

Impact Evaluation of KOICA Projects: Evidence from Healthcare Projects in Peru and Ghana





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Executive Summary

This study estimated the effectiveness of three KOICA projects through applying the same evaluation method using survey data from each project. In addition, a comparative analysis of the projects was conducted using cost-effectiveness and cost-benefit analyses.

First, the effects of the maternal health promotion project and school health promotion project in the Lima and Callao region of Peru were analyzed. The results showed that the school health promotion project reduced the proportion of students who felt suicidal by about 11.8 percentage points. The maternal health promotion project at the public health center increased the postpartum management rate of pregnant women who had given birth by 20.5 percentage points.

Second, we examined whether the home visits of village health volunteers conducted as part of the maternal and child health improvement project in the Volta region of Ghana were effective in promoting the health of children. The main dependent variable, the incidence of diarrhea in children under five years of age, and whether children had diarrhea or fever symptoms at home, were analyzed to see if there was any impact on the project, but no significant impact was found.

Finally, the effect of the improved water supply project in the Volta region of Ghana was analyzed. As a result of the analysis, the improvement in drinking water facilities through the project was effective in reducing the incidence of diarrhea in children under the age of five by 11.9%. It also increased the usage of the improved well by 8.9 percentage points and reduced the time it took to obtain drinking water by approximately 8 minutes. On the other hand, considering the fact that external effects occurred in the treatment and control groups, as a result of analyzing the project effect on the group that actually benefited from the project, it was found that there was a project effect that reduced the incidence of diarrhea by 22.7 percentage points.

It is difficult to generalize the project effects found in this study to the overall project effect. It cannot be said that the effect of the detailed program corresponding to a part of the entire project was analyzed by dividing it into the treatment and control groups; thus, it cannot be said to be the overall project effect. For example, the result that no impact could be found in the maternal and child health improvement project in Volta, Ghana showed that “home visits of village health volunteers” had no effect on “diarrhea incidence.” It cannot be interpreted as a conclusion that there is no effect of “maternal and child health improvement project.” Similarly, the finding that the “maternal health promotion project at the public health center” in the Lima and Callao health promotion programs in Peru is effective in “postpartum management of pregnant women” cannot be generalized to the effectiveness of the whole project.

Comparative analysis between projects was carried out using cost-effectiveness and cost-benefit analyses, for which the measurable effect or effect converted into monetary value was calculated and the cost invested in the project was considered. As a result of analyzing the Peru project and the Ghana drinking water project, where the project effect was found, the Ghana drinking water project showed the highest cost-effectiveness. The cost-benefit ratio was also higher in the Ghana Volta drinking water project, and both projects showed more benefits compared to the input costs.

This study is meaningful in that it attempted a quantitative impact evaluation of projects and comparison between projects using empirical data from KOICA projects. Furthermore, it is expected to be utilized in future evaluations of KOICA project effectiveness and comparison between projects. We hope that project practitioners and KOICA employees will be able to use this study as a reference when planning KOICA project evaluations.

I. Introduction

1. Background and Purpose

The purpose of this study is to measure project effectiveness and compare and analyze projects by selecting projects that have data and can measure an impact quantitatively among health projects which are the core fields of KOICA. Through this study, we intend to present implications and suggestions for the planning, management, and evaluation of KOICA projects based on data and project performance, going beyond the existing budget execution, input, and result-based project management. In addition, we tried to use easy-to-understand expressions so that project participants could use them as a manual when collecting and utilizing actual data to evaluate effectiveness and included an introduction to basic evaluation methodologies.

Empirical data are essential for analyzing the effectiveness of international development cooperation projects. The data referred to here are the data collected directly to analyze the impact of the project and correspond to the primary data collected through the questionnaire survey. In the absence of such data, secondary data collected by other institutions are used, and consequently, there are many restrictions in estimating the impact of the project. The key to impact evaluation is to determine whether there is a causal relationship between project contents and project outcomes using data. Therefore, in this study, three projects were selected by prioritizing them according to whether quantitative analysis is possible with data from health projects.

- 1) Health Promotion Program in North Lima and Callao (2013–2018, \$7.85million)
- 2) The Project for Improving the Maternal and Child Health Care in the Volta Region, Ghana (2013–2017, \$6million)
- 3) Water and Sanitation Project in Krachi East and West Districts in Volta Region of Ghana (2011–2014, \$4million)

For these projects, ex post evaluations were conducted after the project was completed, and related research papers were also published. The analysis of existing results show that the existing reports and papers had different methods of measuring effectiveness, making it difficult to compare between projects; thus, there was a limit to using them as a manual for impact evaluation. Therefore, this study explores how the impact of project is measured and the results of comparison between projects are prepared in a manual format by employing the basic methodology consistently.

2. Research Method

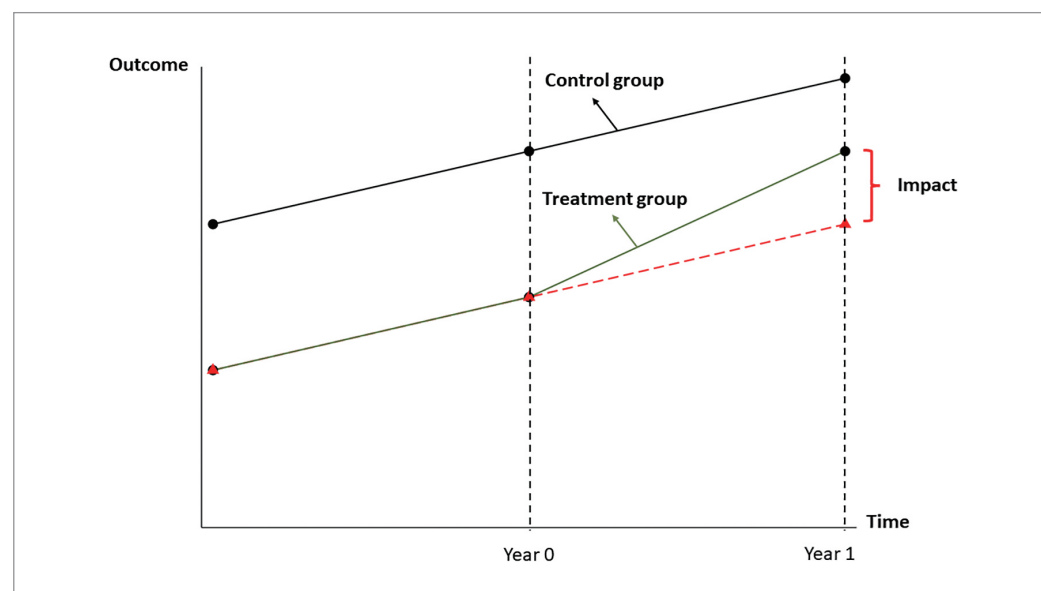
The difference-in-differences (DD) method was used for impact evaluation. This is a quasi-experimental design method that estimates the pure policy impact by comparing changes over time between the beneficiary and non-beneficiary groups before and after policy intervention. In the example in Figure 1, the red dotted line represents the counterfactual of the treatment group under the assumption that the outcome variables will change in the same trend as the control group if policy intervention does not occur in the treatment group. The DD method was calculated by subtracting the hypothetical corresponding value recognized as the difference between the control group before and after the project from the difference in the outcome variable before and after the policy intervention in the treatment group. In other words, it is a method of looking at the pure policy impact by subtracting the change that would have occurred even if the project was not carried out from the change in the outcome variable of the treatment group. Therefore, in order to obtain an unbiased estimate of the project effect through the DD method, it is necessary to satisfy the assumption that the performance variables of the treatment and control groups will move in a common trend over time without the intervention of the project. There is no way to verify whether this assumption is satisfied, but if there are observations before the project implementation (before the baseline survey), the common trend assumption can be verified by checking whether the outcome variables of the treatment and control groups move in a similar trend.

By subtracting the change in the outcome variable of the control group before and

after the project from the change in the outcome variable of the treatment group before and after the project, it is possible to control for the difference in the level of the outcome variable between the treatment and the control groups before the project was implemented. On the other hand, the same result can be derived by subtracting the difference between the treatment and control groups before the project from the difference in the outcome variables of the treatment and control groups after the project.

$$\begin{aligned} \text{Impact Evaluation} &= \\ &= (\text{Outcome after project in treatment} - \text{Outcome before project in treatment}) \\ &\quad - (\text{Outcome after project in control} - \text{Outcome before project in control}) \\ &= (B - A) - (D - C) \end{aligned}$$

<Figure 1> Example of Difference-in-Differences



II. Health Promotion Program in North Lima and Callao

1. Project Summary

The Health Promotion Program in North Lima and Callao ('13-'18/\$7.85 million) is a program to prevent and manage non-infectious diseases among low-income people in cities in northern Lima and Callao, Peru, to improve the level of local health care and health status. This project is centered on health promotion programs in two Lima provinces (under the jurisdiction of Laura Rodrigues and Santa Luzmila II health centers) and two provinces of Callao (Bellavista and Pachacutec health centers). The promotion program consists of a maternal health promotion project at a public health center, a school health promotion project, and a high blood pressure management project at a public health center. In this chapter, we will evaluate the impact of the maternal health promotion project and school health promotion project.

2. Impact Evaluation

Regression analysis using the DD method uses the following model:

$$Y_{ijt} = \alpha + \beta_1 TREA T_j + \beta_2 POST_t + \beta_3 (TREA T_j \times POST_t) + \varepsilon_{ijt}$$

In this model, Y_{ijt} is the dependent(outcome) variables of the individual i in area j at year t . $TREA T_j$ is a dummy variable for the area j , which distinguishes the treatment group from the control group, and controls the difference in fixed characteristics between the treatment and control groups. $POST_t$ is a dummy variable after project implementation, which divides the period as pre-project and post-project and controls general trends over time regardless of whether the project is implemented. $TREA T_j \times POST_t$ denotes the intersection of the aforementioned two dummy variables, and the coefficient of this term β_3 represents the effect identified using the DD method. The following regression model is generally used, including

control variables X_{ijt} to control for other socioeconomic factors in the above basic formula:

$$Y_{ijt} = \alpha + \beta_1 TREA T_j + \beta_2 POST_t + \beta_3 (TREA T_j \times POST_t) + \beta_4 X_{ijt} + \varepsilon_{ijt}$$

The effect of the school health promotion project can be analyzed using DD regression analysis. In the case of the observation value of students belonging to the school where the school health promotion project was implemented, a value of 1, $TREA T_j$, was taken; otherwise, a value of 0 was taken. For observations of the end-line survey conducted in 2017, $POST_t$ takes a value of 1; otherwise, it takes a value of 0. $TREA T_j \times POST_t$ is the observed value of the treatment group after the health promotion project was conducted.

Table 1 shows the results of the regression analysis using the DD method. Because all the dependent variables are binary, composed of 0 and 1, row A is analyzed using ordinary least squares method (OLS) using a linear probability model, and row B is analyzed by including other control variables in the same model. Finally, row C was analyzed using a non-linear model, the probit model, to check whether the results were consistent with the previous linear probability model. The results of row B were analyzed including control variables, and although there was a slight change in the coefficients, the results were confirmed to be consistent with the results of row A. Similarly, it can be confirmed that the results of row C are similar to the results of the previous model, and the regression analysis results confirm that the school health promotion project has a consistently significant effect on the reduction of the proportion of students who feel suicidal. Specifically, the school health promotion project had the effect of reducing the percentage of students who felt suicidal in the treatment group by about 11.8 percentage points.

〈Table 1〉 Effect of Healthcare Project for Students in Peru

Dependent variable	Subjective health status (1)	Suicide ideation (2)	Overweight (3)
<i>A. LPM, No Control</i>			
Effect	0.017 (0.042)	-0.097** (0.038)	-0.051 (0.032)
<i>B. LPM, Control</i>			
Effect	0.026 (0.043)	-0.118*** (0.039)	-0.055* (0.033)
<i>C. Probit Model, Control</i>			
Effect	0.084 (0.055)	-0.050 (0.056)	0.062 (0.062)
<i>D. PSM-DID</i>			
Effect	-0.014 (0.038)	-0.082** (0.036)	-0.055* (0.031)
Mean of dep.var.	0.670 [0.470]	0.263 [0.441]	0.151 [0.358]
N	916	916	916

Notes: 1. *** p<0.01, ** p<0.05, * p<0.1.
2. [standard deviation], (robust standard error)
3. PSM-DID uses kernel propensity-score matching

On the other hand, there was a large difference in the ratio of males to females in the baseline survey. As shown in row B above, gender differences can be controlled by including gender variables in the model, propensity score matching (PSM) combined with DD methods can also be used to better match control and treatment observations on pre-program characteristics, which referred to as PSM-DID. The DD method can be applied after minimizing the observable difference between the treatment and control groups through propensity score matching (PSM), which matches the treatment and control groups using propensity scores calculated by using observable characteristics. The results in row D reveal that the

results estimated with PSM-DID are almost similar to the results of the linear probability model in row B.

Table 2 presents the results of the impact assessment of the maternal health promotion project. Similarly, it can be confirmed that the maternal health promotion project significantly affects the increase in the proportion of pregnant women who have had childbirth to receive postpartum care. Based on the model including the control variable in row B, the postpartum management rate of pregnant women who have had childbirth through the maternal health promotion project increased by 20.5 percentage points.

<Table 2> Effect of Maternal Healthcare Project in Peru

Dependent variable	High blood pressure (1)	Antepartum care (2)	Postpartum care (3)
<i>A. LPM, No control</i>			
Effect	-0.036 (0.022)	0.076 (0.067)	0.194*** (0.072)
<i>B. LPM, Control</i>			
Effect	-0.035 (0.021)	0.065 (0.069)	0.205*** (0.074)
<i>C. Probit Model, Control</i>			
Effect	-0.645 (0.593)	0.301 (0.247)	0.637** (0.246)
Mean of dep.var.	0.012 [0.108]	0.705 [0.457]	0.722 [0.449]
N	339	325	291

주: 1. *** p(0.01, ** p(0.05, * p(0.1.
2. [standard deviation], (standard error).

3. Suggestions

It is necessary to pay attention to the interpretation of the results of the impact assessment of the Peruvian health promotion project as derived above. The biggest limitation is that the project is not randomly assigned, leading to a possibility of serious selection bias errors. In the case of the Peru school health promotion project, the PMC report explains that four schools in the project area and two schools in the project area were divided into treatment and control groups, respectively, but it is not explained how the project schools were selected. The problem of selection bias is more serious in the case of maternal health projects. Pregnant women visiting the public health center were asked about their intention to participate in the program; subsequently, pregnant women who wanted to participate were selected in the treatment group. In this case, pregnant women who are more interested in maternal health participate in the project, thereby resulting in selection bias, as they have different characteristics from non-participants. If such a difference is a observable difference with data, the data can be included in the model to control the impact assessment analysis; however, in many cases, it is a characteristic that cannot be observed with the data. The evaluation results are unreliable.

A randomized controlled trial (RCT) design, as in the case of the Ghana project, which will be discussed in a later chapter, can ideally establish a counterfactual of the treatment group. In other words, by randomly selecting the treatment and control groups and randomly assigning the project, subjects were classified into treatment and control groups with the same characteristics on average to control for selection bias error. Realistically, it is very difficult to design and conduct such a perfect random experiment at a project site in a developing country. Therefore, efforts were made to control the selection bias by creating a counterfactual through a quasi-experimental design, such as the DD method used in this chapter. Nevertheless, these methods are not perfect; therefore, the impact assessment results should be interpreted with caution. In the case of the DD method, if the project is not implemented, the assumption that the treatment and control groups should change with the same trend must be satisfied. In the case of the maternal health promotion project among Peru projects, it is necessary to pay attention to the interpretation of

the results of the impact assessment because even the baseline survey for project evaluation was not carried out. In addition, the DD method effectively controls the time-invariant, unobservable characteristics between the control and treatment groups, but bias may occur if the time-dependent unobservable differences between the control and treatment groups affect the dependent variable.

In addition, in the case of the Peru project, a survey was conducted before project implementation, including the project area in 2014; however, this was not a baseline survey in which the treatment and control groups were separated for strict project evaluation. In the case of the school health promotion project, since the project was carried out by schools, we directly traced the treatment and control groups and were able to compare the data before and after the project. However, in the case of the maternal health promotion project, there is a limit to measuring the effect of a pure project as there was no baseline survey data available. If there was a change in the treatment group due to the project in 2015, the first year of the project, the project impact estimate comparing 2016 and 2017 after the end of the project may underestimate or overestimate the project impact. According to a baseline survey conducted in 2014 by the PMC team at the Pachacutec Health Center in the Ventanilla area, where the maternal health promotion project was conducted, the average high blood pressure in pregnant women was about 1% (sample size 203 persons, standard deviation 0.1). Furthermore, the rate of prenatal care more than six times was approximately 25.6% (sample size, 82 women; standard deviation, 0.44), and the postpartum care rate of pregnant women who had given birth was approximately 58.8% (sample size, 187 women; standard deviation, 0.49). However, this baseline survey could not be used for project impact assessment because it did not separate the treatment and control groups.

In addition, in the case of school and maternal health promotion project surveys, it is repeated cross-sectional data, not panel data. Furthermore, in the case of the maternal health promotion projects, the 2016 midline survey was conducted from January to October 2016. Pregnant women who participated in the project were recognized as a project group; the project group of the end-line survey conducted in 2017 was selected, comprising the pregnant women who participated in the project

from November 2016 to September 2017 (the control group comprised pregnant women who did not participate in the project during the same period). The treatment of pregnant women who are participating both in the midline survey and the end line survey sample is not clearly stated. Although it is explained that the effect evaluation of the Peru PMC report uses the DD method, it basically does not include control variables and does not perform statistical tests; it simply calculates the average of the outcome variables of the treatment and control groups and reports the difference. This cannot be regarded as a reliable result.

On the other hand, when conducting a health project, random assignment of project participants is often difficult in practice because it raises ethical issues. Therefore, if a strict project evaluation is required, the treatment and control groups can be assigned with a time lag in the phase-in method for each cluster in the KOICA project area. Alternatively, although it is a less robust method, it is possible to select a control group similar to the characteristics of the treatment group in an area other than the KOICA project area and compare data before and after the project using the matching method. However, when this matching method is used, only observable characteristics can be controlled; thus, there can be possible bias caused by unobservable characteristics. In addition, in the process of selecting the KOICA project area, if places where the project can be easily performed are selected, this may also make the unobservable characteristics different between the treatment group and the control group. Even with a perfectly designed impact assessment, in reality, it is difficult to design a perfectly identical control group with various factors; there are many considerations such as budget constraints and ethical issues. Thus, it is necessary to include a more detailed description of whether the project participation allocation is random or regarding the background of the KOICA project site selection in the impact evaluation report in order for readers to interpret the impact assessment results conservatively.

III. The Project for Improving the Maternal and Child Health Care in the Volta Region, Ghana

1. Project Summary

The Project for Improving the Maternal and Child Health Care in the Volta Region, Ghana ('13-'17/\$6 million) aims to improve the quality of maternal and child health services in the Volta region of Ghana. For four years from 2013, the program improved awareness of maternal and child health among local residents and strengthened the capacity of maternal and child health personnel. This project also involved opening a midwifery training course with the construction of a midwifery training school as the main pillar, and operating a regional health center and local residents' competency strengthening program. It was conducted in three cities, Ketu North, Ketu South, and Keta, located in the southernmost part of the Volta region.

2. Impact Evaluation

To analyze whether Community Health Volunteers' home visits, which was implemented as part of the above project, were effective in promoting children's health, we analyzed the following DD regression model.

$$Y_{ijt} = \alpha + \beta_1 TREA T_j + \beta_2 POST_t + \beta_3 (TREA T_j \times POST_t) + \beta_4 X_{ijt} + \mu_j + \varepsilon_{ijt}$$

If the Community Health Volunteers' home visits were implemented in the area, $TREA T_j$ takes a value of 1; otherwise, it has a value of 0. If the end line survey was conducted in 2015, $POST_t$ has a value of 1; otherwise, it has a value of 0. $TREA T_j \times POST_t$ is the interaction term of the treatment group after the implementation of the Community Health Volunteer home visit project. In addition, since the project was conducted on a village-by-village basis, a fixed effect that could control the unique characteristics of each village was also included in the analysis model.

Table 3 shows the results of the regression analysis using the DD method. The results could not indicate any significant project impact of home visits by Community Health Volunteers. The results of row B were analyzed including control variables, and although there was a slight change in the coefficients, results consistent with the results of row A can be confirmed. Column (3) of table 3 shows a statistically significant impact on ORS treatment at a significance level of 10%. However, in the case of data on ORS treatment, the sample size was small, and the number of clusters was too small to use the clustered standard error; therefore, care must be taken in the interpretation.

〈Table 3〉 Effect of Healthcare Project in Ghana

Dependent variable	Diarrhea (1)	Fever (2)	ORS (3)	Blood test for malaria (4)	Family planning (5)
<i>A. LPM, No control</i>					
Effect	0.001 (0.025)	0.032 (0.046)	-0.146 (0.103)	-0.021 (0.089)	0.017 (0.039)
<i>B. LPM, Control</i>					
Effect	0.000 (0.025)	0.031 (0.046)	-0.185* (0.109)	-0.013 (0.085)	0.017 (0.041)
<i>C. Probit Model, Control</i>					
Effect	-0.107 (0.164)	0.057 (0.155)	-0.500 (0.304)	-0.104 (0.270)	0.047 (0.112)
Mean of dep.var.	0.123 [0.329]	0.243 [0.429]	0.549 [0.498]	0.298 [0.457]	0.385 [0.487]
N	3,218	3,218	397	783	2,945

Notes: 1. *** p<0.01, ** p<0.05, * p<0.1.
2. [standard deviation], (standard errors adjusted for 40 clusters at village level).
3. Village fixed effects are included.

There may be various reasons for not finding any significant project impact. First, home visits of Community Health Volunteers may not have been enough to induce behavioral changes to promote children's health. In addition, the villages in the treatment and control groups were both areas where other health care projects carried out by KOICA or USAID were being conducted; thus, it is possible that the project impact results were underestimated due to other health care projects. The data indicate that the rate of diarrhea and fever in children is rapidly decreasing in both the treatment group and the control group, regardless of the Community Health Volunteers. In addition, since there is no way to confirm the most important assumption of the DD method that the outcome variables of the treatment group and control group have similar trends, even if various control variables and the village fixed effect are included, the results of this impact evaluation have limitations.

Meanwhile, the PMC team, which carried out this project, did not find any significant impact of the Community Health Volunteers' home visit, either. For project evaluation, the project was first started in the treatment villages; subsequently, the project was conducted in the control villages in phases (phase-in method) after completing the survey of the end line. It was not possible to explore the mid- to long-term impacts of the project. The PMC team's research found that there were significant positive changes in behavioral changes such as washing hands and using mosquito nets due to the visit of Community Health Volunteers in the treatment group. If it takes time for these behavioral changes to lead to changes in outcome variables, there may be a limit to investigate the project effect.

Finally, this result should not be generalized as no overall project effectiveness. The result of the analysis shows that "home visits by Community Health Volunteers" were not effective, and interpreting this result as the ineffectiveness of the entire maternal and child health improvement project is a typical hasty generalization error.

3. Suggestion

The Project for Improving the Maternal and Child Health Care in the Volta Region seems to be the best among three projects we covered in this research when it comes to the research design for impact evaluation. However, the planned impact assessment is limited to Community Health Volunteers' activities, in which about 1% of the total project budget (6,744,475,880 won) was invested, which suggests many implications for the impact evaluation design.

For KOICA to more effectively execute the evaluation budget within the project cost, it is necessary to plan the impact evaluation design focusing on the items with the most budget as possible. In the case of this project, in order to improve maternal health and reduce maternal and child mortality rates, construction of a midwife training school (\$2.2 million), equipment and materials support (\$1.5 million), midwife training course (\$400,000), and strengthening of maternal and child health personnel (including midwives) capacity building (\$340,000), were actually the most budgeted.

In fact, among the ODA projects promoted by KOICA, many construction projects such as hospitals, public health centers, and schools are in progress. However, the most important reason for not planning such an impact assessment is that the completion of infrastructure coincides with the end of the project. Even if the baseline survey is conducted at the end of the construction and before the opening of the midwife training school, the performance of graduates (considering two to three years of the midwives training course) can be surveyed after at least three to four years after the end of the project. In fact, since school operations are led by the recipient country's health office and local government after the project is finished, teachers' competency and quality control of education must be additionally considered. In particular, if students graduate from a midwifery school, in many cases, they have an obligation to work in the province where their school is located and obtained a certificate for a certain period of time. However, if there is a change of this policy, the effect of the midwife training school on reducing the maternal and child mortality in the province where the project is conducted may be underestimated. Because of

the various factors that makes the impact evaluation hard to be conducted after the completion of the project, and this is why the impact evaluation is rarely conducted for the projects which include the large budget supported construction and equipment such as schools, public health centers, and vocational training centers.

However, it is necessary to comprehensively review the scope of the impact assessment and its opportunity cost and feasibility in the planning stage to strengthen the link with the higher-level goals of the impact assessment carried out with the project cost in the future. In addition, when conducting impact evaluation of the health and medical personnel capacity training which contains the most inputs in the maternal and child health project in Volta, Ghana, it is necessary to analyze the effectiveness of the project by examining the indicators directly related to the midwifery training project, such as the ratio of midwives before and after project implementation, satisfaction, maternal antenatal and postnatal management, infant mortality rate, and the weight of children and infants.

IV. Water and Sanitation Project in Krachi East and West Districts in Volta Region of Ghana

1. Project Summary

The Water and Sanitation Project in Krachi East and West Districts in Volta Region of Ghana ('11-'14/\$4 million) aims to provide a safe drinking water sanitation environment for residents through support for drinking water sanitation facilities, capacity building, and deworming projects in the Krachi East and West district of Volta region. To improve the drinking water environment, existing drinking water facilities were inspected and repaired, new wells were developed, and drinking water supply facilities were installed.

2. Impact Evaluation

We investigate the effect of a drinking water improvement project on the health promotion of villagers through a DD regression analysis.

$$Y_{ijt} = \alpha + \beta_1 TREA T_j + \beta_2 POST_t + \beta_3 (TREA T_j \times POST_t) + \beta_4 X_{ijt} + \mu_j + \varepsilon_{ijt}$$

The observed value of the village in the treatment group where the drinking water improvement project was carried out $TREA T_j$ has a value of 1; otherwise, it has a value of 0. $TREA T_j \times POST_t$ represents the observed values of villages in the treatment group after the implementation of the drinking water improvement project. Since the project was conducted on a village-by-village basis, a fixed effect that can control the unique characteristics of each village was also included in the analysis model.

Table 4 shows the results of the regression analysis using the DD method. Row A shows the results of the model which includes only the fixed effects of the village unit and row B includes control variables. These results show that the drinking water improvement project has a significant effects on all outcome variables except for improved drinking water use, which confirms that the project had a significant effect on improving the health of residents. Specifically, the drinking water improvement project showed a significant project effect by reducing the incidence of diarrhea in children under five years of age by 11.9 percentage points in the villages of the treatment group. It also increased the improved well utilization by 8.9 percentage points and reduced the time it took to obtain drinking water by approximately 8 minutes.

〈Table 4〉 Effect of Water Supply in Ghana, ITT

Dependent variable	Diarrhea (1)	Use of improved water (2)	Use of improved well (3)	Travel time (min) (4)
<i>A. LPM, No control</i>				
Effect	-0.109** (0.055)	0.076** (0.037)	0.096** (0.043)	-8.816** (4.354)
<i>B. LPM, Control</i>				
Effect	-0.119** (0.056)	0.056 (0.037)	0.089** (0.044)	-8.385* (4.395)
<i>C. Probit Model, Control</i>				
Effect	-0.334* (0.163)	0.294 (0.220)	0.350* (0.183)	—
Mean of dep.var.	0.361 [0.480]	0.673 [0.469]	0.500 [0.500]	31.82 [43.52]
N	1,114	1,207	1,207	1,201

Notes: 1. *** p<0.01, ** p<0.05, * p<0.1.
 2. [standard deviation], (standard error).
 3. Village fixed effects are included.

Meanwhile, the project impact calculated in Table 4 is estimated under the assumption that all residents of the treatment group benefit from the improved drinking water facilities through the KOICA project, and the residents of the control group do not. The average project impact of this random assignment of treatment is called the intention-to-treat (ITT) effect. The ITT effect does not take into account situations in which some of those randomly assigned to a project do not participate in the project and some of those who are not assigned to the project participate in or indirectly benefit from the project. When such a situation occurs, the average project effect on those who actually benefit from the project is measured differently from the ITT effect.

Such a spillover occurred in the drinking water improvement project in Ghana, and there was serious contamination in the treatment and control groups. In other

words, the villagers belonging to the treatment group did not receive benefits from the drinking water facilities improved by the KOICA project. We find 73.97% of the compliance rate with the experimental design of this project.

To determine the project effect on those who actually received the benefits of the improved drinking water facilities from the KOICA project, the outcome variable of the project was compared to the actual KOICA project using random assignment of treatment as an instrumental variable (IV). A regression analysis of IVs was performed to regress whether or not a person received a benefit. The net project effect on project adherents obtained in this way is called the local average treatment effect (LATE). In Table 5, the IV estimate in column A indicates that the scale of the project effect is larger than the ITT effect obtained above. In the case of actual benefits from the KOICA drinking water improvement project, there was a project effect that reduced the diarrhea incidence rate by 22.7 percentage points. In Table 5, Column B uses a linear regression model (OLS) to regress the outcome variable of the project to determine whether it actually benefited from the KOICA project.

〈Table 5〉 Effect of Water Supply in Ghana, IV

Dependent variable	Diarrhea (1)	Use of improved water (2)	Use of improved well (3)	Travel time (min) (4)
<i>A. IV, No control</i>				
Effect	-0.227* (0.117)	0.158** (0.075)	0.199** (0.090)	-18.173* (9.270)
<i>B. OLS, No control</i>				
Effect	-0.117*** (0.044)	0.149*** (0.034)	0.069* (0.041)	-11.856*** (3.578)
Mean of dep.var.	0.361 [0.480]	0.673 [0.469]	0.500 [0.500]	31.82 [43.52]
N	1,114	1,207	1,207	1,201

Notes: 1. *** p<0.01, ** p<0.05, * p<0.1.
 2. [standard deviation], (standard error).
 3. Village fixed effects are included.

ITT should be interpreted as the result of KOICA's drinking water improvement project in the village as an effect of "implementing/providing the project." On the other hand, IV corresponds to the effect received by those who use the well and drinking water provided by KOICA as a result of the drinking water improvement project as an effect according to the actual "project benefit."

Impact 1: KOICA project execution (instrumental variable, instrument, z): treatment group or control group.

Impact 2: Whether KOICA project results are used (independent variable, x)

Result: Diarrhea, improved drinking water use, improved well use, time taken to obtain drinking water (dependent variable, y)

In summary, ITT is the analysis of the effect of Impact 1 on the outcome (Impact 1 → Outcome) and measures the effect on the outcome by considering the relationship between Impact 1 and Impact 2 (Impact 1 → Impact 2 → Outcome) corresponds to IV. OLS is a method of measuring the effect of Impact 2 on the outcome (Impact 2 → outcome). Therefore, for analyzing the effect of KOICA project assignment on outcome, ITT is estimated, and for analyzing the effect of the project for those who actually use the improved drinking water supported by KOICA, IV is employed. In this way, we can clearly estimate the actual project effects and reduce misinterpretation of the project effects.

3. Suggestion

In the case of projects that are conducted with a time lag within the project area, there is a limitation in that only short-term effects can be measured because there are often not many time lags. If a before/after investigation is possible for the KOICA project area and non-project area (without similar projects), long-term effect estimation is possible; however, this applies not only to the phase-in method but also to the general impact assessment. For designing impact evaluation for KOICA's flagship projects, it is necessary to plan an ex post evaluation so that long-term effects can be measured even after the project is closed. If the primary data

collection is difficult, the secondary data can be used by collaboration with the local government or statistical authorities in partner countries.

V. Comparative Analysis

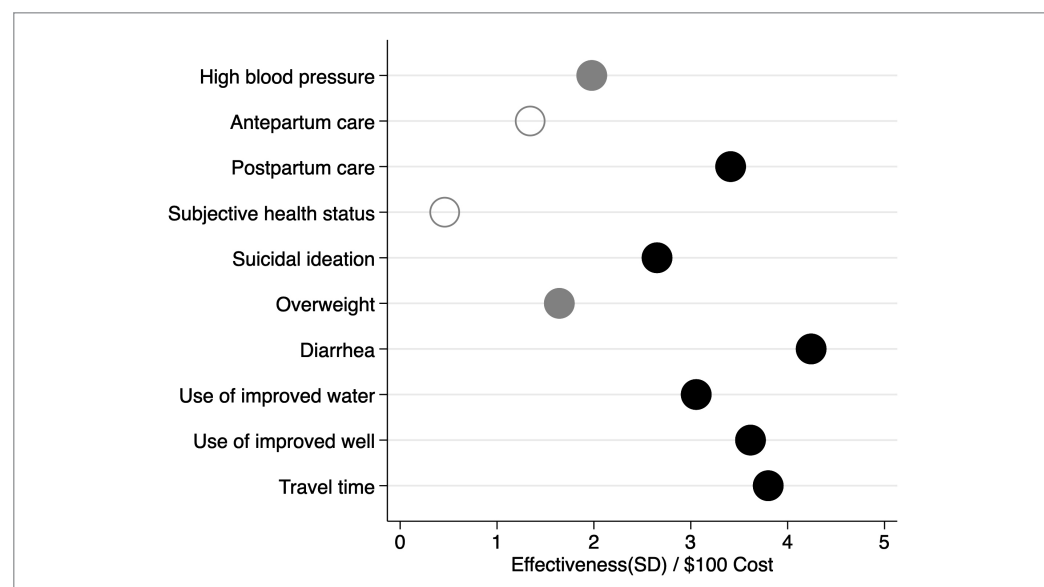
The impact evaluation of project is a process of determining how much benefit the target group has and how meaningful changes are made in a given budget. Taking the health project as an example, the impact evaluation is the process of identifying whether the subject's existing health status or behavior has improved in a measurable form. Cost-effectiveness analysis is an analysis method designed to compare various development cooperation projects with each other by calculating the measurable effects or benefits converted into monetary units and taking into account the cost invested in the project.

1. Cost-Effectiveness Analysis

The cost-effectiveness analysis results are shown in Figure 2. Overall, it can be said that the results of the Ghana drinking water project indicate high cost-effectiveness. In the Peru project, improvement of indicators such as postpartum management and suicidal ideation was found to be highly cost-effective.

Cost-effectiveness analysis is widely used in development cooperation research because it allows direct comparison between projects when the same outcome variable is used; it is easy to calculate and verify and has high scientific reliability. However, if other outcome variables are used, direct comparison between projects is difficult, and it is necessary to consider that there is no absolute standard for the cost-effectiveness ratio, but a relative standard.

〈Figure 2〉 Cost-Effectiveness Analysis



2. Cost-Benefit Analysis

Cost-benefit analysis starts from the assumption that it is efficient to choose an alternative in which the sum of individual gains is greater than the sum of losses. The most commonly used method is to measure the results of a project in monetary units and then calculate the ratio of the social benefits of the project divided by the project costs. Although it may be possible to conclude that a project with such a high cost-benefit ratio is more cost-effective or efficient than other projects, it cannot be concluded that it is moral or socially valid because other value judgments are not considered.

Based on the analysis, the cost-benefit ratio was calculated to be 5.17 for the Peru school health promotion project and 6.41 for the Ghana Volta drinking water project. Both projects can be interpreted as having more benefits from the program than the costs involved. Although the measurements were made using the most conservative values possible, it should be noted that the numbers used are subject to large

fluctuations, such as those with high reliability through on-site or in-depth data research, and may change depending on the validity of assumptions. As in the cost-effectiveness analysis, the Volta Maternal and Child Health Project in Ghana was excluded from the analysis.

When converting project results into monetary values, various factors such as willingness to pay, discount rates, weights, and uncertainties can be considered. However, in this study, complicated factors are omitted so that they can be easily utilized in future project. In addition, the required cost was calculated as the total project cost, and the cost for future operation and maintenance can also be considered; nevertheless, it is omitted to increase future utilization.

VI. Conclusion and Discussion

In this study, the consistent evaluation methodology was applied to the three KOICA health projects that have data available for impact evaluation, with an aim to estimate the project impact and to compare the projects. The analysis using DD method revealed that the Peru School Health Promotion Project decreased the percentage of students who felt suicidal, and the maternal health promotion project showed significant results in increasing postpartum care rate. Although no significant project impact was found on the children's diarrhea incidence rate of Community Health Volunteers' home visits for the maternal and child health project in Volta, Ghana, the drinking water sanitation improvement project in Volta, Ghana was found to be effective in significantly lowering the incidence of diarrhea in children through improved drinking water facilities. The Peru project and the Ghana drinking water project, where the project effects were found, were analyzed; the cost-effectiveness analysis revealed that the Ghana Volta drinking water project was more cost-effective overall had a higher cost-benefit ratio. All of them showed many benefits compared to input costs.

This study attempted to derive KOICA recommendations for rigorous project

effectiveness measurement by showing the impact assessment and comparison process between projects using survey data from KOICA projects. Even if it is the result of an impact evaluation through a strictly designed randomized trial design, there is a Hawthorne effect, that is, the effect of intentionally improving behavior by recognizing that people in the treatment group are observing their behavior. It can be difficult to separate the effect from pure project impact. In addition, the experimental design lacks external validity; thus, there is no guarantee that the same project results will be obtained in other groups in different regions. In addition, as can be seen from the Ghana drinking water sanitation project, even though the project was designed as an RCT, there can be a large difference in baseline characteristics of the treatment and control groups with various factors.

There are various quasi-experimental design methods that can be used as suboptimal solutions when a randomized experimental design cannot be applied due to budget constraints and ethical issues. Even in the case of the DD method, the result is reliable only when the important assumption of the same trend is satisfied. In addition, to use the DD method, a baseline survey must be conducted before the project. Also, if the baseline survey has not been carried out, it is possible to obtain secondary data on site, even in the middle of the project. Project impact assessment can be attempted through the PSM method when only end-line survey is available. Alternatively, if there is a good instrumental variable, selection bias can be controlled.

If individual KOICA project managers and evaluators have a minimal understanding of these various evaluation methodologies and their limitations, they will be able to plan various project evaluation plans according to the project content and budget constraints at the project planning stage. At least, it will be possible to interpret the PMC's evaluation results more critically and to plan effective project evaluation when planning future projects. Since there are many restrictions on obtaining data, especially local data, after the project is closed, it is recommended to establish a plan and timeline for project evaluation under possible budget constraints before starting the project and making the most of available data, including secondary data, when carrying out the project.

The World Bank and Asian Development Bank are providing project impact assessment manuals for project practitioners; KOICA also has translated reports and reports dealing with impact assessment. In particular, reports from the World Bank and the Asian Development Bank can be used as very good reference; this includes not only the DD method introduced in this study, but also various quasi-experimental design methods provided along with the STATA code.

Finally, with the expectation that KOICA will increase the use of project evaluation data in the future, the suggestions for data management are as follows: It is necessary to manage and store major project evaluation data using KOICA as the center. This is because it is necessary to reuse data when conducting replication of project impact evaluation analysis or cost-effectiveness analysis for comparison between projects in the future. The contents below are necessary for data analysis: 1) readme file 2) raw data 3) questionnaire (baseline, midline, end line survey); these three files should be stored and shared together. Furthermore, if good local secondary data collected during project execution can be stored and shared together, it will be of great help when planning KOICA projects in the same area in the future.

This study is meaningful in that it attempted to compare projects by applying the same evaluation method as the actual KOICA project evaluation. Although direct comparison between projects was impossible because there were no identical outcome variables, a method for indirect comparison was presented by converting outcome variables into a standard normal distribution. In addition, a common index was selected and presented for comparison between projects, which can be used when carrying out future KOICA health projects evaluation.

This study is expected to be utilized in KOICA project impact evaluation and comparison between projects and is expected to be used as a reference for project evaluation planning. In terms of study implications, it emphasizes the need for an effective research methodology for evidence-based project design of KOICA projects. Based on this study, it is expected that more successful cases of KOICA projects can be discovered through more sophisticated project evaluations and can be actively used in ODA education and public relations for KOICA ODA projects.

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