Review Article

Micronutrient deficiency and its alleviation: The Philippine experience

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Results of the 1998 Fifth National Nutrition Survey (NNS) of the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST) revealed that the country has persisting micronutrient deficiencies of vitamin A, iron and iodine along with protein–energy malnutrition (PEM) and an increasing number of cases of android obesity. An interplay of various physiological, socioeconomic and political factors performs a role in the nutrition situation of the country. The Medium-Term Philippine Plan of Action for Nutrition (MTPPAN) is a product of multisectoral and multidisciplinary efforts for nutrition adequacy for all Filipinos. It gives priority attention to persisting and emerging nutritional problems through timely and focused strategies. Long-term programmes to address food insecurity through food-based interventions for alleviating PEM and micronutrient deficiencies will be strengthened. Thus, the successor MTPPAN 1999–2004 still implements similar programmes and strategies proven to be effective but they must be fully implemented with more vigor and aggressiveness. The FNRI, as the principal arm of the government as regards food and nutrition, not only conducts national nutrition surveys but also efforts in food fortification research and development as an integral component of the food fortification programme of the MTPPAN. This food-based strategy aims to develop technologies for fortification of commonly consumed food items to increase nutrient availability and consequently increase nutrient intake of the Filipinos.

Key words: Alleviation, micronutrient deficiency, Philippines.

Introduction

The Philippines is one of the Asian countries that first came up with a multidisciplinary and multilevel network to institutionalize nutrition programmes. This is embodied by the creation of the National Nutrition Council (NNC) through Presidential Decree PD491 in 1974. The NNC is composed of a governing board (GB) as the highest policy-making body of the Council and is chaired by the Secretary of the Department of Agriculture. Ten cabinet secretaries sit as members of the governing board, as well as heads of three private sector institutions appointed by the President, which serves for a 3-year term.

The concrete product of this multidisciplinary endeavour in nutrition is the Philippine Plan of Action for Nutrition (PPAN), the country's blueprint for achieving nutritional adequacies for all Filipinos. The PPAN is anchored in the Medium-Term Philippine Development Plan (MTPDP), which upholds human development as the ultimate goal of all development efforts in the country and is consistent with our global commitment to eradicate hunger and malnutrition.

However, despite the presence of a multiparticipative formulation and implementation of the PPAN for more than two decades, the multifaceted nature of malnutrition makes it very complex to resolve and the battle to fight it seems more difficult. It is not a problem that the government alone can eradicate nor abate. Thus, there is a need to act promptly on priority nutrition problems effectively and efficiently through timely and focused strategies. Convergence of services from the national government agencies, non-government organizations, the private sector, academe and the communities, themselves, to fully implement the PPAN is indeed indispensable.

This report will highlight the country's nutrition situation based on the national nutrition surveys of the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST) and how these results were utilized to come up with the successor Medium-Term Philippine Plan of Action for Nutrition (MTPPAN). The paper will not isolate the discussion of PEM because efforts in eradicating micronutrient deficiencies are useless unless deficiencies in macronutrients are first satisfied.

The Philippine food and nutrition situation

Data for the formulation of national policies and programmes are being generated by the FNRI-DOST. The FNRI is the principal research arm of the government in food and nutrition research and is mandated to periodically assess the country's food situation and the Filipinos' nutritional status.

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Since 1978 the FNRI has conducted five national nutrition surveys (NNS) in intervals of 5–6 years, the most recent of which was conducted in 1998. The NNS is composed of anthropometry, food consumption, clinical assessment and biochemical survey. In addition, the FNRI also conducts anthropometric surveys of children up to 10 years of age every 2–3 years to answer the demand for more frequent and more disaggregated data at the regional, and even at the provincial level.[1]

The 1998 NNS reveals that the country is still beset by protein–energy malnutrition (PEM), vitamin A deficiency (VAD), iron deficiency anaemia (IDA) and iodine deficiency disorders (IDD) despite prioritization to control and eliminate these disorders. In contrast, it was also noted that android obesity, characterized by the accumulation of body fat around the abdomen, is also increasing, which predisposes individuals to nutrition-related degenerative diseases such as cardiovascular diseases, diabetes mellitus, and cancer.[2]

Protein–energy malnutrition

Anthropometric survey determines the prevalence of PEM and the changes in the nutritional status of the population. The 1998 update of the nutritional status of 0–10-year-old Filipino children using the National Center for Health Statistics standards reveals that 32.0% of 0–5-year-old children were underweight, 34.0% were stunted and 6.0% had wasting. This means that 32 in every 100 are underweight, 34 in every 100 children are stunted, six in every 100 have wasting; or, an estimated 3.36 million children are underweight, 3.57 million children are stunted and 0.63 million children have wasting. Among the 6–10-year-old children, 30.2% were underweight and 40.8% were stunted.[3]

As compared to the 1996 anthropometric survey, the proportion of underweight children 0–5 years old and 6–10 years old increased by 1.2 and 1.9 percentage points, respectively, in the 1998 survey.

Micronutrient deficiencies

The past five NNS revealed that micronutrient malnutrition still persists among the most vulnerable population groups; the infants, preschool children and pregnant and lactating women. Vitamin A deficiency, IDA and IDD remain serious public health concerns.

The 1998 survey showed that the prevalence rate of anaemia using the International Committee for Standardization in Hematology cyanmethemoglobin method is 30.6% or three in every 10 Filipinos. Infants 6 months to less than 1 year, have the highest IDA prevalence rate of 56.6%, followed by the pregnant women at 50.7% and lactating women at 45.7% (Table 1). Iron deficiency anaemia remains the most serious micronutrient problem among the country's vulnerable groups.[4]

Meanwhile, for VAD, biochemical tests showed that among children aged 6 months–6 years, the prevalence of deficient serum vitamin A levels (<19 μg/dL) was 10.4% and the prevalence of deficient-to-low serum vitamin A levels (<20 μg/dL) was 35.3%.[5] These indicate that the deficiency is of public health significance because the WHO cut-off point is only 5% and 15%, respectively.[6,7] Among pregnant women, the prevalence rate also increased from 16.4% in 1993 to 22.2% in the 1998 survey, while no change was observed for lactating women at 16.5% and 16.4%, respectively (Table 2).[8]

Table 1. Prevalence of anaemia by age/physiological state: Philippines, 1998

Age/physiological state	% Prevalence
Philippines	30.6
6 months to <1 year	56.6
1–5 years	29.6
6 months to 5 year	31.8
6–12 years	
M	34.8
F	36.5
13–19 years	
M	26.2
F	33.2
20–39 years	
M	14.5
F	31.7
40–59 years	
M	27.7
F	33.3
60+ years	
M	49.1
F	39.2
Pregnant women	50.7
Lactating women	45.7

In contrast, the prevalence of IDD in the Philippines as manifested by goitre, doubled from 3.5% in 1987 to 6.7 in 1993 with noticeably higher prevalence rates among women than men, particularly the pregnant and lactating women.[9]

In addition, the 1998 data using the WHO/UNICEF/ICCDD criteria showed that the mean urinary iodine excretion (UIE) of 71 μg/L is of mild severity (Fig. 1).[10] According to the per cent distribution of urinary iodine excretion values, 35.8% of 6–12-year-old Filipino children have moderate to severe levels of iodine deficiency (Fig. 1).

Looking at the dietary intake alone, the series of NNS from 1978 to 1993 showed the declining trend in mean per capita total food consumption as well as in consumption of major food groups such as cereal and cereal products, starchy roots and tubers, fruits and vegetables (Table 3).[11,12] The decrease in energy and micronutrient intake is due to the decrease in food consumption, because the trend in dietary intake generally follows the trend in nutrient intake. From 1987 to 1993, intake of energy and other nutrients decreased, except for protein and vitamin A (Table 4). In contrast, the decreasing food available at the household level can be due to poverty and other factors such as the Asian economic recession, the regional currency crisis, natural calamities and the peace and order situation in the country, to some extent.

The Philippine nutrition programme

Based on the food and nutrition situation of the Philippines, malnutrition is still a serious problem of the country made more complex by the presence of overnutrition. An interplay of interrelated factors such as health status, food supply, household income, intra-familial food distribution, water supply, waste disposal facilities and environmental sanitation, socioeconomic situation, poverty incidence and food threshold, among others, needs to be considered. To employ non-palliative strategies is very challenging indeed both for the policy-makers and implementors.

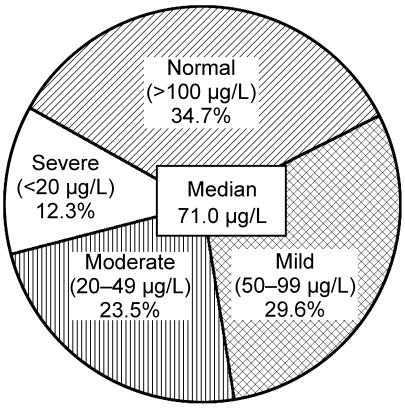

Figure 1. Prevalence and percentage distribution of iodine deficiency disorders among 6–12-year-old children: Philippines 1998.

Thus, the PPAN continues to respond to the persisting as well as emerging nutrition problems in the country. Approaches that were proven effective in the past will be implemented with more vigor, while programmes that lagged but which were proven effective will be strengthened and/or improved. A two-pronged approach of improving the food security in every household as well as reducing the prevalence of PEM among children, chronic deficiency among adults and micronutrient deficiencies VAD, IDA and IDD as well as the emerging lifestyle diseases will have to be enforced.[13]

The PPAN aims to reduce by 20% the prevalence of PEM among preschoolers and school children, chronic deficiency among adults, iron deficiency anaemia and overweight among specific age groups. It also aims to reduce subclinical VAD among preschoolers and IDD to levels

Table 2. Comparison of prevalence of VAD by age and physiological state: Philippines, 1993 and 1998

Age/physiological state	1993			1998		
	Low	Deficient	Total	Low	Deficient	Total
6 months–5 years	24.9	10.4	35.3	29.8	8.2	38.0
Pregnant women	13.4	3.0	16.4	15.1	7.1	22.2
Lactating women	11.2	5.2	16.4	12.6	3.9	16.5

VAD, vitamin A deficiency.

Table 3. Comparison of mean 1-day per capita food consumption: Philippines, 1978, 1982, 1987, and 1993

Food group/subgroup	Consumption (raw, as purchased) in g						% change
	1978	1982	1987	1993	1993 urban	1993 rural	1987–1993
Total food	897	915	869	803	819	785	–
Cereals and cereal products	367	356	345	340	318	361	–1.4
Rice and rice products	308	304	303	282	273	290	6.9*
Corn and corn products	38	34	24	36	17	55	–50.0*
Starchy roots and tubers	37	42	22	17	13	21	–22.7*
Sugars and syrups	19	22	24	19	20	17	–20.8*
Fats and oils	13	14	14	12	14	10	–14.3*
Fish, meat and poultry	133	154	157	147	161	133	–6.4*
Fish and fish products	102	113	111	99	98	100	–10.8*
Meat and meat products	23	32	37	34	44	23	–8.1*
Poultry	7	10	9	14	19	–	–
Eggs	8	9	10	12	15	9	20.0*
Milk and milk products	42	44	43	44	64	24	2.3
Dried beans, nuts and seeds	8	10	10	10	11	8	0.0
Vegetables	145	130	111	106	98	113	–4.5
Green leafy and yellow	34	37	29	30	25	34	3.4
Other	111	93	82	76	73	–	–
Fruits	104	102	107	77	82	73	–28.0*
Vitamin C-rich	30	18	24	21	27	15	–12.5
Other	74	84	83	56	55	58	–32.5*
Miscellaneous	21	32	26	19	23	16	–26.9*

*Significant at $\alpha = 0.01$.

Table 4. Comparison of mean one-day per capita nutrient intake: Philippines, 1987 and 1993

Nutrient	Intake		% change
	1987	1993	
Energy (joules)	7363	7073	–3.9*
Protein (g)	49.7	49.9	0.4
Iron (mg)	10.7	10.1	–5.6*
Calcium (g)	0.42	0.39	–7.1*
Retinol equivalent (μg)	389.7	391.9	0.6
Thiamine (mg)	0.68	0.67	–1.6
Riboflavin (mg)	0.56	0.56	–0.0
Niacin (mg)	16.3	16.1	–1.2
Ascorbic acid (mg)	53.6	46.7	–1.29*

*Significant at $\alpha = 0.01$.

below the WHO cut-off for considering these conditions as a public health problem.

Specifically, the PPAN aims to achieve reduction in the prevalence of the following health and nutrition targets by 2004. Underweight preschoolers aged 0–5 years old: from 9.2% to 7.4% (Philippine Reference Standards); 0–5-year-old boys, from 8.4% to 6.7%; 0–5-year-old girls, from 10.0% to 8.0%. Underweight school children aged 6–10 years: from 8.7% to 6.6% (Philippine Reference Standards); 6–10-year-old boys, from 7.6% to 6.1%; 6–10-year-old girls, from 9.0% to 7.2%. Chronic energy deficiency (%): men (20 years and above), from 11.1 to 8.9; women (20 years and above), from 15.4 to 12.3. Overweight (%): preschoolers, from 4.7 to 3.8; school children, from 7.3 to 5.8; men (20 years and above), from 17.1 to 13.6; women (20 years and above), from 23.3 to 18.6. Iron deficiency anaemia (%): infants 6–11 months, from 56.6 to 45.3; preschoolers, from 29.6 to 23.7; school children, from 35.7 to 28.5; adolescent boys, from 26.2 to 21.0; adolescent girls, from 33.2 to 26.6; elderly (60 years and above), from 44.1 to 35.4; pregnant women, from 50.7 to 40.2; lactating women, from 45.7 to 36.6. Low and deficient serum retinol level in 6-month to 5-year-old children, from 38.0% to 15.0%. Moderate and severe iodine deficiency (indicated by UIE), from 35.8% to 20.0%.

Philippine Plan of Action for Nutrition impact programmes

The following are the PPAN impact programmes that have been found to be effective through the years and which will be implemented with more vigor in the coming years to achieve the aforementioned PPAN targets.

Home, School and Community Food Production. This addresses food security by ensuring that food at the household and community is always available, adequate, accessible, affordable and safe. This is the long-term measure to improve food intake and micronutrient deficiencies among Filipinos and in support of the DA-Agriculture and Fisheries Modernization Act (AFMA) vision of food security and poverty alleviation. One of the DA-banner programmes that supports the PPAN is the High Value Commercial Crops Programme (HVCCP) which covers the production of highly nutritious vegetables and root crops for the home table such as *malunggay* (horseradish) sweet potato and *saluyot* (jute) among others.

The Urban Agriculture Program is focused on urban poor communities in Metro Manila and in thickly populated towns and suburban provinces. Under this program, the *Gulayan sa Barangay* (village vegetable gardening) and food production at schools should be strengthened. The Food Always in the Home (FAITH), a model home with backyard, animal raising and plant gardening is being piloted in many areas of the country, and is hoped to be institutionalized in the near future in collaboration with Department of Agriculture and the LGU.

Micronutrient Supplementation. The continuing Micronutrient Supplementation Programme covers the provision of vitamin A, iron and iodine to vulnerable groups, particularly infants, preschoolers, adolescents, pregnant and lactating women through universal and targeted regular supplementation. Nationwide supplementation is being conducted twice a year, on National Immunization Day and National Micronutrient Day. The National Micronutrient Day, locally termed as *Araw ng Sangkap Pinoy*, started in 1993 and coincides with the World Food Day celebration. It is also the occasion for promoting other PPAN impact programmes through distribution of vegetable seeds and cuttings for home food production, conduct of nutrition counselling, iodized salt testing, distribution of iodized salt and promotion of fortified foods. In contrast, during National Immunization Day vitamin A supplements were given along with immunization activities. Starting in April 1999, other health activities were also integrated into the National Immunization Day and is now called *Garantisadong Pambata* (Preschoolers' Health Week). It included other services such as deworming of 2–5-year-olds to complement iron supplementation, growth monitoring of 0–5-year-old children, distribution of free toothbrushes and promotion of dental care, information on safe and educational toys and promotion of naturally micronutrient-rich foods and fortified foods with the *Sangkap Pinoy Seal* (the governmental seal of acceptance for fortified foods).[14,15] Regular supplementation, in contrast, includes supplementation during consultation and routine activities at health centres, hospitals and school clinics.

In regard to the high prevalence of IDA, a national programme will also be formulated, giving priority to low birthweight infants, 6–24-month-old children and pregnant and lactating women through routine health visits. For IDD, the programme will also continue to target the 7-year-olds and above in endemic areas, and women of child-bearing age.

Food fortification. Recognizing the importance of food fortification as a food-based strategy to address micronutrient deficiency, and to complement the supplementation efforts, food fortification is now a separate impact programme from the micronutrient supplementation programme. The FNRI leads various food fortification research and development efforts such as iron fortification of rice, iodization of salt, and vitamin A fortification of margarine, wheat flour, sugar and cooking oil as well as fortification of several processed foods. The iron fortified rice is ready for commercial production, and the technology in iodinated water is ready for transfer. The food fortification efforts will not be possible without the strong support and partnership with the private sector as exemplified by the *Sangkap Pinoy Seal* Programme (SPSP) and the Project BIDA (*Bayang Mayaman sa Iron*, *Iodine at Bitamina A*).[16] The SPSP is a strategy to encourage food manufacturers to market high-quality fortified food products. The seal is envisioned to be a prestigious sign to be awarded to food manufacturers who are able to meet standards for fortifying their products with Vitamin A, iron or iodine. Project BIDA, in contrast, is a collaboration between Procter and Gamble, the Nutrition Center of the Philippines, Department of Education Culture and Sports, Department of Health, NNC and the local communities to promote PPAN programmes particularly as regards micronutrient deficiencies.

Legislation is a proven effective and long-term measure for addressing micronutrient malnutrition. The passage of the Republic Act RA8172, popularly known as the ASIN law (an Act promoting salt iodination nationwide), is a large leap in the food fortification programme. However, enforcement of the law remains wanting. With the positive result of the study conducted by the Nutrition Centre of the Philippines which determined the stability of iodine in iodized salt sold through the *takal* (retail) system,[16] it is hoped that more iodized salt will be made available in the local markets. Further, the food fortification bill is due for signing into law by the President, and it is also expected to be instrumental in solving micronutrient deficiencies in the country.

The efforts of the National Micronutrient Action Team and Legislative Advocates for Nutrition and Development are contributory to the implementation of micronutrient supplementation and food fortification programmes.

Food Assistance. The Food Assistance Programme is a social safety net for nutritionally vulnerable groups and at-risk families during periods of economic displacement. The programme will be continued to immediately rehabilitate nutritionally at-risk individuals and it includes (i) regular supplementary feeding schemes such as centre-based feeding, for preschoolers, a school feeding programme including a breakfast feeding programme, school milk project and alternative school nutrition programme; (ii) emergency feeding; and (iii) food price discounting.

Nutrition Education. The Nutrition Education Programme aims for the adoption of desirable food and eating practices that ensure nutritional well-being, by increasing the level of awareness and knowledge about nutrition and eventually, its application and practice. It is the promotive strategy of the PPAN and it follows the principle that impact programmes, when coupled with nutrition education, are found to be more effective than nutrition education alone. The integration of nutrition in school curricula through the teacher–child– parent approach, the tapping of the private sector to use nutrition as a selling point, the Child-Growth Project of Helen Keller International, the networks of local communication and media channels (NUTRICOMNET) for nutrition and of libraries and librarians (NUTRINET) led by FNRI and airing of the tri-media approach, among others, were proven to be effective in creating awareness of nutrition.

Among the significant milestones in this field is the Nutritional Guidelines for Filipinos developed by the Technical Working Group – Nutritional Guidelines for Filippinos chaired by FNRI, that promotes adoption of 10 nutrition messages for optimum nutrition.

Philippine Plan of Action for Nutrition enabling mechanisms

Effective implementation of the aforementioned PPAN impact programmes will not be possible without the following enabling mechanisms, which embody clear-cut directions for the implementation of PPAN.

Human resource development. The human resource development (HRD) component of the PPAN involves training of implementors, service providers and managers in programme planning and project management, as well as monitoring and evaluation, to equip them with the necessary skills, knowledge and attitudes for the effective delivery of nutrition services. Each PPAN impact programme will have a HRD component in order to respond to the needs of nutrition service providers, implementors and beneficiaries.

Nutrition advocacy. This component involves convincing and persuading individuals, groups or organizations, particularly those who have resources to share, in efforts for nutrition improvement in the country. It includes legislative advocacy, sectoral advocacy, local level advocacy and resource mobilization through advocacy.

Nutrition research and standards. This aims to respond to research needs to address prevailing and emerging nutritional problems and food insecurity. Nutrition research shall provide scientific bases for continually improving the implementation of the PPAN in terms of policy decisions and programme design. A 5-year nutrition agenda will be developed in the areas of food fortification, functional food standards, standards and requirements formulation, and nutrition intervention modelling and nutritional assessment. Nutrition research and development will be led by the FNRI-DOST as the principal research arm of the government in food and

nutrition, and other government and private research institutions with an interest in nutrition will also be involved.

Resource generation and mobilization. The PPAN recognizes the need to mobilize funds and stimulate action in various sectors at all levels in carrying out programmes for nutrition improvement. To advocate is to let nutrition concerns reach the attention of legislative bodies and LGU and to build strong linkages with private sectors, NGOs and international funding institutions.

Overall planning, coordination, management and surveillance. The National Nutrition Council as mandated, shall be in charge of coordinating and orchestrating implementation of all nutrition activities from the national down to the *barangay* level through the institutionalized interagency nutrition committees.

The adoption of a nine-point NUTRITION agenda summarizes the guiding path of the country's nutrition programme which will still be pursued in the successor MTPPAN: Nationwide salt iodization, Unified efforts and initiatives for micronutrient supplementation and food fortification; Targeted assistance to ensure household food security; Reinforced capacities for policy and plan formulation, advocacy, surveillance, research and its utilization; Integration of nutrition considerations in development policies and programmes; Tri-media approach for effective information and education campaign; Intensified alliance among stakeholders toward increased investments in nutrition; Organization and management of nutrition programmes in poorest areas; Non-wage benefits in labour and industry.

Conclusion

The results of the 1998 national nutrition survey of the FNRI-DOST show that much still needs to be done to fight malnutrition (both undernutrition and overnutrition), in the country. Concerted efforts and the strong commitment of key nutrition stakeholders coupled with responsive and focused long-term nutrition strategies need to be emphasized.

It is hoped that the challenges in nutrition programme implementation will not be an obstruction in bringing the PPAN vision (of nutritional adequacy for all, of people who are well-nourished, healthy, intelligent, and socially and economically productive with a strong sense of dignity) to every Filipino.

References

1. Velandria FV, Duante CA, Mendoza TS, Mendoza SM, del Cruz EO. Prevalence of android obesity among Filipino adults, 20 years and over. Philipp J Nutr 2001: 69–80.
2. Laña RD, Villavieja GM, Cerdeña CM. Comparison of the nutritional status of 0–59-month-old Filipino children using Philippine and international standards. In: Nutrition Facts and Figures 2001. Manila: Food and Nutrition Research Institute Department of Science and Technology, 2001.
3. Villavieja GM, Molano WL, Cerdeña CM, Laña RL, Constatino AS, Tarrayo ER, Concepcion DS, Juguan JA, Sario IS. Fourth National Nutrition Survey: Philippines 1993 Part B. Anthropometric survey. Philipp J Nutr 1997; 44: 36–48.
4. Madriaga JR, Cheong RL, Desnacido JA, Marcos JM, Fuertes RT, Cabrera MIZ, Perlas LA. Prevalence of anemia among Filipinos. Philipp J Nutr 2001: 45–56.
5. Madriaga JR, Cheong RL, Desnacido JA, Marcos JM, Cabrera MIZ, Perlas LA. Prevalence of vitamin A deficiency among specific population groups. Philipp J Nutr 2001: 29–42.
6. International Vitamin A Consultative Group. (IVACG). Biochemical methodology for the assessment of vitamin A status. Washington DC: Nutrition Foundation, 1982.
7. International Vitamin A Consultative Group. (IVACG). Methodologies for monitoring and evaluating vitamin A deficiency intervention programs. Washington DC: Nutrition Foundation, 1989.
8. Kuizon MD, Perlas LA, Madriaga JR, Cheong RL, Desnacido JA, Marcos JM, Fuertes RT, Valdez DH. Fourth National Nutrition Survey: Philippines 1993. Part D. Biochemical nutrition survey. Philipp J Nutr 1997; 44: 71–75.
9. Velandria FV, Magbitang JA, Tanchoco CT, Mendoza TS, Orense CL, Tango JB, Mendoza SM, Duante CA, de la Cruz EO, Abarra LV. Fourth National Nutrition Survey. Philippines 1993. Part C. Clinical nutrition survey. Philipp J Nutr 1997; 44: 60–62.
10. WHO/UNICEF International Council for the Control of Iodine Deficiency Disorders (ICCIDD). Indicators for assessing iodine deficiency disorders and their control through salt iodization. WHO/NUT 946. Geneva: World Health Organization, 1992.
11. Florentino RF. Nutrition situation: Today and tomorrow. Occasional Paper no. 9. Bicutan, Taguig, Metro Manila: Food and Nutrition Research Institute, 1996.
12. Villavieja GM, Cerdeña CM, Molano WL, Laña RD, Boquecosa JP, Raymundo BE, Nones CA, Abaya HSP, Palafox EF, Chavez MC, Burayag G, Pine CR, Recuenco JRD, Saturno DS, Delos Reyes CM. Fourth National Nutrition Survey: Philippines 1993. Part A. Food consumption survey. Philipp J Nutr 1997; 44: 4–21.
13. National Nutrition Council. Medium-Term Philippine Food and Nutrition Plan (Draft) Manila. Manila: National Nutrition Council–Department of Agriculture, 2000.
14. National Nutrition Council. PPAN 1993–1998 accomplishment report. Manila: National Nutrition Council–Department of Agriculture, 1999.
15. dela Cuadra AC. The Philippine micronutrient supplementation programme. Food Nutr Bull 2000; 21: 512–514.
16. Solon FS. Food fortification in the Philippines: Policies, programmes, issues and prospects. Food Nutrition Bull 2000; 21: 515–520.