

## 論文の内容の要旨

論文題目 Effect of a package of continuum of care interventions on the completion of maternal, newborn, and child health care in Ghana: a cluster-randomized trial  
(ガーナにおける母子保健継続ケア介入のサービス統合カバー率に対する効果：クラスターランダム化比較試験)

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### **Introduction:**

In low- and lower-middle income countries, mortality regarding pregnancy and childbirth is still a major public health concern. Since such mortality is largely preventable, appropriate and timely care can save the lives of women and children during the pregnancy, delivery, and postpartum stages. The coverage of essential services has been improved in maternal, newborn, and child health in low- and lower-middle income countries. The coverage of deliveries assisted by a skilled birth attendant was improved globally from 58% in 1990 to 73% in 2013. Concurrently, the coverage of antenatal care four times or more was improved from 31% to 60%. However, women and children do not necessarily receive all of such services along with the continuum of care. Moreover, many low- and lower-middle income countries failed to achieve the targets of reducing maternal and neonatal mortality under the Millennium Development Goals by 2015.

To achieve the continuum of care, women should be informed during the early stage of pregnancy about the importance of receiving care along the continuum. Also, it is important to identify a service with lower coverage along the continuum and conduct an intervention that improves the coverage of such a service. However, past interventions have not examined how to achieve the continuum of care in maternal, newborn, and child care by receiving antenatal care, delivered assisted by a skilled birth attendant, and receiving postnatal care. This study was aimed at evaluating the effect of a continuum of care intervention on improved continuum of care completion during pregnancy, delivery, and postpartum in Ghana.

### **Methods:**

As a cluster-randomized controlled trial using an effectiveness-implementation hybrid design, this trial was implemented to assess the effect of the package of interventions on improving the

continuum of care completion maternal, newborn, and child health services in Ghana. This paper evaluated the quantitative impact of the interventions under the design. The trial was conducted in three Health Demographic Surveillance Sites in Ghana, namely, Dodowa, Kintampo, and Navrongo, which had a population of 469,000 and whose crude birth rate was 3.1 in 2011. Among 32 sub-districts in the study site, women and children living in randomly selected 16 sub-districts received the package of the following interventions from October 2014 to September 2015: 1) the use of home-based record called the continuum-of-care card, 2) received services from health workers who received training on the continuum of care, 3) 24-hour retention services after delivery at a health facility, and 4) home-visit of a health worker in addition to routine services at health facilities. The interventions were implemented by taking advantage of the existing infrastructure and health workers with minimal additional investment for the trial. Among the interventions, 3) and 4) were implemented at health facilities where the provision of infrastructure at health facilities and health workers were sufficient enough to conduct them.

For the evaluation of the effect of the interventions, randomly selected 1,500 women of reproductive age who gave birth or had stillbirth before the intervention period (from September 2012 to June 2014) received a face-to-face interview at the baseline survey between July and September 2014. Randomly selected 1,500 women of reproductive age who gave birth or had stillbirth during the intervention period received a face-to-face interview at the follow-up survey between October and December 2015.

The outcome of this study was completing the continuum of care in maternal, newborn, and child health services during the pregnancy, delivery, and postpartum stages. It was defined as meeting all of the followings: 1) received antenatal care four times or more, 2) delivered with assistance by a skilled birth attendant at a health facility, and 3) received postnatal care within 48 hours, around one week, and around six weeks after delivery for herself and her child. Mixed-effect logistic regression was used to evaluate the effect of the intervention using a difference-in-differences indicator and intent-to-treat approach. Also, mixed-effect logistic regression was used to investigate the differences of improvement in the continuum of care completion by the characteristics of the nearest health facilities and sub-districts. These analyses included women's, children's and household characteristics as covariates to adjust for

differences in the means of such characteristics between the intervention and control arms. Such differences were possibly caused by the allocation of a central sub-district in a district having a district hospital in the intervention arm.

### **Results:**

The proportion of women who completed the continuum of care was 410/870 (47.1%) in the intervention arm and 246/620 (39.7%) in the control arm ( $p=0.004$ ) after the interventions, whereas more than 90% discontinued care at the baseline period. The package of interventions improved the continuum of care completion (adjusted odds ratio [AOR]=1.75; 95% confidence interval [CI]: 1.09, 2.74). Living in or close to an intervention sub-district (AOR=2.17, 95% CI: 1.29, 3.66) and having a community-level health facility as the nearest facility (AOR=1.94, 95% CI: 1.05, 3.60) were associated with improved the continuum of care completion. In sub-sample analyses based on various health systems factors at the sub-district level, significant association between the intervention and continuum of care completion existed among women living in a sub-district far from a main road (AOR=13.5, 95% CI: 1.12, 162.3), without higher-tier health facilities (AOR=2.47, 95% CI: 1.08, 5.62), having two or more higher-tier health facilities (AOR=16.2, 95% CI: 4.13, 63.6), with high density in the number of health facilities per pregnancy cases a year (AOR=3.35, 95% CI: 1.71, 6.57), with at least one health facility with a midwife (AOR=2.00, 95% CI: 1.24, 3.23).

### **Discussion and conclusions:**

The level of the continuum of care in the pregnancy, delivery, and postpartum stages was improved by the package of interventions combining the use of inexpensive home-based records, the provision of care by health workers recognizing the importance of the continuum of care, and improvement in access to postnatal care in Ghana. After the intervention, an extensive improvement was observed in the continuum of care completion among women and children living in the control arm as well. It suggested that the effect of the interventions was contaminated. It is also possible that health workers, regardless of the arms, gained a better understanding of the continuum of care. In this study, the continuum of care completion was higher after the intervention period among those who lived in a control sub-district locating close to an intervention sub-district. It implies that information on the importance of the

continuum of care might be spilled over toward both women and health workers in such a nearby control sub-districts.

This study highlights the importance of strengthening health systems, particularly regarding the provision of community-based health services and the upgrading of human resources for health to accelerate the effect of the continuum of care interventions. Sub-districts with dense community-based health facilities improved the continuum of care by ensuring access to health services for women and children by visiting facilities or receiving home visits to health workers. Sub-districts with higher-tier health facilities, such as hospitals and health centres, had the highest level of the continuum of care. Such facilities can retain women and children long after delivery to ensure that they accessed care during the most critical period of mortality. However, higher-tier health facilities needed coordination with community-based health facilities where women and children received antenatal care and postnatal care after discharge. The upgrading of human resources for health was measured in this study as having more midwives in the community-based health facilities. Sub-districts with a midwife at least at one health facility improved the continuum of care. While community-based health facilities might not provide delivery care, upgraded human resources for health might successfully enhance the continuum of care.

This study demonstrates the importance of combined interventions regarding the continuum of care education at the early stage of pregnancy and improving access to services after delivery. These interventions can encourage women and children to receive care continuously across pregnancy, delivery, and postpartum stages. This study also shows that the interventions worked in the existing health service provision setting where the different types of health facilities provided maternal, newborn, and child health services in Ghana. The interventions can be implemented in low- and lower-middle income countries with similar health service provision settings. The effect of the interventions may be higher in an area with strengthened health systems having the combination of higher-tier health facilities and the dense distribution of community-based health facilities and upgraded human resources for health.

(1,386 words)