Use of Routine Data in Evaluation:
Technical Brief

July 2020

# Can a Quality Improvement Project Impact Maternal and Child Health Outcomes at Scale in Northern Ghana?

**This document is part of a series that describes how routine data were used in research and evaluations of health programs and projects. Data for Impact (D4I) has compiled these examples from its own work and the work of others found through a literature review—and consultation with the original authors—to compare ways routine data can be appropriate for evalu ations and to shed light on its benefits and shortcomings for evaluation.**

**A companion guidance document compiling these lessons is available at the D4I website. This suite of materials may be useful for others contemplating using available and routine data in their own work.**

**This technical brief describes use of routine data in an impact evaluation of a quality improvement intervention in Ghana that aims to improve maternal and child health outcomes. Read the report at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4910198/pdf/12961_2016_Article_115.pdf**

## Program Description

Achieving the United Nations' Millennium Development Goals (MDGs) is a national priority for many countries, including the Government of Ghana. For Ghana and many other sub-Saharan African countries, maternal mortality and under-five mortality continue to be a great concern (UNFPA, World Health Organization, UNICEF, World Bank Group, & United Nations Population Division, 2019). Initiatives such as Project Fives Alive! have been implemented to assist and accelerate Ghana's efforts to achieve MDG 4 (reducing under-five mortality) and MDG 5 (reducing maternal mortality). Funded by the Bill & Melinda Gates Foundation, Project Fives Alive! began in July 2008 and ended in 2015. It was implemented by the National Catholic Health Service and the Institute for Healthcare Improvement in collaboration with the Ghana Health Service under the Ministry of Health. The project aimed to improve maternal and child health outcomes by employing a quality improvement (QI) approach whereby process failures in service delivery and provision of high-quality care were identified by health staffs, and changes were tested at health facilities and in the corresponding communities to address the failures.

The first phase (Wave 1) was the innovation and testing phase. It included 27 health facilities (government and faith-based) in Northern Ghana. During this phase, the implementation team developed a package of locally identified and tested interventions (change ideas) focused on improving both care-seeking behavior and the care provided to mothers and children. In the subsequent scale-up phase (Wave 2), from September 2009 to March 2013, the locally developed interventions were expanded to all government and faith-based facilities in Northern Ghana (more than 800 health facilities). This impact evaluation, also funded by the Bill & Melinda Gates Foundation, examined the association between the interventions implemented at the health facilities and the maternal and child health outcomes achieved during Wave 2. The findings of the impact of the first phase (Wave 1) are published elsewhere (Singh, et al., 2013).

## Rationale for the Use of Routine Data

The evaluation employed a quasi-experimental design with a multivariable interrupted time-series analysis and controlled for potential confounding factors. Outcome data for the analysis were collected from health information reported by the facilities, whereas the independent variables

came from the records of facilities and programs. Health facilities complete monthly reports on key indicators in the health information system (in this case, the District Health Information Management System [DHIMS]). These reports are compiled at the district and national levels. From January 2009 to December 2011, the facilities used paper-based forms to report on the key outcome indicators. These forms were compiled and the data were entered at the district level in the DHIMS 1 before submission to the national level. Beginning in January 2012, there was a shift to an electronic system, whereby the facilities entered the data in the DHIMS 2 and submitted the forms directly to the national level. The decision to use routine data instead of a parallel project data collection system was made by the implementing team to support the efforts of making the intervention sustainable and scalable by using a data source available all over the country.

## Evaluation Questions

The study used routine data to address the following questions:

1. **Impact of interventions on early antenatal care (ANC):** Do change interventions increase the percentage of ANC registrants in the first trimester?

2. **Impact of interventions on skilled delivery coverage:** Do change interventions increase the percentage of deliveries that are attended by skilled personnel?

3. **Impact of interventions on underweight infants at child welfare clinics:** Do change interventions reduce the percentage of one- to 11-month-old child welfare clinic attendees who are under 60 percent weight for their age (moderately or severely underweight )?

The study also aimed to answer this fourth research question on the impact of interventions on under-five mortality: Do change interventions increase the percentage of ANC registrants in the first trimester? However, it was not able to address this question because of data quality concerns stemming from the change in reporting from the DHIMS 1 to the DHIMS 2.

The change interventions evaluated varied depending on the type of health facility. The change interventions for health centers and health posts were targeted at the following: early pregnancy identification, four or more ANC visits, skilled delivery and immediate postnatal care (PNC), PNC on day 1 or 2, and PNC on day 6 or 7. Hospital change interventions focused on education, targeting and engaging primary providers, training, triage, and task shifting and nurse empowerment.

## Data Description and Data Management

Data used for the analysis were collected from a total of 744 facilities. Some facilities initially included in the sample were excluded because of the lack of pre-intervention data. The data were accessed directly from the DHIMS (1 or 2), downloaded into Excel, and then transferred into Stata for analysis. The data collected from the DHIMS included maternal health variables (early ANC, skilled delivery, PNC), child health outcomes (percentage of child welfare clinic attendees who are underweight and facility-level under-five mortality for hospitals), and health insurance coverage (percentage of outpatients with health insurance).

Data from program records provided information for the facility-level control variables. This included the type of health facility, affiliation of the health facility, presence of a QI team, number of people on the QI team, profession of the QI team leader, and the type of change intervention implemented at the facility.

## Assessment of the Usability and the Quality of the Data

Data quality training sessions and data quality checks were conducted by the implementing team and the QI teams as part of program implementation. In instances where errors were found, the QI teams double-checked the data at the health facilities and corrections or updates were made.

Missing data were defined as an outcome not reported in a specific month once a facility had initiated reporting. Missing data for attendance of underweight infants at child welfare clinics varied from 31 percent for health centers to 41 percent for hospitals. Missing data for under-five mortality was 43 percent for hospitals. Statistical techniques, such as generalized estimating equations, were introduced in the regression analysis to address the high level of missing data.

## Data Analysis Methods Used

Descriptive analysis was used to compare the pre-intervention, transition phase, and post-intervention means of the outcome variables. To evaluate the impact of Project Fives Alive!, multivariable interrupted time-series regression analysis was used to determine whether the intervention was associated with the change in the outcomes of interest. The regression models

controlled for key variables and included a quadratic term to account for a potential non-linear trend. Generalized estimating equations (GEEs) were used to run the regression analysis because of the amount of missing data and the presence of serial autocorrelation and clustering. Last, sensitivity analysis was conducted to check against the results from the main GEE analysis where single imputation was used to impute all missing values or impute missing values for facilities with fewer than 25 percent of their observations missing.

## Limitations in Using Routine Data for Evaluation

There were several limitations in using routine data for the evaluation. The transition of the reporting method for routine data at the health facility level from the DHIMS 1 to DHIMS 2 limited the analysis conducted and the data available. As noted above, one outcome of interest—neonatal and infant mortality—was not analyzed because of data quality concerns, and fewer facilities reported neonatal and infant mortality outcomes in the DHIMS 2. A large number of facilities no longer provided the denominators needed for the skilled delivery outcome when entering data in the DHIMS 2; therefore, the analysis of skilled delivery was limited to the period ending December 2011. In addition, only 744 health facilities were included in the analysis, although more than 800 health facilities were involved in the project. This reduction in sample size was made because of the lack of pre-intervention data for the excluded health facilities (which were newer facilities).

Data cleaning and management of the routine data used took a lot of time. The team had data on different spreadsheets and no unique identifiers. Merging the datasets was dependent on the name of the health facility, which was different on each spreadsheet and had to be corrected to be identical on each spreadsheet. Over the course of the study, the names of some facilities were changed or the facility was upgraded. These changes were identified by working closely with the program staff.

The data available were limited to events that occurred at the health facilities. For example, the data were restricted to facility deaths and not deaths that occurred in the community. This fact could lead to the underreporting of deaths, which meant there was low power to find statistically significant changes for the mortality outcome. Last, the analysis was constrained to the variables available in the DHIMS database and program records.

## What Worked Well

Using the program and facility data added to the richness of the analysis. The partnership between the implementing team and the evaluation team worked very well. The richness of the program data added greatly to the analysis. The use of health information system data was also important in that it showed it is possible to use routine data for evaluation.

## Conclusion

Routine data were successfully used to address several evaluation questions despite the limitations encountered. Using outcome data reported monthly by each facility before and after the intervention improved the strength of the evaluation design. Moreover, the study demonstrated the feasibility of using existing routine data in a multivariable time-series analysis. Statistical procedures, such as GEE, can be introduced to address issues with missing data—usually present when using routine data. GEE uses all available data and assumes missing data is missing at random, which is a plausible assumption for these data.

## References

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