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Impact of Supply on Contraceptive Use: Building Evidence in Rwanda

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Introduction

The research presented here was carried out as a collaborative effort between the Ministry of Health of Rwanda, Department of Maternal and Child Health and the USAID | DELIVER PROJECT, with funding from USAID. The team endeavored to establish a relationship between the routine availability of contraceptive supplies and the increase in contraceptive prevalence witnessed in Rwanda over the past five to seven years. The opportunity to conduct this analysis in Rwanda was timely due to the rich amount of independent data sources available, both facility-based supply chain performance data from the logistics management information system (LMIS), as well as population-based contraceptive use data from the recent Demographic and Health Surveys (DHS).

Both demand and product availability are required for women to seek and use modern contraceptives. The USAID | DELIVER PROJECT works predominantly in ensuring product availability, so demand was not explored in this analysis. We have identified three ways to determine product availability over time: reliability of product supply, volume of products distributed to clients through the supply chain, and number of contraceptive methods available. Given the data available, we have focused on the first two, which comprise having products in country and being able to get those products to health facilities where clients can access them. The following graphic portrays the hypothesis applied for this research.

Figure 1. Hypothesis of Analysis

Data Sources and Period of Analysis

As noted, this analysis attempted to examine the relationship between two independent data sets—LMIS and DHS data. LMIS data for contraceptives, namely records on the volume (i.e., quantities) of commodities dispensed to clients at the service delivery point (SDP) level, has been collected and managed by the MOH with technical support from the USAID | DELIVER PROJECT's office in Rwanda since 2005. These data have been aggregated at the district level and then reported to the central level for nationwide aggregation. Over time, the LMIS data has become increasingly comprehensive with the implementation of a computer-based software (Supply Chain Manager) in 2009.

In addition, MEASURE DHS has conducted Demographic and Health Surveys in Rwanda in 1992, 2000, 2005, 2007/08, and 2010. These nationally-representative household surveys include important information on contraceptive use. Survey results indicate a dramatic increase in the contraceptive prevalence rate (CPR) in Rwanda.

Based on the data available from these two sources, the period of analysis extends from 2005 to 2010. Since we have electronic logistics data starting in 2005, we used DHS data starting in 2005 as well.

Methodology and Results

Contraceptive Use from the DHS

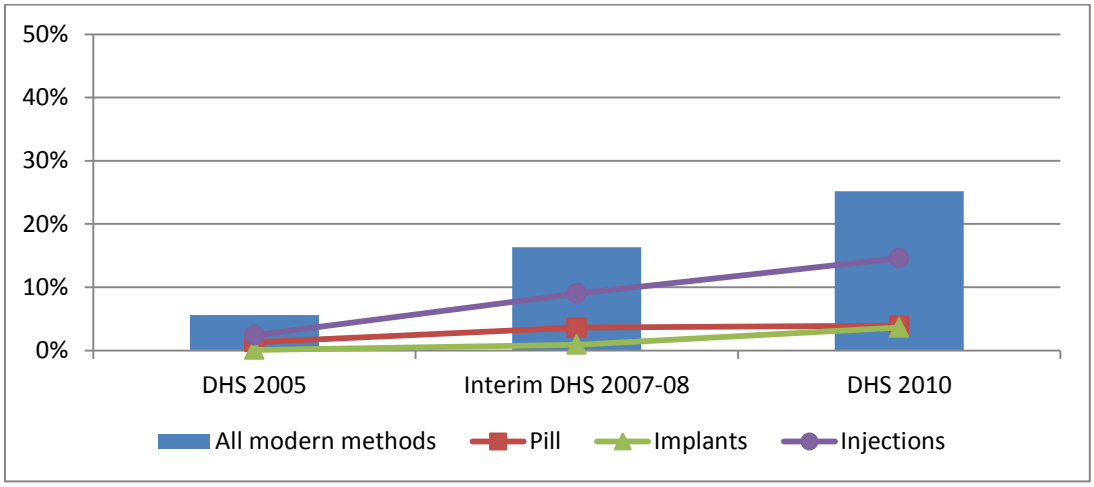
Because the public sector in Rwanda provides women with contraceptives regardless of marital status, the subsequent analyses utilize the CPR figures for all women of reproductive age (WRA). In addition to indicating overall contraceptive use, the DHS provides information on the percentage of users utilizing each method (see figure 2). This graph represents modern CPR among all WRA in Rwanda as reported in the Rwanda Demographic Health Surveys (DHS) from 2005, 2007/8, and 2010[1].

Modern CPR among all women in Rwanda has increased from 5.6 percent in 2000 to 25.2 percent in 2010. The majority of the increase is found in injectable use, which has increased from 2.4 percent to 14.6 percent. Injectables comprise the greatest percentage of modern method users in Rwanda. Throughout this paper, results from the analysis on injectables have been used as examples.

As a national survey, information in the DHS is representative at the provincial level, but not lower levels, which influenced our later analysis.

1 National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International. 2012. *Rwanda Demographic and Health Survey 2010*. Calverton, Maryland, USA: NISR, MOH, and ICF International; Ministry of Health (MOH) [Rwanda], National Institute of Statistics of Rwanda (NISR), and ICF Macro. 2009. *Rwanda Interim Demographic and Health Survey 2007-08*. Calverton, Maryland, U.S.A.: MOH, NISR, and ICF Macro; Institut National de la Statistique du Rwanda (INSR) and ORC Macro. 2006. *Rwanda Demographic and Health Survey 2005*. Calverton, Maryland, U.S.A.: INSR and ORC Macro.

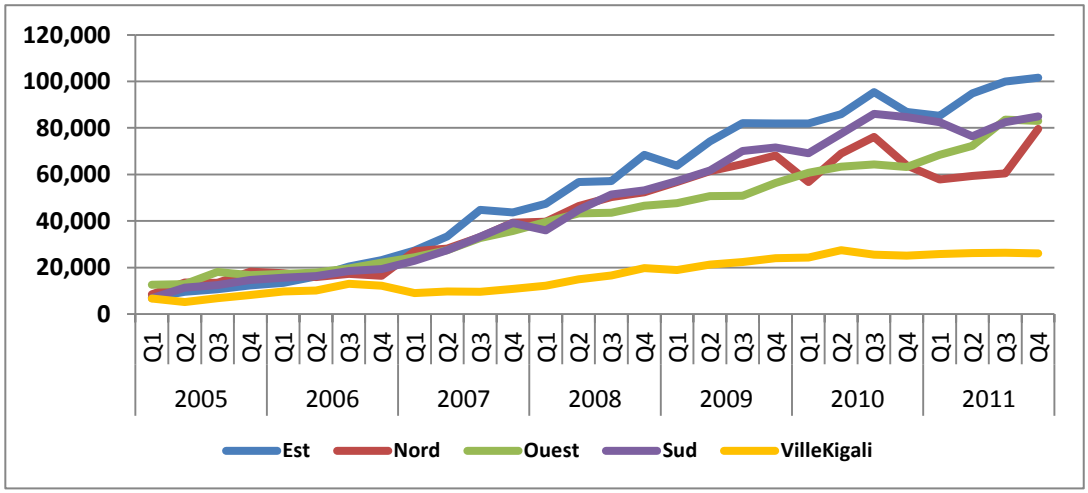
Figure 2. CPR Among All Women, Rwanda DHS



Volume Data from LMIS

In this paper, "volume" refers to the quantities of contraceptives dispensed to clients at the SDP level, aggregated at the district level of the supply chain in Rwanda. Information was then aggregated to the provincial level in order to allow comparisons with the DHS data. (The DHS data is representative at the provincial, but not the district level.) As seen in the example in Figure 3, there is a continuous increase in volumes of injectables dispensed to clients in each of the five provinces. There has been greater growth in volumes of injectables dispensed to clients outside of Kigali, increasing roughly seven times over the six-year period. While growth in Kigali has not maintained the same pace, volumes dispensed have roughly doubled. Differences in the methods of data aggregation may have led to the increase in variability in volumes reported in later time periods.

Figure 3. Volume of Injectables Dispensed to Clients (Aggregated to a Provincial Level)

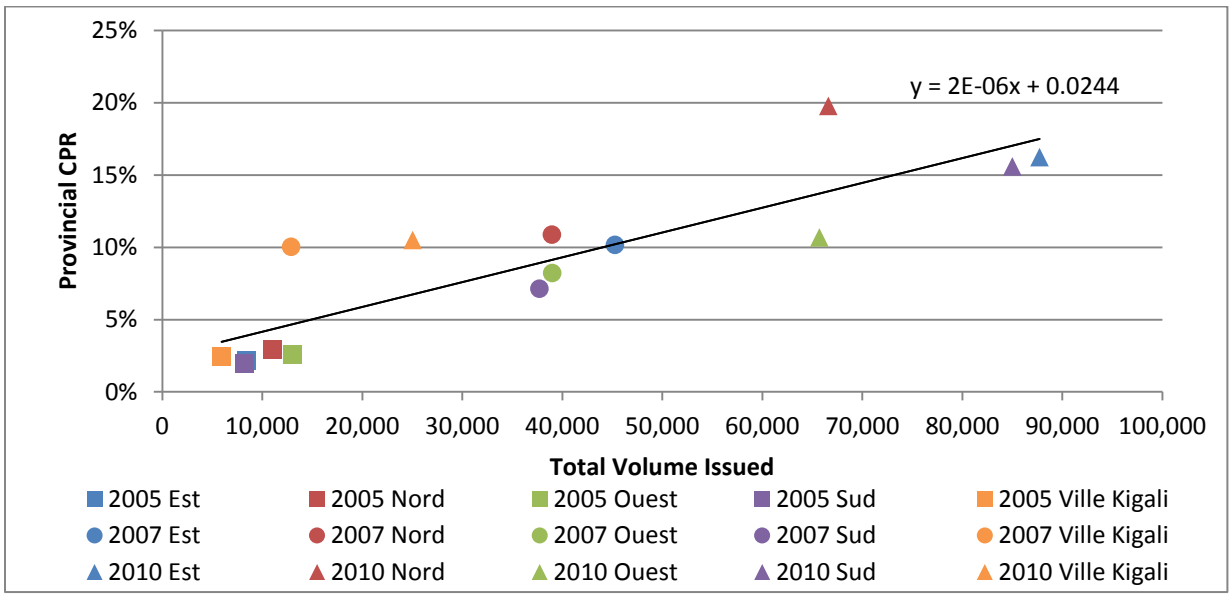


Provincial Volumes Compared to CPR

For the analysis comparing provincial volume to CPR, the six-month average district volume of quantities dispensed to clients was summed up by province and compared to the CPR for each province for the same time period. It is important to note that linking logistics data and client use data can be complicated in terms of timing. Clients may have received their current contraceptive in the last month, or they may have obtained it earlier (especially for injectables and long-term methods). This is the reason for using a six-month average of commodities dispensed instead of using the volume of commodities dispensed only at the time of the survey.

For injectables, using the quantities dispensed data, we see that the injectables dispensed in country directly support the increase in CPR for this method. Each point in figure 4 represents a province and time period in 2005, 2007/08, or 2010/11 (coinciding with DHS time periods). As seen in this graph, as volumes dispensed increase over time, there is a corresponding increase in CPR by province, thus indicating a relationship between supply and client use.

Figure 4. Average Volume of Injectables Dispensed to Clients (Aggregated to a Provincial Level) Compared to CPR: 2005, 2007, 2010



This graph can help predict how many injectables are needed per quarter to help increase CPR by 1%. Of course, other factors play a role, too—population size, demand, barriers to access, and source of supply, for example.

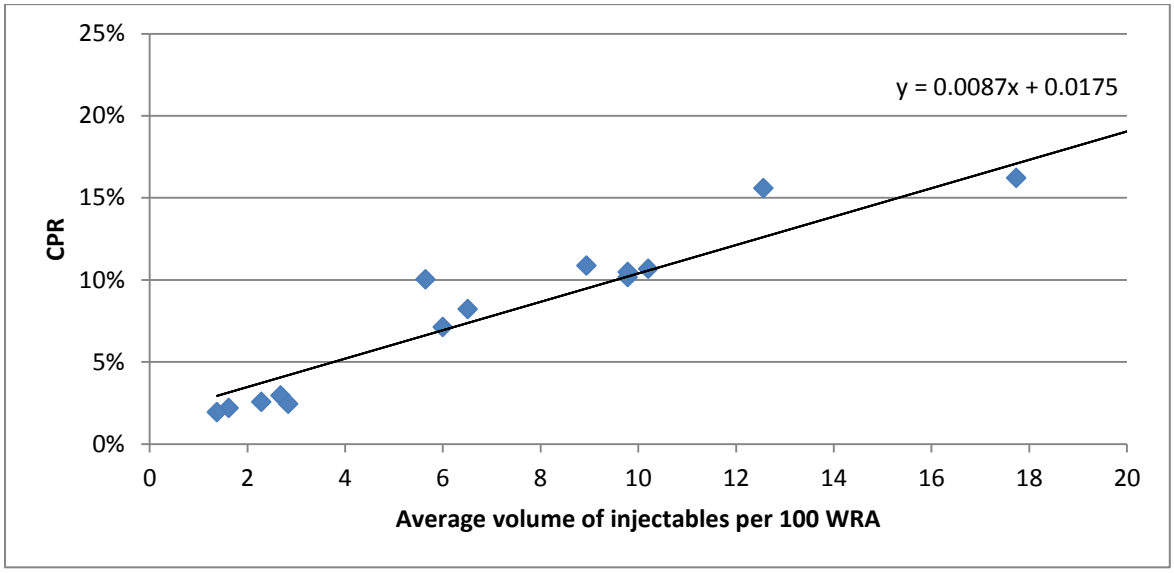
Volume Compared to CPR, Per Woman of Reproductive Age

In order to show that the increase in volume dispensed was due to additional users and not simply differences between provinces' populations or population growth between years, analysis was also conducted controlling for population size. In order to remove the effect of population size between

provinces, the quantities dispensed in a province during the quarter were divided by the mid-year population for women of reproductive age (WRA) in that province and then multiplied by 100 to calculate the number of contraceptives dispensed per 100 WRA per quarter[2]. For example, if the population of WRA in one province was 1 million, one would expect 10,000 injectables dispensed per quarter in order for the CPR for injectables to be 1%. However, if another province had a population of 2 million WRA, you would expect them to need 20,000 injectables in order for the CPR for injectables to be 1%. The results were compared to the CPR for the method, by province.

Similar to the preceding graph, each point represents one of the five provinces during the DHS surveys in 2005, 2007/8 and 2010. Figure 5 shows that the logistics data we have aligns fairly well with CPR. For example, in the province where 10 injectables are distributed for every 100 women of reproductive age, you see a CPR of about 10%.[3]

Figure 5. Average Volume of Injectables per 100 WRA per Quarter vs. CPR

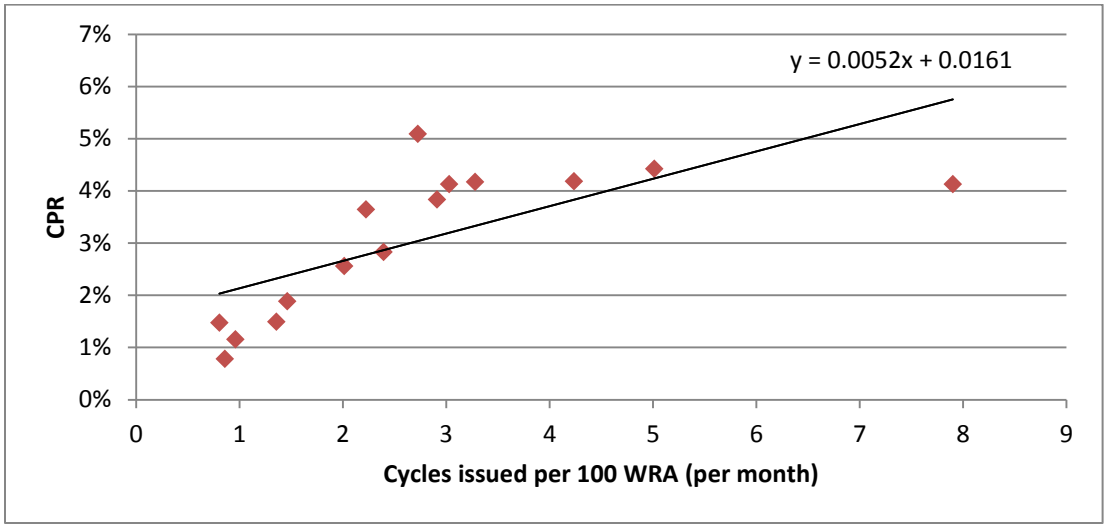


Using the dispensed-to-users data to conduct the same analysis for oral contraceptives, we see that the orals distributed in country directly support the increase in CPR for this method as well (see figure 6). Since this analysis is done on a monthly basis, you would expect one cycle distributed monthly per 100 WRA to line up with a 1% CPR rate, and it more or less does.

2 Population data was taken from the AfriPop Demography 2005 and 2010 datasets2 (interpolating the 2007/2008 values). Data accessed February 2012 from http://www.clas.ufl.edu/users/atatem/index_files/AfriPop.htm

3. Slight deviations from this one-to-one relationship may be due to use of contraceptives from a non-public sector source, a disconnect between the time period of the DHS survey and the LMIS data used, or inaccurate population, CPR, or LMIS data.

Figure 6. Volume of Orals Dispensed per 100 WRA per Month vs. CPR



Measuring Reliability of Commodity Supply

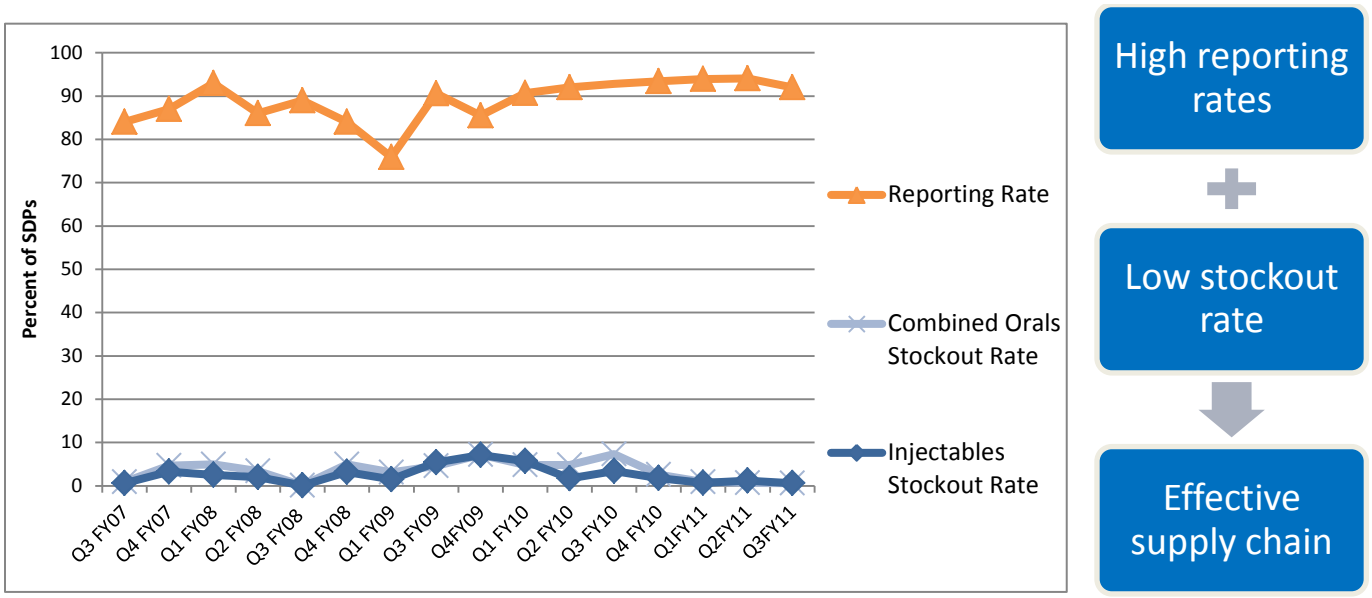
While we have presented volumes of contraceptives dispensed that support the CPR increases, there are additional measures that indicate that the supply chain is working well in Rwanda, including low stockout rates, high health facility reporting rates, and facilities stocked according to plan.

From data available in country beginning in 2007, we can see that stockouts are consistently low in Rwanda (below 10% of facilities stocked out for pills and injectables), suggesting a high performing supply chain. However, we don't have this information disaggregated at a lower level until 2009, until the introduction of Supply Chain Manager.

In addition, the health facility reporting rates are very high, which suggest:

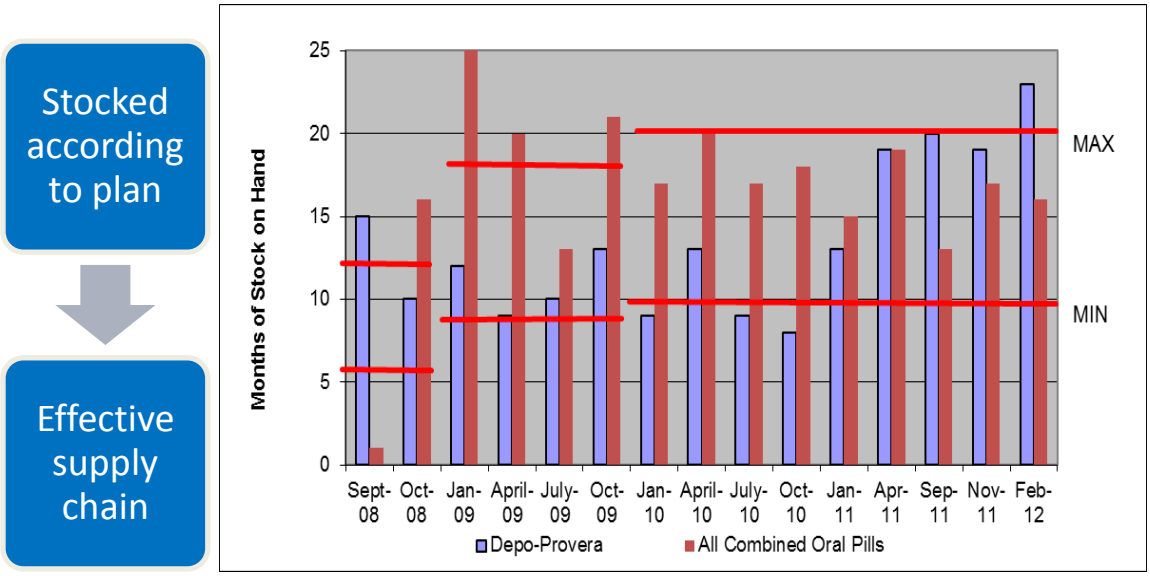
1) that the stockout data and other LMIS data that we have is nationally representative, and
2) the LMIS is functioning at a very high level.

Figure 7. Rwanda Health Facility Stockout and Reporting Rates



Another indicator of supply chain effectiveness is the ability for a system to maintain inventory levels according to the design of the system, or "stocked according to plan". From the Procurement Planning and Monitoring Report (PPMR), we have stock status information at the central level in 2008. Beginning in 2009, the data reflect central level and district level information. From 2010 onward, the data reflect stock status from all levels of the system. However, this information does not show us specifically whether health facilities are stocked according to plan, just if the supply chain system is as a whole. Figure 8 shows that, in general, inventory levels in Rwanda have been largely maintained between their intended maximum and minimum levels, or that they are typically "stocked according to plan".

Figure 8. Stocked According to Plan



Estimated Impact on Health Outcomes

Additional analysis of the quantities dispensed to clients through the public sector supply chain in Rwanda allows for certain health outcomes to be estimated. The quantities of modern methods of contraception distributed to clients from 2005 to 2011 represent approximately 2.85 million couple years of protection (CYPs)[4]. These CYPs translate into approximately 820,000 unintended pregnancies averted, which, in turn, could have prevented approximately 22,600 infant deaths and over 2,400 maternal deaths in Rwanda from 2005 to 2011[5]. Therefore, an efficient family planning supply chain plays a critical role in preventing unintended pregnancies, as well as maternal and child morbidity and mortality.

[4] Darroch, Jacqueline E. and Susheela Singh. September 30, 2011. "Estimating Unintended Pregnancies Averted from Couple-Years of Protection (CYP)." Guttmacher Institute.

[5] Darroch, Jacqueline E. and Susheela Singh. October 2011. "Adding it Up: The Costs and Benefits of Investing in Family Planning and Maternal and Newborn Health, Estimation Methodology." Guttmacher Institute.

Conclusions

Using these two independent data sources (DHS and LMIS), this analysis has validated that the increasing trend in contraceptive use, shown in the DHS, corresponds to the same increasing trend in contraceptive supply and availability from 2005 to 2010 (aggregated to a provincial level). Specifically, the analysis showed a near one-to-one relationship between increases in CPR and increases in volumes of commodities dispensed to clients for injectables and oral contraceptive pills (reference figures 5 and 6). This indicates that products dispensed are generally used by clients and wastage by clients is likely minimal. In addition, there is reason to believe that the LMIS is accurately capturing logistics dispensed-to-user data; the data seems to be of good quality given that the quantities dispensed are similar to the quantities used (based on the CPR).

In addition, the low reported stockout rates and high facility reporting rates also indicate overall high product availability throughout the country. These rates, along with the "stocked according to plan" data, also signify that the supply chain is maintaining a continuous supply of contraceptives and performing at a very high level, thus ensuring the availability of contraceptives to the majority of Rwandans who chose to practice family planning. Therefore, in the future, given the logistics and population data, we may be able to offer an estimate of the CPR in Rwanda in between population-based surveys.

It is important to note that many factors contribute to increases in CPR—in addition to the effectiveness of the supply chain—such as changes in demand and shifts in cultural norms and the acceptability of using family planning. However, the supply chain must keep pace with this demand or the health system risks losing clients if contraceptives are stocked out at the health center. The client may never come back and unintended pregnancies result. Thus, an efficient family planning supply chain plays a critical role in preventing unintended pregnancies, as well as the related maternal and child morbidity and mortality. These data indicate that the supply chain in Rwanda has responded to increasing demand over the past five to seven years, keeping products reliably available across the country, and enabling Rwandan women to choose, obtain and use contraceptives whenever and wherever they want.