Study Title: The Impact and Implementation of a Mobile Messaging Intervention to Improve Infant and Young Child Nutrition in Senegal

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STATISTICAL ANALYSIS PLAN

Study outcomes: Table 1 provides an overview of our study outcomes.

Table 1. Overview of study outcomes

Outcome type	Outcome	Description
Primary	Anemia prevalence	We will use Hemocue Hb301 machines to measure hemoglobin levels in children in order to determine anemia prevalence using the WHO cut-offs: mild 10 ≤ hb < 11 g/dl; moderate 7 ≤ hb < 10 d/dl and severe hb < 7 g/dl. A finger prick will be used to obtain a drop of capillary blood that is placed on a cuvette and inserted in the Hemocue machine to obtain an on-the-spot assessment of hemoglobin levels.
	Minimum Acceptable Diet	Minimum Acceptable Diet Prevalence, Primary, baseline and endline: The minimum acceptable diet indicator will be used to assess dietary diversity in children. A 24-hour open dietary recall will be conducted with mothers to assess their child's dietary intake over the previous day. The 24-hour recall will be used to calculate minimum dietary diversity (MDD) (consuming ≥4 of 7 food groups (grains, roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin A rich fruits and vegetables; other fruit and vegetables)) and minimum meal frequency (MMF) (2x/day for breastfed infants 6-8.9 months; 3x/day for breastfed children 9-23.9 months; 4x/day for non-breastfed children 6-23.9 months). Children who meet the thresholds for both MDD and MFF are defined as consuming a MAD, based on the WHO/UNICEF IYCF indicator.
Secondary	Frequency of consuming key foods in past 7 days	Frequency of consuming key foods in the past 7 days, Secondary, baseline and endline: We will use a 7-day food frequency questionnaire (FFQ) to assess the frequency that children consumed specific foods targeted in the intervention over the course of the previous week. More specifically, the FFQ will ascertain the number of times that the following foods have been consumed: eggs, leafy greens, fish, milk, cowpea, nuts, orange colored fruits and vegetables, other fruits and vegetables, thick porridge, beef or mutton, pork, chicken and liver.
	IYCF practices	IYCF practice indicators, secondary, baseline and endline: We will use the WHO/UNICEF IYCF indicators to assess feeding practices. Mothers will be asked about feeding practices as part of the household surveys. These include: Bottle feeding 0–23 months; Continued breastfeeding 12–23 months; Exclusive breastfeeding under six months; Exclusively breastfed for the first two days after birth; Egg and/or flesh food consumption 6–23 months; Early initiation of breastfeeding; Ever breastfed; Introduction of solid, semi-solid or soft foods 6–8 months; Minimum dietary diversity 6–23 months; Mixed milk feeding under six months; Minimum meal frequency 6–23 months; Minimum milk feeding frequency for non-breastfed children 6–23 months; Sweet beverage consumption 6–23 months;

		Unhealthy food consumption 6–23 months; Zero vegetable or fruit consumption 6–23 months The proportion of children being fed according to the detailed descriptions of these indicators will be assessed based on the WHO/UNICEF IYCF indicator manual.
	IYCF knowledge, attitudes, norms and intentions	IYCF knowledge, attitudes, norms and intentions, Secondary, baseline and endline: IYCF knowledge, attitudes, norms and intentions will be assessed using survey questions based on the components of the intervention. Both mothers and fathers will be asked the survey questions as part of the household survey. The questions are grounded in the theory of planned behavior and based on previously published IYCF knowledge, attitudes, norms and intentions questions by Monterrosa et al.[1] The questions have been pilot tested by the project PI.

Table 2. Overview of statistical tests to assess intervention impacts on outcomes

Primary outcomes	
Outcome	**Statistical approach**
Anemia prevalence	difference-in-difference
Minimum acceptable diet (MAD)	difference-in-difference
Secondary outcomes	
Frequency of consuming key foods in past 7 days	difference-in-difference
IYCF practices	difference-in-difference
IYCF knowledge, attitudes, norms and intentions	descriptive statistics

Description of Statistical Approach: To estimate the impact of the mHealth messaging intervention on anemia and MAD, as well as our secondary outcomes, we will utilize a difference-in-differences approach. Linear regression models will be fitted for each outcome, with explanatory variables that include the intervention indicator, time (baseline and endline), and intervention by time interaction. The interaction term is of primary interest, as it summarizes mean changes in the outcome before and after the intervention in the treatment group compared with the control group. The intervention variable is as randomized (intention to treat). We anticipate that the parallel trend assumption will hold in this scenario since the various clusters and triads within clusters are similar to each other socio-economically; however, we will carefully test this assumption by applying the recently developed difference-in-difference model checklist[4]. We will analyze the data on the individual level and use generalized estimating equation (GEE) extensions of regression in SAS 9.4 to account for clustering. All models will adjust for sex of the child, and highest education completed by the mother. We will also conduct exploratory subgroup analyses based on baseline anemia status.

References

1. Monterrosa EC, Frongillo EA, Gonzalez de Cossio T, et al. Scripted messages delivered by nurses and radio changed beliefs, attitudes, intentions, and behaviors regarding infant and young child feeding in Mexico. *J Nutr*. 2013;143(6):915-922.