Mapping Nutrients Crucial to a Growing Population

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Background and Significance

The World Health Organization (WHO) estimates that over two billion people worldwide suffer from inadequate levels of micronutrients, mainly in the form of iodine, iron, and vitamin A* deficiencies. This is usually a result of the unavailability of crops rich in these nutrients.

Micronutrient deficiencies leave the body more susceptible to infection and illnesses that lead to death. They mainly afflict children, pregnant women, and nursing women.

The world's population is expected to grow by two and a half billion in the next forty years (UNDESA 2010). This places an increased demand to produce and distribute food high in iodine, iron, and vitamin A.

The purpose of this study is to determine whether or not enough of these important nutrients are produced to meet the nutritional needs of the global population .

*Vitamin A is measured in Retinol Activity Equivalents (RAE) which allows the various forms of vitamin A to be considered in terms of their biological activity.

Methodology

This study focuses on iron and vitamin A content of the most agriculturally produced crops by tonne (1 tonne = 1,000 kilograms). Iodine was omitted in the micronutrients examined because The WHO is addressing this deficiency in the form of iodized salt.

The most highly produced crops were determined using data from the Food and Agricultural Organization of the United Nations (FAOSTAT). 20 crops were selected from global production and 10 from production in developing regions. Developing regions were focused on because they are expected to see the largest increase in population (Botkin and Keller 2009).

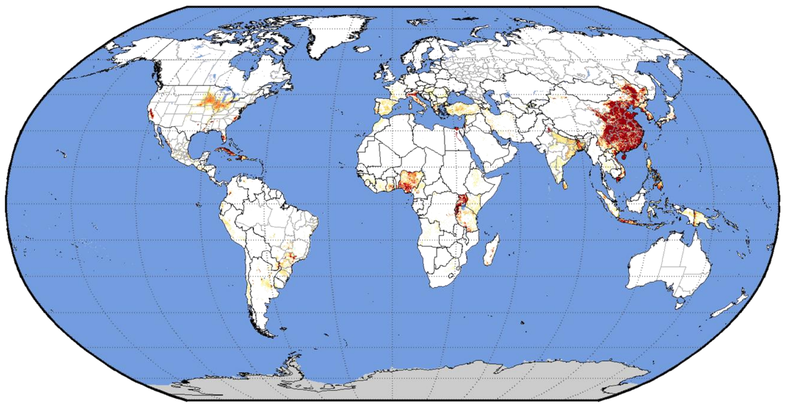
Nutritional content of the selected crops was determined using data from the U.S. Department of Agriculture (USDA) and combined with area specific production data (Monfreda et al. 2008) . The percentage of edible portions of crop were also taken from the USDA. This allowed us to map how much vitamin A and Iron are produced and where.

Daily Values of iron and vitamin A as established by the Food and Drug Administration (FDA) were multiplied by 365 to get the amount a person needs in a year and then multiplied by the worlds population (7 billion) to get the amount of nutrients the world needs in a year. This process was repeated for the United Nation's (UN) estimate of the world's population in 2050 (9.2 billion).

Area specific nutrient production data was compared for world regions by looking at the grams of nutrients produced per person. This comparison was enhanced by looking at the prevalence of nutritional deficiencies in these regions.

Crops examined: sugar cane, maize, wheat, rice, potatoes, cassavas, sugar beets, soybeans, oil palm fruits, tomatoes, barley, sweet potatoes, watermelons, bananas, onions, apples, oranges, grapes, coconuts, mangoes, eggplants, plantains , sorghum, millet, beans, yams, cow peas, sesame seeds, cottonseeds, and sunflower seeds.

Vitamin A produced from major crops



In grams/hectare

0 0.05 0.1 0.15 0.2 0.25 0.3 0.35

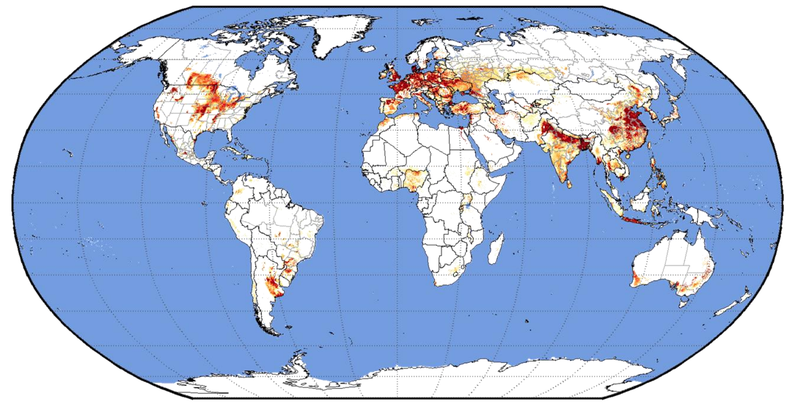
Figure 1.

Continent	RAE Vitamin A Produced (t)	Micrograms RAE Vitamin A Per Person	Vitamin A Deficiency Prevalence (%)
Africa	67	65,543	41.6
Asia	670	160,893	33.5
Europe	14	18,965	14.9
LAC	27	45,756	15.6
North America	22	63,855	No Data
Oceania	3.9	106,578	12.6
Global	803.9	116,577	33.3

Figure 2.

Figures 1 and 2 show the global distribution of vitamin A production.

Iron produced from major crops



In grams/hectare

0 5 10 15 20 25 30 35 40

Figure 3.

Continent	Iron Produced (t)	Grams Iron Per Person	Anemia Prevalence (%)
Africa	3,500	3	64.4
Asia	28,000	7	47.7
Europe	15,000	20	16.7
LAC	4,200	7	39.5
North America	7,700	22	3.4
Oceania	1,300	36	28
Global	59,700	9	47.4

Figure 4.

Figures 3 and 4 show the global distribution of iron production..

Results

It takes 45,990 tonnes of dietary iron to meet the nutritional needs of the global population, and 3,871.2 tonnes RAE of vitamin A. The global production of iron is 59,700 tonnes, and the global production of vitamin A is 803.9 tonnes. The nutritional needs for the UN's projected population in 2050 are 60,444 tonnes of iron and 5,087 tonnes of vitamin A. A year's worth of the FDA's Daily Value of iron is 6.6 grams. Every continent except Africa meets or exceeds this value. 553,030 mcg RAE are needed a year for one person according to the FDA. No continent produced enough vitamin A to meet their population's demand through the crops examined.

Discussion

There is enough iron produced globally to meet the current population's nutritional needs, and nearly enough to meet the nutritional needs of the projected population for 2050. The variation in grams produced per person between continents suggests that this is a distribution problem. On the other hand there was not enough vitamin A produced for the current population. This may be a result of the limited number of crops studied, and future research may prove that this is not the case. Regions with a higher amount of nutrient produced per person tended to have a lower prevalence of the corresponding nutritional deficiency. This suggests that growing more foods with these nutrients may prevent the suffering and death of billions of people.

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