescriptions of injectable medications of any ownership or level in both study periods (66.3% at baseline, 71.3% at follow-up) (Figure 10).

Figure 10: Changes in injection prescribing by level and ownership in Nebbi district



*** The change over time is significant at this level.**

6.2. FINDINGS BY GENDER

At the time of the baseline study period in Nebbi district, comparable proportions of men and women received injections (38.2% and 35.0%, respectively). By the time of the follow-up, however, a significant *decrease* in the prescription of injections among women to 28.9%,

while men stayed stable at 35.6%, resulted in a significant difference between the two genders ($p \leq .01$).

6.3. FINDINGS BY AGE GROUP

In Nebbi district as in the others, the 0 to 5 years of age group was prescribed the most injections. There was some evidence of a downward trend, but the change over time was not significant (50.6% at baseline, 46.1% at follow-up) ($p=.07$). In fact, the only age group to show a significant *decrease* was that of the 6 to 14 years of age group. In this group, 45.8% received 1 or more injections at baseline compared to 34.1% at follow-up ($p \leq .01$). The group of young adults from 15 to 30 years remained the same with 23.0% at baseline and 22.7% at follow-up. Similarly, the group of older adults over 30 years of age remained stable with 18.5% at baseline and 15.5% at follow-up.

6.4. FINDINGS BY DIAGNOSTIC GROUP

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment and four major groups for which an injection *may be given* as part of standard (rational) treatment. (Please refer to Section 2.6 for a detailed description of these categories.)

In Nebbi district, among the diagnostic groups for which injections are not part of the standard treatment guidelines, the only specific diagnostic group that showed a significant change over time was ***miscellaneous cases that are not treated with an injection***. This group *decreased* over time from 19.4% at baseline to 13.5% at follow-up ($p \leq .05$) (Table 10).

The ***malaria*** group remained stable over time with 44.9% of patients at baseline receiving 1 or more injections and 48.5% at follow-up. The group of ***malaria with secondary conditions that are not treated with an injection***, on the other hand, showed some evidence of a reduction from 41.8% at baseline to 32.9% at follow-up, but it was not significant ($p=.08$) (Table 10).

The ***cough/cold*** group had only 6 cases across both study periods out of 2,880 cases overall that were included in this study. This was remarkably fewer cases than were found in the other districts, while at the same time the number of cases of "pneumonia" cases was markedly higher (174 cases were seen at baseline and 165 at follow-up),[11] suggesting that either patients in Nebbi do not seek care when they are suffering from cough/cold symptoms or that prescribers in Nebbi tend to diagnosis "pneumonia." The data collected in this study cannot resolve this question. This is an area where further study would be valuable since overdiagnosis of pneumonia may be accompanied by overprescription of antibiotics at increased cost to the health system.

[11] Pneumonia cases are included in the miscellaneous group of conditions for which injections may be prescribed in this analysis.

Among the diagnostic groups for which injections **are** part of the standard treatment guidelines, the only group which showed a significant change over time was the group of ***infected wounds and trauma,*** which *decreased* over time from 76.4% at baseline to 58.5% at follow-up ($p \leq .01$). ***Malaria with any secondary condition that is treatable with an injection*** (32.3% at baseline, 16.7% at follow-up) and ***miscellaneous conditions that may merit an injection*** (21.9% at baseline, 22.9% at follow-up) were statistically similar in both study periods. The group of cases with diagnoses related to ***malaria and pneumonia*** showed some evidence of a decrease from 44.8% at baseline to 37.3% at follow-up, but the change was not significant ($p=.06$) (Table 10).

Table 10: Findings by diagnostic group in Nebbi district

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	44.9%	325	48.5%	332	No change
Malaria with any secondary condition that is not treated with an injection	41.8%	122	32.9%	161	Some evidence of downward trend (p=.08)
Cough/cold only	0.0%	4	0.0%	2	No change
Miscellaneous conditions that are not treated with an injection	19.4%	340	13.5%	364	Reduced (p≤.05)
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	32.3%	31	16.7%	30	No change
Malaria and pneumonia	44.8%	252	37.3%	217	Some evidence of downward trend (p=.06)
Infected wounds and trauma	76.4%	106	58.5%	94	Reduced (p≤.01)
Miscellaneous conditions that may be treated with an injection	21.9%	260	22.9%	240	No change

6.5 RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS IN NEBBI DISTRICT

In addition to the analysis by the 8 diagnostic groups described in Section 2.6, all cases were also assigned to 1 of 2 broader categories based on the MOH treatment guidelines available in Uganda at the time of this study: "Rational" cases for which injections were mentioned or recommended in treatment guidelines and "nonrational" cases for which injections were *not* mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register.

In Nebbi district, the global analysis using the overarching categories of "rational" versus "nonrational" revealed a significant *decrease* in the proportion of patients receiving 1 or more injections in cases where injection *are* considered part of standard treatment from 40.2% at

baseline (n=649) to 33.7% at follow-up (n=581, $p \leq .01$). Among those with conditions for which injections are not part of standard treatment, the results were similar over time from 33.2% at baseline (n=791) to 30.6% at follow-up (n=859).

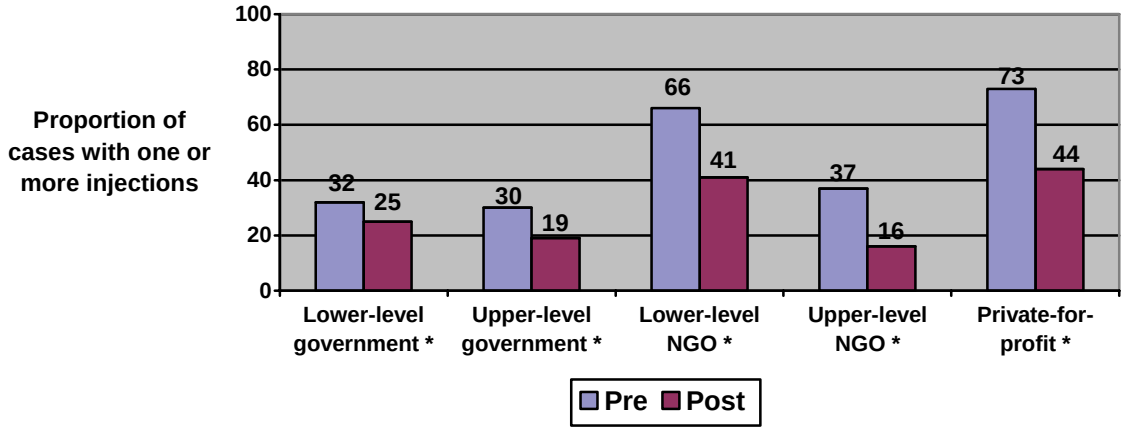
CHAPTER 7: RESULTS FOR MPIGI DISTRICT

Across all four intervention districts as a whole, there was a significant reduction in the proportion of cases being prescribed injections. Mpigi district was 1 of the 3 out of 4 individual project districts in which a significant reduction in injection use was found across all cases, from 40.2% at baseline to 24.6% at follow-up ($p \leq .001$).

7.1. FINDINGS BY OWNERSHIP AND LEVEL

In Mpigi district, all five categories of level and ownership decreased significantly over time (lower-level public, $p \leq .05$; all others, $p \leq .001$). As illustrated in Figure 11, by far the highest rate of prescription of injections was found in PFP facilities, which experienced a substantial decrease from the initial rate of 72.5% of cases receiving 1 or more injections to 43.8% at follow-up. Lower-level NGO facilities experienced a similar drop, going from a baseline rate of 66.3% of cases receiving injections to 40.6% at follow-up. Upper-level NGO facilities had only half as many injections at follow-up (16.3%) as were found at baseline (37.2%). Among government facilities, from similar starting points for upper-level facilities (30%) and lower-level (32.2%), a more pronounced decrease was found in the upper-level facilities, which dropped to 19.4% at follow-up compared to 25.3% among lower-level public sector facilities (Figure 11).

Figure 11: Changes in injection prescribing by level and ownership in Mpigi district



*** The change over time is significant at this level.**

7.2. FINDINGS BY GENDER

In Mpigi district, the proportion of patients who received an injection *decreased* significantly over time for both genders. Although at baseline men were significantly more likely to receive an injection than women (42.8% versus 38.0%, respectively) ($p \leq .05$), by the time of the follow-up that difference had disappeared (24.4% versus 24.8%, respectively).

7.3. FINDINGS BY AGE GROUP

Mpigi district showed a significant *decrease* across all age groups ($p \leq .001$). Injection prescribing was highest in the 0 to 5 years of age group in both the baseline and follow-up study periods (59.7% and 43.1%, respectively). Among the older children and teenagers from 6 to 14 years of age, 37.6% received an injection at baseline compared to 21.5% at follow-up. The rate of prescription of injections also dropped dramatically among young adults from 15 to 30 years of age (from 27.9% to 17.0%) and among adults over 30 years of age (from 29.6% to 14.2%).

7.4. FINDINGS BY DIAGNOSTIC GROUP

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment and four major groups for which an injection *may be given* as part of standard treatment. (Please refer to Section 2.6 for a detailed description of these categories.) (Table 11.)

The findings for Mpigi district are noteworthy in that this was the district whose results mostly closely paralleled the results for the combination of all intervention areas with significant reductions over time in four diagnostic categories. The proportion of ***malaria*** cases that received an injection decreased from 51.4% at baseline to 27.5% at follow-up ($p \leq .001$). ***Malaria with secondary conditions that are not treated with an injection*** dropped from 46.2% at baseline to 30.5% at follow-up ($p \leq .001$). The proportion of patients with ***miscellaneous cases that are not treated with an injection*** who received an injection dropped significantly from 17.1% at baseline to 8.1% at follow-up ($p \leq .01$). Similarly to the overall results for all intervention districts, there was some evidence of a reduction in the use of injectable medications to treat ***cough/cold*** cases at follow-up (15.9%) compared to baseline (27.3%), but it was not significant in this district ($p = .07$) (Table 11).

Among the diagnostic groups for which injections **are** part of the standard treatment guidelines, the only group that showed a significant change over time was the group of ***infected wounds and trauma***, which *decreased* from 52.9% at baseline to 32.2% at follow-up ($p \leq .01$). The group of ***miscellaneous conditions that may merit an injection*** remained similar over time with 23.7% at baseline and 21.0% at follow-up. The diagnostic group of ***malaria with secondary conditions that may be treated with an injection*** remained stable with 37.2% at baseline and 25.0% at follow-up as did the group of ***malaria and pneumonia***, which had

the highest rates of injection use of any diagnostic group in either time period in this district (75% at baseline, 61.5% at follow-up) (Table 11).

Table 11: Findings by diagnostic group in Mpigi district

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	51.4%	368	27.5%	371	Reduced (p≤.001)
Malaria with any secondary condition that is not treated with an injection	46.2%	264	30.5%	243	Reduced (p≤.001)
Cough/cold only	27.3%	66	15.9%	82	Some evidence of downward trend (p=.07)
Miscellaneous conditions that are not treated with an injection	17.1%	210	8.1%	197	Reduced (p≤.01)
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	37.2%	43	25.0%	40	No change
Malaria and pneumonia	75.0%	44	61.5%	52	No change
Infected wounds and trauma	52.9%	70	32.2%	59	Reduced (p≤.01)
Miscellaneous conditions that may be treated with an injection	23.7%	131	21.0%	138	No change

7.5. ANALYSIS BY RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS

In addition to the analysis by the 8 diagnostic groups described in Section 2.6, all cases were also assigned to 1 of 2 broader categories based on the MOH treatment guidelines available in Uganda at the time of this study: "Rational" cases for which injections were mentioned or recommended in treatment guidelines and "nonrational" cases for which injections were *not* mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register.

In Mpigi district, the global analysis using the overarching categories of "rational" or "nonrational" treatment revealed significant *decreases* over time in both categories. In the category of "rational" injections, 40.6% of patients at baseline received 1 or more injections

(n=288) compared to 31.1% at follow-up (n=289, $p \leq .01$). Among those for whom injections were not considered rational treatment, the reduction was from 40% at baseline (n=912) to 22.5% at follow-up (n=911, $p \leq .001$).

CHAPTER 8: RESULTS FOR PALLISA DISTRICT

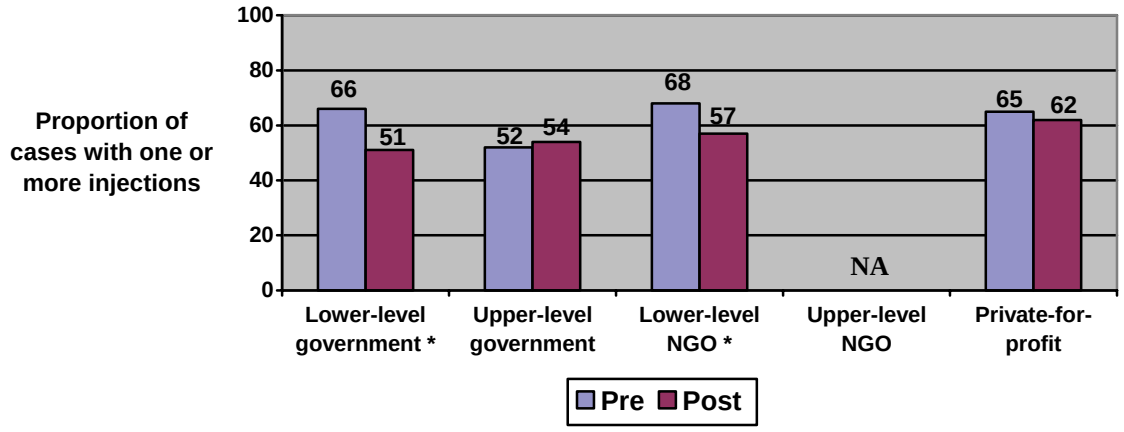
Across all four intervention districts as a whole, there was a significant reduction in the proportion of cases being prescribed injections. Pallisa district was one of the three out of four individual project districts in which a significant reduction in injection use was found across all cases. This district had the highest proportion of cases prescribed at least 1 injection at both baseline (62.7%) and follow-up (56%, $p \leq .001$).

8.1. FINDINGS BY OWNERSHIP AND LEVEL

In Pallisa, as reported in Section 2.2.2, no upper-level NGO facilities exist, so the analysis that follows is limited to the other 4 categories.

In contrast with the other intervention districts in which the usage of injections varied widely by level and ownership, in Pallisa, rates of injection use were uniformly high across all categories of facilities. Lower-level NGO and public sector facilities were the only two categories to show significant reductions over time. Among lower-level NGO facilities, the proportion of cases that were prescribed 1 or more injections dropped from 68.4% at baseline to 56.6% at follow-up ($p \leq .001$), while among lower-level government facilities it fell from 65.9% to 50.9% ($p \leq .001$). Among upper-level government facilities, the rate remained unchanged over time (51.6% at baseline, 54.4% at follow-up). PFP facilities remained high as well (65.0% at baseline, 62.2% at follow-up) (Figure 12).

Figure 12: Changes in injection prescribing by level and ownership in Pallisa district



*** The change over time is significant at this level.**

8.2. FINDINGS BY GENDER

In Pallisa district, the proportion of patients receiving 1 or more injections decreased significantly over time for both women (from 60.3% to 52.9%; $p \leq .01$) and for men (from 66.4% to 60.4%, $p \leq .05$). Even though both groups decreased, men were significantly more likely to receive an injection than women in both time periods.

8.3. FINDINGS BY AGE GROUP

Although Pallisa district continued to have the highest rates of injection use of any of the districts that were included in this study, there were significant *decreases* in the 3 youngest age groups—0 to 5 years of age, 6 to 14 years of age, and 15 to 30 years of age—even though overall this district continued to have the highest rates of injection use of any of the districts that were included in this study. Among children from 0 to 5 years of age, 76.3% received 1 or more injections at baseline compared to 68.4% at follow-up ($p \leq .01$). Among older children and teenagers from 6 to 14 years of age, 70.1% received injections at baseline compared to 54.6% at follow-up ($p \leq .01$). At baseline, 48.9% of the young adults from 15 to 30 years of age received injections. By the time of the follow-up, this figure had decreased to 41.4% ($p \leq .05$). Among adults over 30 years of age, 46.9% received injections at baseline with 44.0% receiving them at follow-up.

Only five patients' records in this district did not have any age recorded. Of those, one of three received an injection at baseline, and one of two received an injection at follow-up.

8.4. FINDINGS BY DIAGNOSTIC GROUP

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment and four major groups for which an injection *may be given* as part of standard treatment. (Please refer to Section 2.6 for a detailed description of these categories.)

In Pallisa district, among the diagnostic groups for which injections are **not** part of the standard treatment guidelines, the ***malaria*** group and the ***malaria with secondary conditions that are not treated with an injection*** both *decreased* significantly over time. For the malaria group, the proportion of patients receiving an injection was reduced from 65.6% at baseline to 57.2% at follow-up ($p \leq .05$). For malaria with secondary conditions, the decrease was more dramatic, from 73.3% at baseline to 57.8% at follow-up ($p \leq .001$) (Table 12).

Of the other two groups for which injections are not part of the standard treatment guidelines —***cough/cold*** and ***miscellaneous cases that are not treated with an injection***—the changes over time were not significant. Cough/cold remained stable with 41.8% at baseline compared to 38% at follow-up. Miscellaneous cases that did not require an injection were also similar at baseline (34.5%) and follow-up (38.8%) (Table 12).

Among the diagnostic groups for which injections are part of the standard treatment guidelines, the only group that showed a significant change over time was the group of

infected wounds and trauma, which *decreased* over time from 82.8% at baseline to 73.1% at follow-up (p=.05). The group of cases with diagnoses related to ***malaria and pneumonia*** showed some evidence of a decrease (85.9% at baseline, 75.9% at follow-up), but the change was not significant (p=.09) (Table 12).

Malaria with any secondary condition that is treatable with an injection (73.9% at baseline, 65.1% at follow-up) and ***miscellaneous conditions that may be treated with an injection*** (47.9% at baseline, 48.8% at follow-up) were statistically similar in both study periods (Table 12).

Table 12: Findings by diagnostic group in Pallisa district

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	65.6%	358	57.2%	390	Reduced (p≤.01)
Malaria with any secondary condition that is not treated with an injection	73.3%	303	57.8%	306	Reduced (p≤.001)
Cough/cold only	41.8%	55	38.0%	50	No change
Miscellaneous conditions that are not treated with an injection	34.5%	223	38.8%	201	No change
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	73.9%	46	65.1%	63	No change
Malaria and pneumonia	85.9%	71	75.9%	83	Some evidence of downward trend (p=.09)
Infected wounds and trauma	82.8%	128	73.1%	104	Reduced (p≤.05)
Miscellaneous conditions that may be treated with an injection	47.9%	94	48.8%	80	No change

8.5. ANALYSIS BY RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS

In addition to the analysis by the 8 diagnostic groups described in Section 2.6, all cases were also assigned to 1 of 2 broader categories based on the MOH treatment guidelines available in Uganda at the time of this study: "Rational" cases for which injections were mentioned or

recommended in treatment guidelines and “nonrational” cases for which injections were *not* mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register.

In Pallisa district, the global analysis using the overarching categories of “rational” or “nonrational” revealed significant *decreases* over time in both categories. In the category of “rational” injections, 72.6% of patients received 1 or more injections at baseline (n=339) compared to 66.4% at follow-up (n=330, $p \leq .05$). Among those for whom injections were *not* considered rational treatment, the reduction was from 59.2% at baseline (n=941) to 52.4% at follow-up (n=950, $p \leq .01$).

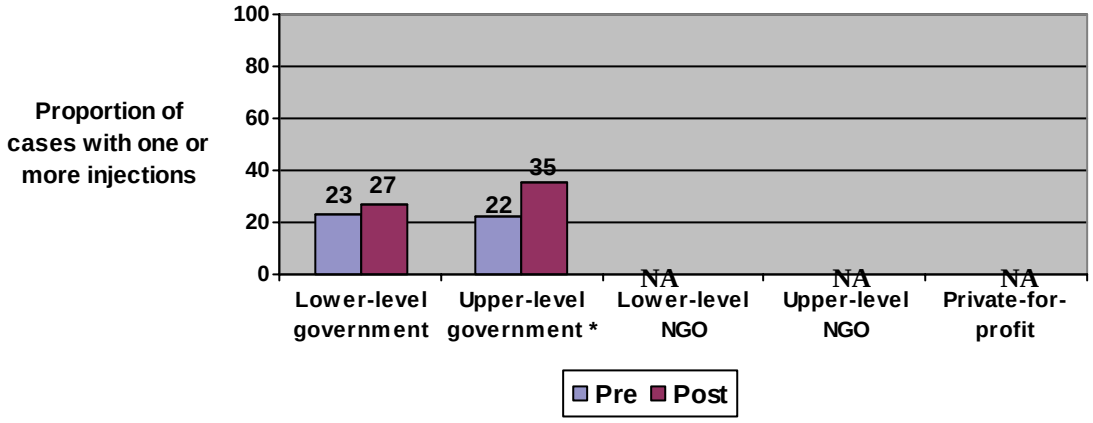
CHAPTER 9: RESULTS FOR LUWERO DISTRICT

In contrast to the MMIS intervention districts, Luwero district (the control district in this study) had a low prevalence of prescriptions of injections in the preintervention sample and a significant *increase* in prescriptions of injections over time from 22.8% at baseline to 31.1% at follow-up ($p \leq .001$).

9.1. FINDINGS BY OWNERSHIP AND LEVEL

In Luwero district, the sampling of facilities for this study was limited to government facilities as explained in Section 2.2.2. Overall for the district as a whole, a significant increase in injection use was found in comparing the baseline rate of 22.8% to that of the follow-up with 31.1% ($p <= .05$). However, of the 2 levels studied—upper-level and lower-level public facilities—the only level that changed significantly over time was the upper-level public facilities, which *increased* from 22.2% at baseline to 35.0% at follow-up ($p \leq .001$). The lower-level facilities remained stable with 23.4% at baseline and 27.2% at follow-up (Figure 13).

Figure 13: Changes in injection prescribing in Luwero district by level and ownership



*** The change over time is significant at this level.**

9.2. FINDINGS BY GENDER

In Luwero district, the proportions of patients receiving injections *increased* significantly over time for both men (23.6% at baseline, 35.1% at follow-up, $p \leq .01$) and women (22.3% at baseline, 28.6% at follow-up, $p \leq .05$).

9.3. FINDINGS BY AGE GROUP

In Luwero, there were significant *increases* in the 0 to 5 years of age group (from 34.9% at baseline to 48.2% at follow-up; $p \leq .01$) and the group over 30 years of age (from 12.3% to 24.8%, $p \leq .01$). The other age groups did not change significantly. Among older children and teenagers, 25.0% received injections at baseline compared to 26.7% at follow-up while among young adults from 15-30 years, 19.4% received one or more injections at baseline compared to 25.5% at follow-up.

In this district, 33 patient records did not have any age recorded. Of those, 5 of 22 (22.7%) received an injection at baseline compared to 1 of 11 at follow-up.

9.4. FINDINGS BY DIAGNOSTIC GROUP

In this report, results are presented initially across the entire set of study cases using four major groups for which an injection is *not* considered part of standard treatment and four major groups for which an injection *may be given* as part of standard treatment. (Please refer to Section 2.6 for a detailed description of these categories.)

In this control district, the only diagnostic group with a significant change over time was the ***cough/cold*** group, which *increased* from 9.2% of patients receiving an injection at baseline to 38.7% at follow-up ($p \leq .001$). Among the other diagnostic groups for which injections are not part of the standard treatment, ***malaria*** cases remained similar over time (24% at baseline, 31.6% at follow-up) as did ***malaria with secondary conditions that are not treated with an injection*** (34.7% at baseline, 35.4% at follow-up). ***Miscellaneous cases that are not treated with an injection*** did not change significantly between the two time periods (7.5% at baseline, 15.2% at follow-up; $p=.09$).

Among the other diagnostic groups for which injections are part of the standard treatment, no significant changes were seen. For ***malaria with secondary conditions that are treatable with injections***, very few cases were seen in either time period, and the results did not change from baseline (3 of 7 cases or 43%) to follow-up (6 of 20 cases or 30%). The same was true of ***malaria and pneumonia*** with 20% at baseline (1 of 5 cases) and 25% at follow-up (6 of 24 cases). The group of ***miscellaneous conditions that may be treated with an injection*** remained stable with 22.5% at baseline and 24.3% at follow-up as did that of ***infected wounds and trauma*** with 48.8% at baseline and 54.5% at follow-up (Table 13).

Table 13: Findings by diagnostic group in Luwero district

	Baseline		Follow-up		
Diagnostic Group	**% of cases receiving an injection**	**# cases**	**% of cases receiving an injection**	**# cases**	**Significance testing and direction of change (if any)**
Diagnostic groups for which injections are *not* standard treatment					
Malaria alone	24.0%	183	31.6%	155	No change
Malaria with any secondary condition that is not treated with an injection	34.7%	124	35.4%	147	No change
Cough/cold only	9.2%	87	38.7%	75	Reduced ($p \leq .001$)
Miscellaneous conditions that are not treated with an injection	7.5%	107	15.2%	105	No change
Diagnostic groups for which injections *are* standard treatment					
Malaria with any secondary condition other than pneumonia that is treatable with an injection	42.9 %	7	30.0%	20	No change
Malaria and pneumonia	20.0%	5	25.0%	24	No change
Infected wounds and trauma	48.8%	43	54.5%	44	No change
Miscellaneous conditions that may be treated by an injection	22.5%	80	24.3%	70	No change

9.5. ANALYSIS BY RATIONAL VERSUS NONRATIONAL USE OF INJECTIONS

In addition to the analysis by the 8 diagnostic groups described in Section 2.6, all cases were also assigned to 1 of 2 broader categories based on the MOH treatment guidelines available in Uganda at the time of this study: "Rational" cases for which injections were mentioned or recommended in treatment guidelines and "nonrational" cases for which injections were *not* mentioned as the recommended treatment for any of the diagnoses recorded in the outpatient register.

In Luwero district, the global analysis using the overarching categories of "rational" or "nonrational" revealed a significant increase in injections among cases with diagnoses for which injections were *not* standard treatment from 20.4% at baseline (n=505) to 30.3% at follow-up (n=482, $p \leq .001$). Among those for whom injections *are* considered rational treatment, there was no change from 31.9% at baseline (n=135) to 33.5% at follow-up (n=158).

CHAPTER 10: DISCUSSION AND CONCLUSIONS

Interventions implemented by MMIS including:

- training health workers on the dangers of unsafe injections and the risks associated with unnecessary injections
- behavior change campaigns targeting prescribers and communities not to demand injections
- revisions in the MOH treatment protocols—specifically the change in malaria treatment guidelines—

brought about significant reductions in the prescription of injectable medications in three of the four districts (Nebbi, Mpigi and Pallisa) included in this study. The only district that did not see a significant reduction overall (Ibanda) was the one that was closest to the MOH goal of 15% of patients receiving a prescription for an injectable medication.

In Pallisa district, this study showed a significant reduction in the prescription of injections compared to earlier studies done (Khalid and Seru 2004) in which Pallisa had a 70% injection prescription rate. It is not clear why Pallisa continued to prescribe more injections than any other district since factors such as the availability of orals were similar. Pallisa district had the highest proportion of cases between 0 to 5 years of age—which is the age group that was found to be the most likely to be prescribed an injection—but even when these cases were removed from the analysis, the other age groups continued to be prescribed many more injections than in any other district studied. More information is needed on the prescribers' and patients' attitudes toward injections to understand the strong motivation to prescribe injections.

In general, a higher rate of injection use was found in the primary health care facilities compared to hospitals. This could be related to the availability of better diagnostic facilities in upper-level facilities as well as having more trained personnel who may been able to make a more definitive diagnosis and recognize patients who need an injectable treatment (MOH, JSI, and MACRO 2002).

It was believed that large hospitals would be likely to see very complicated cases and would, thus, be unlikely to achieve significant reductions in injection use. The findings of this study, however, showed that both public and nonprofit hospitals achieved significant reductions in injection use when all four intervention districts were considered together. In fact, the reductions in the prescription of injectable medications that were achieved were seen across all levels of care and all types of ownership in the intervention districts as a whole. In spite of these reductions, though, injection use still remained well above the proposed rate of 15% injection use at OPD (Kafuko et al. 1994) in all districts.

Interestingly, PFP facilities continue to prescribe the highest number of injections. It was expected that PFP facilities would respond to patients' demands since the patients or parents of patients pay for services out of pocket. Thus, the monetary incentive to prescribe injections

is high (Ogwal-Okeng et al. 2004; McPake et al. 2000). It was expected that changing the behavior of private practitioners would be difficult without putting in place other incentives to offset the projected loss from a reduction in injections. Certainly, special interventions targeting the private sector may have to be developed to bring about further changes, but it is encouraging to see the reduction that was already achieved using the same strategies as in government facilities.

This study found that injections were commonly prescribed even when oral alternatives were available. While this may point to deliberate overuse of injections in the NGO and PFP facilities, government facilities depend entirely on the government for funds to procure drugs. Considering that the national medicines budget of USD 1.6812 per capita falls short of the USD 3.5 per capita required to meet the basic essential drugs needs (the MOH annual performance report 2004/2005), availability is not always guaranteed. In such situations, rationing of drugs is common and, hence, availability on the shelf may not necessarily mean availability for use. Nevertheless, in this study, availability of oral alternatives was only rarely a concern; and it does not appear to have impacted the prescription of injectables, particularly in PFP and NGO facilities, which can replenish stocks as and when necessary. The only specific disease for which stockouts may have been a factor was for malaria. In these cases, anecdotal reports suggest that the change in the malaria treatment protocol resulted in stockouts of oral antimalarial drugs in some locations, and this may have resulted in situations where clinicians resorted to prescribing injectable antimalarial drugs. Looking beyond this particular case, however, it appears that factors other than availability of oral medications influence the decision to prescribe injections.

With the overall reduction in prescription of injectable medications in three of the four districts, a reduction in the number of pricks or individual doses of those medications might have been expected; however, at all levels of care, prescribers were more likely to prescribe a full course of injectable treatment even though they had the option of prescribing a starting dose of injection followed by an oral alternative for the patient to complete the treatment course. This finding may point to a knowledge gap, especially at lower levels of health care, in the mode of action of the two dosage forms in treatment of disease. The findings of this study suggest that once the decision to prescribe an injectable medication is made providers do not reduce the number of doses or switch to an oral alternative for ongoing care.

The cost implication for preference to prescribe full courses of injectable treatment is enormous. At the average of 1.32 pricks per OPD case, and with close to 24 million new OPD cases visiting facilities countrywide per year (Khalid and Seru 2004), 31.7 million syringes are required to meet the demand.

The overall analysis across all four intervention districts masked important differences when each district was considered alone. When considered separately, Mpigi was the only district to parallel the overall finding of reductions in injection use at each of the five levels studied. In Pallisa district, lower-level government and NGO facilities were the only facilities with significant reductions, while in Nebbi only upper-level government facilities had a significant

[12] The figure excludes contributions from global initiatives (e.g. Global Fund for ARV, TB and Malaria drugs and GAVI for pentavalent vaccine.)

decrease. In Ibanda, the only significant change was an increase in the proportion of patients receiving an injection in upper-level government facilities; but in this district, despite this increase, cases at this level remained consistent with the MOH guideline of 15% use of injections. Generally, the pattern that is seen in the district-level analysis can be summarized as showing that the districts with the highest use of injectable medications (Pallisa and Mpigi) are the districts with the most reductions, but they continue to have very high use of injections.

Another general conclusion is that the district of Luwero was not as good of a control as had been expected. As explained in Chapter 2, this district was selected as a control because of a prior study that showed it to be similar to the intervention district of Nebbi. However, the findings of this study showed that at baseline Luwero had significantly fewer injections than Nebbi although both districts were similar by the time of the follow-up study.

In the analysis by gender, despite significant decreases for both genders over time, male patients were prescribed significantly more injections than female patients in both study periods when all intervention districts were combined. In Pallisa and Mpigi districts, prescriptions of injections fell significantly for both genders, while in Nebbi district only women received significantly fewer injections at follow-up than at baseline. Interestingly, in three of the four intervention districts (Ibanda, Nebbi, and Pallisa), by the time of the follow-up, men were significantly more likely to receive injectable medications than women. It is not clear whether this finding indicates a higher rate of demand for injections among men, a perception of more serious illness among male patients, or if prescribers make this choice themselves. Further investigation would be required to investigate this finding.

In the analysis by age groups, it was clear that children from 0 to 5 years of age received the most injections of any age group, followed by the 6 to 14 years of age group. These findings held true across all districts in spite of reductions in the prescription of injectable medications across all ages when all districts were tested as a group and in spite of significant reductions in the 0 to 5 years of age group in Mpigi and Pallisa districts. (As mentioned earlier, these two districts had the highest starting points of any districts and, thus, the most room for improvement.) In Ibanda and Luwero districts, in contrast, the proportion of children from 0 to 5 years of age that received prescriptions for injectable medications actually *increased* significantly over time. It is not clear to what this increase could be attributed. It is possible that the particular mix of cases found in the second time period may have shifted, but it is important to note that the study design using the same calendar months for baseline and follow-up was designed to control for any seasonality effects that might otherwise have affected these results.

In the overall analysis by diagnostic groups, the groups consisting of cases of malaria, malaria with secondary conditions that are not treated with an injection, miscellaneous cases that do not require an injection, and infected wounds and trauma all decreased significantly over time across the total sample from the four intervention districts. Once again, Mpigi and Pallisa districts, which had the highest proportions of patients receiving injections, were the districts with the most significant reductions, while Ibanda, which remained stable overall, saw an

increased level of prescriptions of injectable medications for malaria, particularly for children under five years of age.

In the analysis by diagnostic groups, there were interesting patterns among the four groups with malaria as a diagnosis. In Ibanda district, for example, malaria with secondary conditions that do not require an injection remained stable in both study periods; and in each group these cases were significantly less likely to receive an injection than cases that had malaria as the only diagnostic code. It is possible that prescribers who recorded "malaria" as the only diagnosis were more certain of this diagnosis and proceeded to treat it more aggressively with injectable medications than prescribers who recorded other symptoms and conditions for "malaria" cases, some of which may have been other types of febrile illnesses that might not require an injection. Further investigation would be required to test this hypothesis.

As reported in Chapter 4, significant reductions in the prescription of injectable medications over time were found for both rational and nonrational cases of injection use across the combined sample of all four intervention districts. Once again, Mpigi and Pallisa districts, which had the highest proportions of patients receiving injections, were the districts that had significant reductions in both categories, while in Nebbi reductions were only seen in the rational injection group; and in Ibanda, no significant changes were seen.

Although the overall findings of this study are encouraging, it is important to note that the rate of injection use among nonrational cases of prescription of injections at follow-up (31.8%) is still double the MOH goal of 15% of *all* cases—rational and nonrational—receiving an injection. This is particularly striking considering that these "nonrational" cases do not have *any* symptoms associated with treatment by injections according to treatment guidelines used in Uganda. This suggests that although progress has been made more efforts are needed to continue to educate health workers on the advantages of noninjectable treatment and to reinforce compliance with treatment protocols.

CHAPTER 11: RECOMMENDATIONS

1. It is recommended that the MOH revisit the targets set for the prescription of injectable medication. In addition, it appears that these districts still need more training on rational use of drugs with emphasis on reducing unnecessary injections. In particular, these efforts can focus on identifying diagnoses and conditions for which further reductions can be made without compromising patient care.

2. In view of the initial success of the interventions undertaken by MMIS, it is recommended that similar interventions be implemented in all districts to reduce the existing high rate of injection use nationwide. These interventions can be further tailored and enhanced using the data from this study.

3. More efforts should be made to involve the private sector in reducing unnecessary injections. Prescribers in the private sector need special attention to ensure that they adhere to treatment guidelines. If the monitory incentive is strong, educational intervention will have to be combined with sensitization of the consumers, but the results reported in this study are encouraging as they show a good response from this group.

4. Further studies should be undertaken to understand the factors motivating prescribers to recommend injections even when effective oral alternatives are available and in stock. Patients' demands and individual patient's characteristics such as gender and age appear to be factors that influence prescribers' behavior. This finding highlights the need to assess the attitude of clients towards injections so that unnecessary demand is reduced.

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APPENDIX 1: COMPARISON OF THE ACTUAL SAMPLE VERSUS PLANNED FACILITIES OF THE STUDY

	Districts	Number of facilities planned per district	Number actually included per district	Records PreInter-vention (obtained sample)	Records Postinter-vention (obtained sample)
Public sector Levels II and III (lower level)	Ibanda	4	4	320	320
	Mpigi	4	4	320	320
	Nebbi	4	4	320	320
	Pallisa	4	4	320	320
	Luwero	4	4	320	320
Public sector Levels IV and V (hospital)	Ibanda	2	2	320	320
	Mpigi	2	2	320	320
	Pallisa	2	2	320	320
	Nebbi	1	1	320	320
	Luwero	2	2	320	320
NGO 1 (lower level)	Ibanda	4	1	320	320
	Mpigi	4	2	160	160
	Nebbi	4	4	320	320
	Pallisa	4	4	320	320
NGO 2 (hospital)	Ibanda	1	1	320	320
	Nebbi	2	1	320	320
	Mpigi	1	1	320	320
	Pallisa	0	0	NA	NA
PFP (clinics)	Ibanda	4	4	320	320
	Nebbi	4	2	160	160
	Pallisa	4	2	320	320
	Mpigi	3	1	80	80
Total		**64**	**51**	**6,160**	**6,160**

APPENDIX 2: PROPORTION OF CASES BY DISEASE/CONDITION IN ALL DISTRICTS

	Preintervention			Postintervention	
	Proportion of All Cases	Number of Cases		Proportion of All Cases %	Number of Cases
Malaria	56.8 %	6,160		58.4 %	6,160
Cough or cold (without pneumonia)	18.0 %			17.9 %	
Pneumonia	10.8 %			10.7 %	
Intestinal worms	6.4 %			6.1 %	
Infected wounds	4.3 %			4.0 %	
Gastrointestinal diseases	3.8 %			4.8 %	
Abdominal pain	3.6 %			3.0 %	
Urinary tract infections	2.7 %			2.7 %	
Body/back / limb ache	2.4 %			2.9 %	
Dental diseases	2.3 %			1.5 %	
Skin diseases	2.2 %			2.6 %	
Diarrhea (nonbloody, nonpersistent)	1.9 %			2.1 %	
Nonintentional trauma (not including road traffic accidents)	1.9 %			1.4 %	
Ear Infections	1.6 %			1.4 %	
Dysentery	1.5 %			1.9 %	
Eye Infections	1.5 %			1.8 %	
Anaemia	1.4 %			1.6 %	
Hypertension	1.2 %			1.3 %	
Genital ulcers	1.1 %			1.3 %	
Domestic violence	0.9 %			1.0 %	
Genital or vaginal discharge	0.9 %			0.8 %	
Headache	0.9 %			0.6 %	
Pelvic inflammatory diseases	0.8 %			1.3 %	
Pregnancy (including all cases of maternal, perinatal conditions and/or complications)	0.8 %			1.0 %	
Fungal infections	0.7 %			0.8 %	
Asthma	0.6 %			1.0 %	
Tuberculosis (suspected or confirmed cases)	0.3 %			0.6 %	
Diabetes	0.3 %			0.5 %	
Typhoid fever	0.3 %			0.4 %	
Trauma related to road traffic accidents	0.3 %			0.3 %	
Abortion	0.3 %			0.3 %	
Persistent diarrhea	0.2 %			0.2 %	

Other intentional trauma (not including domestic violence)	0.2 %			0.2 %	

* This table does not include proportions for diseases and conditions in which fewer than 20 cases (0.2%) were found across the total study sample from baseline and follow-up such as mental illnesses (18 cases), meningitis (16 cases), measles (14 cases), cardiovascular diseases (12 cases), AIDS (9 cases), neonatal tetanus (5 cases), severe malnutrition (4 cases), cholera (1 case), and onchocerciasis (1 case).

APPENDIX 3: NUMBER AND PROPORTION OF CASES BY DIAGNOSTIC GROUP AND DISTRICT, AT BASELINE AND FOLLOW-UP

Baseline												
	Intervention Districts										Control	
	Ibanda		Pallisa		Mpigi		Nebbi		Total		Luwero	
	#	%	#	%	#	%	#	%	#	%	#	%
Malaria only	606	37.9	358	28.0	368	30.7	325	22.6	1657	30.0	183	28.6
Malaria with one or more secondary conditions that are NOT treated with injections	246	15.4	303	23.7	264	22.0	122	8.5	935	16.9	124	19.4
Malaria with any secondary condition other than pneumonia that IS treatable with an injection	52	3.3	46	3.6	43	3.6	31	2.2	172	3.1	7	1.1
Cough/cold only	163	10.2	55	4.3	66	5.5	4	0.3	288	5.2	87	13.6
Miscellaneous—NO conditions that are treated with injections	204	12.8	223	17.4	210	17.5	340	23.6	977	17.7	107	16.7
Miscellaneous—Injections are OK	196	12.3	94	7.3	131	10.9	260	18.1	681	12.3	80	12.5
Malaria and pneumonia, all cases	38	2.4	71	5.5	44	3.7	252	17.5	405	7.3	5	0.8
Infected wounds and trauma with or without any secondary condition except malaria	78	4.9	128	10.0	70	5.8	106	7.4	382	6.9	43	6.7
No specific diagnosis recorded	17	1.1	2	0.2	4	0.3	0	0.0	23	0.4	4	0.6
Total for this district	**1600**	**100.0**	**1280**	**100.0**	**1200**	**100.0**	**1440**	**100.0**	**5520**	**100.0**	**640**	**100.0**

Follow-up												
	Intervention Districts										Control	
	Ibanda		Pallisa		Mpigi		Nebbi		Total		Luwero	
	#	%	#	%	#	%	#	%	#	%	#	%
Malaria only	564	35.3	390	30.5	371	30.9	332	23.1	1657	30.0	155	24.2
Malaria with one or more secondary conditions that are NOT treated with injections	250	15.6	306	23.9	243	20.3	161	11.2	960	17.4	147	23.0
Malaria with any secondary condition other than pneumonia that IS treatable with an injection	97	6.1	63	4.9	40	3.3	30	2.1	230	4.2	20	3.1
Cough/cold only	159	9.9	50	3.9	82	6.8	2	0.1	293	5.3	75	11.7
Miscellaneous—NO conditions that are treated with injections	179	11.2	201	15.7	197	16.4	364	25.3	941	17.0	105	16.4
Miscellaneous—Injections are OK	228	14.3	80	6.3	138	11.5	240	16.7	686	12.4	70	10.9
Malaria and pneumonia, all cases	32	2.0	83	6.5	52	4.3	217	15.1	384	7.0	24	3.8
Infected wounds and trauma with or without any secondary condition except malaria	71	4.4	104	8.1	59	4.9	94	6.5	328	5.9	44	6.9
No specific diagnosis recorded	20	1.3	3	0.2	18	1.5	0	0.0	41	0.7	0	0.0
Total for this district	**1600**	**100.0**	**1280**	**100.0**	**1200**	**100.0**	**1440**	**100.0**	**5520**	**100.0**	**640**	**100.0**

APPENDIX 4: COMPLETE LISTING OF DIAGNOSES BY FIRST DIAGNOSIS AND BY TOTAL TIMES MENTIONED

Diagnosis	As First Diagnosis		Among All Diagnoses		Whether injection is rational according to guidelines when this is the only condition
	Frequency as First Diagnosis	Percent of Total	Frequency among all Cases	Percent of Total Cases	
Abdominal pain	405	3.3%	405	3.3%	No
Abortions	32	0.3%	34	0.3%	Yes
AIDS	8	0.1%	9	0.1%	No
Anemia	184	1.5%	187	1.5%	No
Body/back/limb pain/ache	313	2.5%	328	2.7%	No
Bronchial asthma	65	0.5%	98	0.8%	Yes
Cholera	1	0.0%	1	0.0%	No
Cough or cold (no pneumonia)	785	6.4%	2,208	17.9%	No
Dental diseases and conditions	233	1.9%	236	1.9%	Yes
Diabetes mellitus	52	0.4%	52	0.4%	Yes
Diarrhea—Dysentery	205	1.7%	215	1.7%	No
Diarrhea—Not bloody	234	1.9%	244	2.0%	No
Diarrhea—Persistent	27	0.2%	27	0.2%	No
Ear infection	181	1.5%	183	1.5%	No
Eye infection	194	1.6%	201	1.6%	No
Fungal infection	90	0.7%	90	0.7%	No
Gastrointestinal diseases	490	4.0%	526	4.3%	Yes
Genital infection—Ulcerative	139	1.1%	148	1.2%	Yes
Genital infection—Urethral discharge	30	0.2%	100	0.8%	No
Genital infection – Vaginal discharge	62	0.5%			
Headache	81	0.7%	91	0.7%	No
Hypertension	132	1.1%	153	1.2%	No

Infected wounds	413	3.4%	512	4.2%	Yes[13]
Intestinal worms	639	5.2%	768	6.2%	No
Malaria	5,810	47.2%	7,091	57.6%	Yes, if complicated: No, if not
Measles	13	0.1%	14	0.1%	No
Meningitis	14	0.1%	16	0.1%	Yes
Mental illnesses	14	0.1%	18	0.1%	Yes
Neonatal tetanus	1	0.0%	5	0.0%	Yes
Onchocerciasis	1	0.0%	1	0.0%	No
Other cardiovascular diseases	7	0.1%	12	0.1%	No
Other complications of pregnancy	67	0.5%	113	0.9%	Yes
Perinatal conditions	19	0.2%			
Pelvic inflammatory disease	81	0.7%	126	1.0%	No
Pneumonia	418	3.4%	1,325	10.8%	Yes
Severe malnutrition	2	0.0%	4	0.0%	Yes
Skin diseases	205	1.7%	291	2.4%	Yes
Trauma—Domestic violence	96	0.8%	117	0.9%	Yes
Trauma—Other intentional	18	0.1%	21	0.2%	
Trauma—Other nonintentional	186	1.5%	204	1.7%	
Trauma—Road traffic accidents	38	0.3%	39	0.3%	
Tuberculosis (suspected or confirmed)	26	0.2%	51	0.4%	No
Typhoid fever	16	0.1%	39	0.3%	Yes
Urinary tract infections (not sexually transmitted)	224	1.8%	336	2.7%	Yes
Other	68	0.5%	77	0.6%	No
Total	**12,320**	**100%**	**12,320**	**100%**	

[13] Since the data do not specify what type of injury or wound occurred, an injection may be necessary such as for rabies or tetanus prevention.

APPENDIX 5: SAMPLE SIZES FOR ANALYSIS BY AGE, SEX, AND DISTRICT

	Ibanda			Nebbi			Mpigi			Pallisa			Total for Intervention			Luwero (Control)		
	Base-line	Follow-up	Total	Base-line	Follow-up	Total	Base-line	Follow-up	Total	Base-line	Follow-up	Total	Base-line	Follow-up	Total	Base-line	Follow-up	Total
Total	1600	1600	3200	1440	1440	2880	1200	1200	2400	1280	1280	2560	5520	5520	11040	640	640	1280
Age Groups																		
0-5 years	363	320	683	565	571	1136	390	348	738	545	580	1125	1863	1819	3682	169	164	333
6-14 years	195	185	380	214	182	396	186	209	395	157	185	342	752	761	1513	108	120	228
15-30 years	437	492	929	391	384	775	330	318	648	321	304	625	1479	1498	2977	186	184	370
31+ years	348	426	774	270	303	573	294	325	619	254	209	463	1166	1263	2429	155	161	316
Age not recorded	257	177	434	0	0	0	0	0	0	3	2	5	260	179	439	22	11	33
Gender																		
Men	588	580	1168	617	643	1260	537	542	1079	524	538	1062	2266	2303	4569	237	248	485
Women	1007	1014	2021	823	797	1620	663	658	1321	754	739	1493	3247	3208	6455	403	392	795
Gender not recorded	5	6	11	0	0	0	0	0	0	2	3	5	7	9	16	0	0	0

For more information, please visit www.mmis.jsi.com.

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