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Optimizing local diet using linear programming to improve micronutrient intakes of lactating women in rural area of Senegal

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Background and objectives: Micronutrient deficiencies remains a great public health challenge particularly in rural settings. In Senegal, the double burden of malnutrition currently highlighted among women of reproductive age of the groundnut basin become worrisome. To tackle these malnutrition issues, it would be useful to determine the best foods combination to balanced diets. We aimed to use a linear programming method to examine whether optimized diet using a locally-made porridge containing millet, cowpea and orange fleshed sweet potato could meet nutrient requirements of lactating women.

Methods: A dietary survey was carried out among 59 rural lactating women and their children using the weight food record method. All foods and beverages consumed during a whole day were quantify. Nutrient intakes were calculated using the west African food composition tables. Prices (per kg) of foods were obtained from the local shops/markets and the harmonized index of the national agency of statistics. The 22 foods items daily consumed by women with an average of consumption of 15 g were selected for the model. A linear programming method of the excel solver was used to optimize diet with the overmentioned locally-made porridge. The objective function was to minimize the cost of the diet taking into account the constraints related to the recommended intakes of the selected nutrients.

Results: According to the results, the median intakes of the staple diet cover around 70% of the energy and proteins requirements of the women. While, iron, zinc and vitamin A intakes were lower than the recommended dietary allowances. The optimum diet obtained with the add of the porridge (1.46 mg iron, 2.13 mg zinc and 4025 µgRE vitamin A) covers the total (100%) energy (2620.7 kcal), proteins (76.6 g) and iron (15 mg) requirements and more than 200% of the adequacy of fibers, zinc, vitamin C, folate and vitamin A.

Conclusions: These findings support the potential impact of nutrient dense complementary porridge to improve the iron, zinc and vitamin A status of rural lactating women. This model could be adapted for children to reduce micronutrients deficiencies in rural area in Senegal.

Keyword: Linear programming, Micronutrients deficiencies, Lactating women, Rural area, Senegal

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Association of changes in dietary variety with all-cause mortality among older Japanese adults with/without frailty

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Background and objectives: Eating a variety of foods maintains nutritional status and prevents frailty or mortality. We conducted a 2-year community-wide intervention for promoting dietary variety and preventing frailty. However, it remained unclear whether the effect of changes in dietary variety on health outcomes differs with/without frailty. This study examines the influence of changes in dietary variety during 2-year on all-cause mortality among older Japanese adults living in a metropolitan area.

Methods: We performed secondary analysis of data from a community-wide intervention focused on promoting dietary variety in Ota City, Tokyo, Japan. Participants were 7,505 non-disabled residents (3,867 men and 4,137 women) aged 65–84 years who responded to self-administered questionnaire surveys in 2016 and 2018. Frailty was defined as a score of ≥ 4 on the Kaigo-Yobo Checklist (range: 0–15). Dietary variety was assessed using the dietary variety score (DVS: 0–10 points) and defined as low (0–3) or high (4–10). Participants were classified according to changes in the DVS category between 2016 and 2018; high–high, high–low, low–high, low–low groups. Multilevel survival analyses were conducted to calculate the adjusted hazard ratio (HR) and 95% confidence interval (CI) for all-cause mortality by with/without frailty.

Results: The numbers and rate of high–high, high–low, low–high, and low–low groups were 2110 (35.3%), 549 (9.2%), 852 (14.2%), and 2469 (41.3%) in the non-frailty group, respectively. Corresponding numbers and rate were 325 (21.3%), 125 (8.2%), 211 (13.8%), and 864 (56.7%) in the frailty group. During a follow-up of 3-year, 352 (4.7%) individuals died. Compared with high–high group, HR (95% CI) for all-cause mortality for high–low, low–high, and low–low groups were 1.64 (0.96–2.80), 1.03 (0.66–1.60), and 1.31 (0.74–2.31) in non-frailty group, respectively. Corresponding HR (95% CI) were 2.49 (1.15–5.34), 1.56 (0.61–4.01), and 2.74 (1.14–6.58) in frailty group.

Conclusions: Although changes in DVS categories were not associated with all-cause mortality among non-frail respondents, even those with frailty may be able to reduce their risk of all-cause mortality by maintaining or increasing dietary variety.