



USAID Nutrition Landscape Analysis for Jordan

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Background

Jordan is a country in nutrition transition, which is characterized by overweight and obesity with a proportion of the population still suffering undernutrition¹. This undernutrition includes anemia, iron deficiency, and vitamin D deficiency, which in 2010 affected 14%, 17%, and 20% of pre-school age children and 29%, 35%, and 60% of women of childbearing age, respectively². The country has maintained iron supplementation programs for decades and in 1996 introduced fortification of wheat flour with iron and zinc, vitamins A and D, and 6 vitamins of the complex B. Although the impact of these programs has not been formally evaluated, a recent paper suggested that the reduction of anemia (29% in 2010 to 20% in 2017) and iron deficiency (35% in 2010 to 29% in 2017) in women may be attributable to the existence of the wheat flour fortification program³.

Jordan is highly urbanized and access to health services is good. More than 85% of children have received all basic vaccinations since 2009, and more than 95% of women have benefited from antenatal care and child delivery at health facilities since 2000. In 2017, under-five mortality was 19/1000 children, and 90% of those were infant mortality⁴. In spite of these advances, infant and young child feeding (IYCF) practices in Jordan continue to be poor: early initiation of breastfeeding and exclusive breastfeeding (less than 30% since 2002) are not common, and although complementary feeding meets dietary diversity standards, it is often introduced too early or too late. Therefore, it is not surprising that the intense use of breastmilk substitutes has favored the increase in chronic diseases later in life. This coupled with unhealthy dietary practices since childhood, lack of physical exercise, and smoking -including hookah- explain the main causes of mortality in the country: cardiovascular diseases (37%), other non-communicable diseases (20%), cancers (12%), diabetes (6%), and chronic respiratory diseases (3%)⁵.

Within this country context, the Syrian refugee influx has – and continues to – place enormous strain on all of Jordan's public sector social services. With 1.3 million additional refugees in the Kingdom, demand for health services now far outpaces capacity. While the donor community has mobilized significant humanitarian resources to provide health services within the refugee camps, health services to the 80% of Syrians residing outside the camps are primarily provided by the Government of Jordan. Without a comprehensive strategy or sufficiently resilient health systems, Jordan's Ministry of Health (MOH) is struggling to manage and deliver the necessary health services to address dramatic population increase while simultaneously meeting the needs of its own citizens.

¹ Regional strategy on nutrition 2010- 2019/ World Health Organization (EMRO), 2010.

² Jordan Ministry of Health, GAIN, US-CDC, UNICEF. National Micronutrient Survey, Jordan 2010. 2011.

³ Abdo *et al.* The prevalence and determinants of anemia in Jordan. *Eastern Mediterranean Health J* 2018, accessible at: <https://doi.org/10.26719/emhj.18.047>

⁴ Department of Statistics-Jordan government, ICF. Jordan Population and Family Health Survey 2017-18: Key Indicators Report. 2018.

⁵ WHO Non-communicable diseases country profile for Jordan. http://www.who.int/nmh/countries/jor_en.pdf

The USAID/Jordan Population and Family Health (PFH) Office initiated this landscape analysis for the nutrition situation in Jordan to identify nutrition-related gaps, opportunities, and priorities.

Methodology

The TDY team (Laura Itzkowitz and Omar Dary from GH/MCHN/NEH) conducted a desk review of documents provided by USAID/Jordan prior to arrival and continued this desk review with documents collected while in country. The team, in company of professional personnel of USAID-Jordan (Reem Ajlouni and others), met with a wide range of stakeholders, including Dr. Sawsan Majali, Jordanian Senator; the Ministry of Health Non-Communicable Diseases Director, Nutrition Unit, and Maternal and Child Health Directorate; USAID's Health Service Delivery Project (HSD); USAID's Jordan Communication, Advocacy, and Policy project (JCAP); University of Jordan Nutrition Department, and the Family and Community Medicine Department; the National Center for Diabetes, Endocrinology, and Genetics; the UN-agencies WHO, UNICEF, UNHCR, and WFP. They also conducted a field visit to two USAID project sites in Tafila and Aqaba, interviewing both governmental functionaries and personnel of implementing partners.

Overview of key findings

Three overarching adverse nutrition outcomes emerged and were explored more deeply throughout this landscape analysis:

- Overweight/obesity (and associated non-communicable diseases, NCD's)
- Anemia
- Vitamin D deficiency

A number of poor nutrition practices were shown to relate to these nutrition outcomes, particularly the low rates of exclusive breastfeeding and poor complementary feeding practices across Jordan. In addition to poor infant and young child feeding practices that negatively affect child health and wellbeing, a shifting diet toward unhealthy dietary and lifestyle practices negatively impacts the entire population.

These three nutrition problems are described in more detail, along with potential solutions, below.

Overweight/obesity (NCD's)

Defining the problem

Non-communicable diseases (NCDs) are estimated to account for 78% of all deaths in Jordan.

Overweight and obesity are considered to be major risk factors for NCDs, along with other risk factors including tobacco use and physical inactivity. Overweight and obesity in Jordan have been continually increasing since 2000 and are predicted to continue to increase⁶.

Overweight and obesity starts in infancy. Infants who are breastfed exclusively (i.e. not fed any infant formula/breast milk substitutes) are less likely to become obese as adults. The introduction of solid foods too soon or in too large quantities increases an infant's risk of obesity later in life. Although the mother's weight and metabolic status influence an infant's risk of overweight and obesity, exclusive breastfeeding -even from obese mothers- has been shown to reduce this effect.

Exclusive breastfeeding rates in Jordan are very low. Since the DHS calculates exclusive breastfeeding as a weighted average based what all children aged 0-5 months were fed the previous day, the actual rates of children who are exclusively breastfed for the full 6 month recommended period are significantly lower. It is estimated that only 2-3% of Jordanian children are exclusively breastfed for 6 months (**Figure 1**). In addition to providing the appropriate mix of macro and micro nutrients, breastfeeding is important because it supplies protective substances, such as antibodies and probiotics, as well as strengthens the emotional bond between mother and baby while providing love and attention.

A major limitation to promoting breastfeeding in Jordan is insufficient knowledge and appreciation for breastmilk by professionals in the health sector, who frequently recommend the early introduction of milk formulas. Moreover, university nutrition graduates who should have a deep understanding of IYCF and breastfeeding lack formal courses and training in these areas, and in public health nutrition in general. The main focus of their coursework is on treatment of diseases through nutrition and food technology.

⁶ WHO Non-communicable diseases, country profile for Jordan.
http://www.who.int/nmh/countries/jor_en.pdf

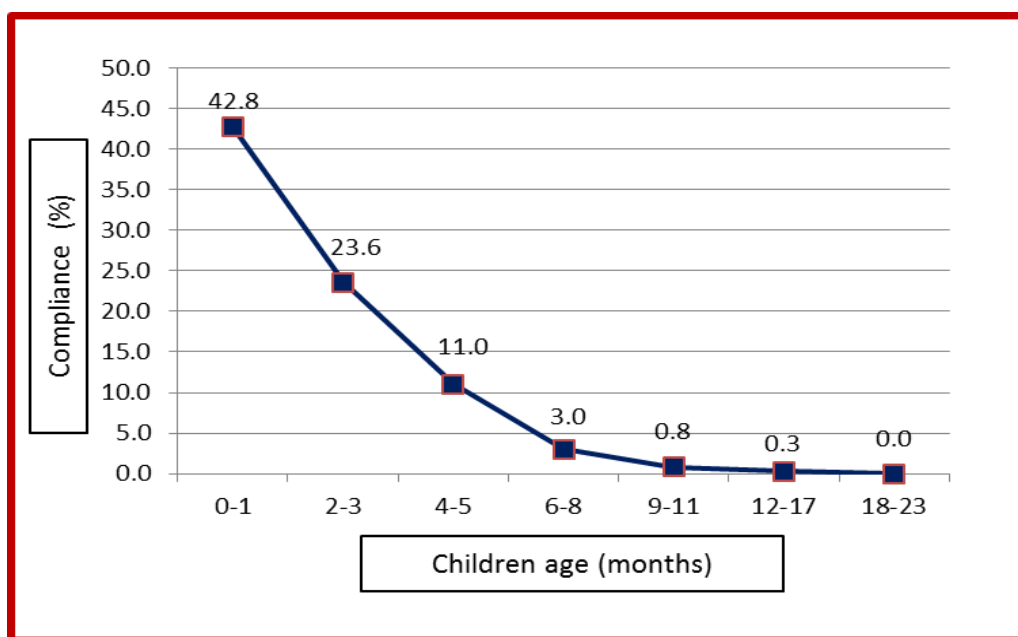


Figure 1: Exclusive breastfeeding by age

In addition to the low exclusive breastfeeding rates, the rates of minimum acceptable diet for children ages 6-23 months are also low as illustrated in **Figure 2** below.

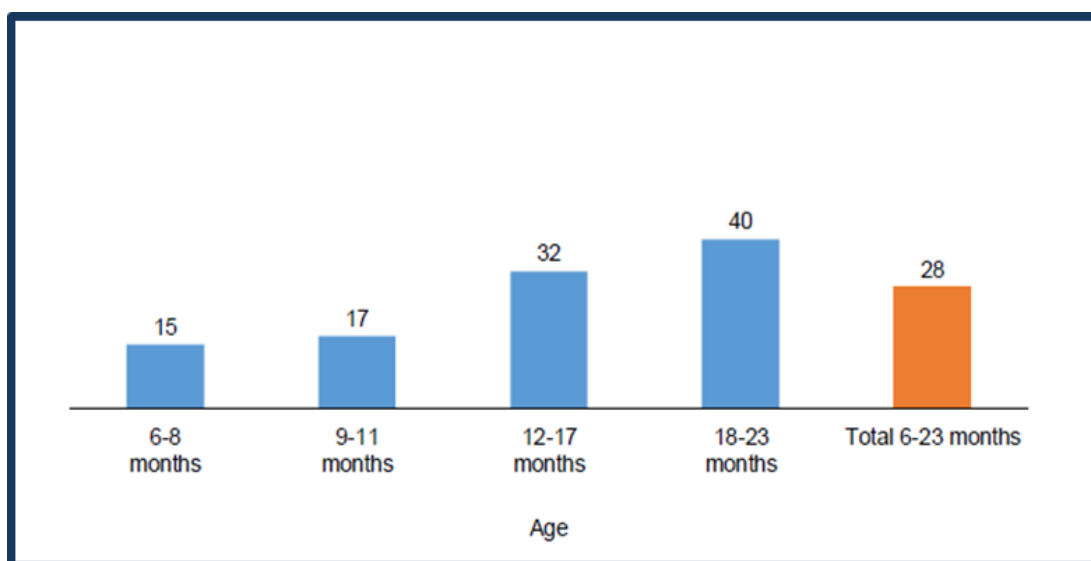


Figure 2: Minimum acceptable diet by age

Recommended solutions

The following behaviors need to be improved to reduce overweight and obesity and improve nutritional outcomes in Jordan:

- Early initiation of breastfeeding
- Exclusive breastfeeding for 6 months
- Appropriate complementary feeding starting at 6 months
- Continued breastfeeding until 2 years or more
- Use of infant formula only when medically necessary
- Healthy family meals

Improving IYCF practices will lead to improved overall nutrition and reduce all forms of malnutrition, benefiting both children and mothers. Exclusive breastfeeding for 6 months is known to protect against both undernutrition and obesity⁷. Exclusive breastfeeding is much easier to achieve when breastfeeding is initiated within the first hour of birth. Currently, complementary feeding in Jordan typically starts earlier than 6 months. Since children start eating family foods around 9-12 months, the family diet as a whole needs to improve for the child to be fed a healthy, diverse diet. Improving family diets for the entire community will also help change social norms and ensure that future children start out life with a healthier diet.

Whenever discussing diet and food preparation, hygiene behaviors are important. Hygiene habits were not explored during this landscape analysis, but they should be included whenever food preparation is discussed. Increasing physical activity is an important aspect to address overweight/obesity and to prevent NCDs in adults, but it is not a priority to improve infant and young child raising practices. That being said, increased physical activity for women is important as it will impact their nutritional and metabolic state when they become pregnant, as well as -if it is practiced outdoors with some skin not covered- reduce vitamin D deficiency.

No single intervention is likely to achieve significant changes in the behaviors listed above. Instead, multiple interventions are needed at all levels of the socio-ecological model (**Figure 3**).

⁷ http://www.who.int/elena/titles/bbc/breastfeeding_childhood_obesity/en/

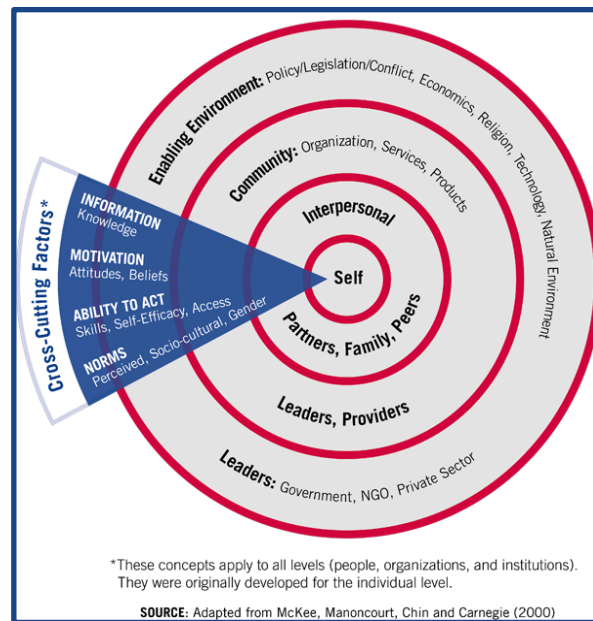


Figure 3: Socio-ecological model

Understanding the key factors that influence each behavior will help define how to best target interventions. No intervention should ever focus on **ONLY** increasing knowledge or raising awareness. When a lack of knowledge or awareness exists, it is never the only factor affecting that behavior; therefore increasing knowledge or raising awareness on its own will not significantly increase the number of people practicing a behavior. A small amount of qualitative research has been conducted on breastfeeding in Jordan to understand the barriers and motivators, but very little recent qualitative research exists on complementary feeding practices or general dietary practices of the Jordanian population. This type of formative research is important to inform future interventions, ensuring that they address all of the priority factors that influence the behavior. Any qualitative research that has been or will be conducted for an individual project or campaign should be published and disseminated broadly throughout the nutrition community in Jordan so that others can also use it to inform their interventions or research.

Individual and interpersonal level interventions

Most health interventions in Jordan are focused around health facilities as they are easily accessible, but there is a need to go beyond facilities into the community to reach people between care seeking occasions. There is a lack of clarity on the best way to reach people outside of facilities as few projects have attempted community work. Most of the recent community work in Jordan has used project staff to conduct the work in communities rather than being fully integrated into community systems. By definition this means that when the project funding ends, all community outreach also ends. To prevent this and ensure sustainability for future community projects, sustainability and integration within existing systems should be considered from the design phase. In addition, it is likely that multiple platforms will be needed to fully reach target communities.

Support groups have been successful at improving IYCF practices in a variety of settings. They are particularly helpful for breastfeeding as they help mothers believe that they are capable of working through problems they encounter. In the US and a number of other developed and developing countries, [La Leche League](#) sponsors free breastfeeding support groups run by volunteer leaders. In developing countries the [Care Group model](#) has been successful at changing IYCF behaviors. Another support group model that has had a lot of success within health system interventions is [Centering](#). Centering is a method of combining ANC and PNC visits with a facilitated peer support group. The key similarity among all successful support group models is that they encourage dialogue between mothers and allow space for them to help each other work through problems they are encountering. Support groups should not be used as a vehicle to deliver messages.

A social franchise is another option to consider for reaching communities, which could include support groups as part of it. This could be done through the public or private sector and would encourage local ownership and sustainability from the start. One successful example of this is [Alive & Thrive's Little Sun clinics](#) attached to health facilities across Vietnam.

Because there is insufficient experience in Jordan reaching communities for health and nutrition, this might be a good opportunity to use human-centered design. Human-centered design is a creative approach to problem solving that focuses on innovating to meet people's needs. It is most commonly used to develop products and services. To encourage ownership of the end result, a variety of different stakeholders should be involved in the design process including the organization that will implement the intervention that's designed, the Ministry of Health, and other stakeholders.

Facility level interventions

Improving exclusive breastfeeding will require support for early initiation of breastfeeding needs. In addition to many health benefits to the mother and baby, early initiation of breastfeeding makes it easier for a mother to start breastfeeding and more likely to continue breastfeeding in the coming weeks and months. In Jordan almost all children are delivered in health facilities, therefore the health worker who assists during the delivery and the hospital environment are equally as important for early initiation of breastfeeding as the mother. If a mother decides to exclusively breastfeed prior to delivery, but after delivery the health worker removes the baby from the room so she can rest and maybe even feeds the baby formula, she will be unable to initiate breastfeeding early nor to exclusively breastfeed.

Anecdotally, it seems that current practice in Jordanian health facilities both supports and encourages formula use, even in hospitals that were previously certified by the baby friendly hospital initiative (BFHI). This implies that providers are not convinced that breastfeeding is what a mother should be doing, nor do they feel a powerful role in supporting mothers to start breastfeeding. Attitudes around breastfeeding and BFHI need to change such that mothers prefer to deliver at BFHI-certified hospitals and providers feel proud to work at a BFHI-certified facility. Full implementation of BFHI needs to include all hospital staff in both public and private facilities on all shifts for both C-sections and vaginal deliveries. It will likely require reorganization of space to allow for rooming in of mothers and babies. It will also require an

overall strengthening of provider support for breastfeeding in general.

Inconsistent information was received on whether or not BFHI-certification is required for accreditation, which it should be. Once a hospital attains BFHI status, there do not seem to be regular inspections or a penalty for not maintaining all BFHI requirements. Thus far BFHI work been at a small scale (5 hospitals) with HSD working in additional hospitals on the 10 Steps to Successful Breastfeeding, the main basis for BFHI.

In addition to improving BFHI and health provider practices around breastfeeding, there is a need to improve the reach of the facility-based nutritionists. They are an underutilized cadre that exists across the Jordanian health system. Currently facility-based nutritionists are focused on overweight adults. These nutritionists are based inside health facilities and typically do not conduct outreach to communities. Their reach could be greatly improved if they began conducting outreach working on community nutrition and mostly aimed to promote healthy dietary and lifestyle practices. They also need additional training on breastfeeding, IYCF, and public health nutrition, as none of these topics are included in their pre-service training.

Enabling environment interventions

In general, policies for nutrition in Jordan are appropriate and abundant, but enforcement is weak. The Code of Marketing for Breast Milk Substitutes has been passed in Jordan but needs to be enforced in public and private facilities. One policy area that does need strengthening is protection for working mothers, which would require coordination with the Social and Development Ministry. Women who return to work need a private space and time to express and store breast milk. Alive & Thrive has [resources](#) on how to set up a workplace lactation program that could be useful for programming in this area.

In addition to policy improvements and implementation of existing policies, nutrition needs to be better integrated within the Jordanian academic structure and become part of the medical curriculum for all types of medical professionals. The Nutrition Department at the University of Jordan sits within the Faculty of Agriculture and focuses on food technology and dietetics. They do not cover breastfeeding or complementary feeding in their nutrition courses. Currently, clinicians, including pediatricians, receive minimal nutrition instruction as part of their pre-service training. There used to be an elective course on nutrition for medical students, but that is no longer offered. The Family and Community Medicine Department includes a couple of lectures on nutrition within their courses for medical students. In these courses breastfeeding is taught in a very clinical way with a focus on the breast anatomy and the physiology of breastfeeding. They do not train medical or nursing students on how to support mothers to breastfeed or how to counsel mothers through breastfeeding problems.

Jordanian nutrition and medical academics need to be motivated to include breastfeeding and young child feeding in their curriculum. Raising the prestige of these topics will help provide motivation. Hosting workshop or conferences on breastfeeding featuring regional and international experts is one way to work toward this. These events could focus on breast milk composition and human physiology while also stressing the importance and lifelong benefits of breastfeeding for both the children and the mothers. In addition, sponsoring or otherwise

encouraging academic research on breastfeeding could also help raise its profile and prestige, while simultaneously growing the evidence on the benefits of breastfeeding to inform programs.

Interventions across levels

A broad-reaching mass communications campaign can help change social norms regarding IYCF and a healthy diet, though these are typically very expensive interventions and should only be done in coordination with other interventions “on the ground”. Because of the good reach of the social media in Jordan, a social media campaign might be as effective with as broad of reach as a mass media campaign for less money. If any form of campaign is conducting, it needs to be very specific with a single behavioral focus. It also needs to be based on research to understand where there is a possibility for movement (i.e. aim for the low hanging fruit first). Training of journalist is also recommended as experience has shown its effectiveness in other countries at improving the way journalists cover nutrition-related topics. This training would help ensure that accurate information is included when nutrition-related stories are published in the media.

There seems to be a need for high-level coordination on campaigns and messages related to nutrition. Currently there is no coordination, but multiple organizations are conducting campaigns, and there is a risk that conflictive messages may be released. Ideally this would be coordinated by the Ministry of Health Awareness and Health Information Directorate in collaboration with the Nutrition Division and/or Maternal and Child Health Division, as needed. JCAP’s campaign and the materials developed are of high quality, but current focus on care seeking for anemia is not only limited but risky; details are provided in the section on anemia.

Additional activities

While slightly outside the scope of IYCF, interventions aimed to increase physical activity opportunities for women of reproductive age would help improve their physical health before and during pregnancy, leading to healthier babies. They also could improve their vitamin D status if conducted outside with some skin not covered. Likewise more attention to care of the children by their own mothers is necessary and would positively impact child development.

A focus on smoking cessation would improve overall health in Jordan and also decrease infant and young children’s exposure to second and third-hand smoke. While not directly linked to nutrition, this has a strong link to child health and respiratory infections. When children have respiratory infections they are less likely to eat healthy food and more likely to be less healthy.

Anemia

Defining the problem

Anemia is identified when blood contains lower concentrations of hemoglobin than the amounts needed for oxygen transport to maintain an active and healthy life. Anemia is a biological indicator that -in theory- is easy to measure, but it is difficult to interpret as it is a syndrome of different human affections. In the case of Jordan, anemia might occur due to genetic traits (thalassemia minor, e.g.), loss of blood (by menstruation of child-age bearing women, or by internal hemorrhages in old males, e.g.), nutritional deficiencies (iron, vitamin B₁₂, folate, vitamin A, and others), or infectious diseases (the body react against iron-avid pathogens reducing

internal mobilization or intestinal absorption). Moreover, more hemoglobin is progressively synthesized in response to lower supply of oxygen because living at high altitudes⁸ or because intensity of smoking.

In Jordan, anemia is considered an important public health problem based on results collected since 2009 by Jordanian Population Family and Health Surveys (JPFHS) (**Table 1**).

Year	2002	2009	2010	2012	2017-18	2017-18
Survey Type	Vit. A (venous blood)	JPFHS (capillary blood)	MNS (venous blood)	JPFHS (capillary blood)	JPFHS (capillary blood)	Anemia survey (venous blood)
Children (6-59 months or *12-59 months)						
Anemia	20.2 %*	34.0 %	16.6 %*	32.0 %	32.0 %	-
Iron def.	26.2 %*		13.7 %*			-
Women (15-49 years)						
Anemia	29.3 %	34.0 %	29.2 %	37.0 %	43.0 %	20.3 %
Iron def.	38.7 %		35.1 %			28.7 %

Table 1. Prevalence of anemia and iron deficiency in Jordan by different surveys.

The JPFHS's have determined total anemia prevalence of around 30% for pre-school age children and above 35% for women. In the survey of 2017-18, moderate and severe anemia prevalence was estimated as 11% and 7% for each one of these groups, respectively. Based on this information and assuming that most anemia is caused by iron deficiency, the country decided to act and selected iron supplementation as the preferred intervention for preventing and treating anemia in young children and pregnant women. As iron supplementation may have unintended negative consequences through favoring growth of pathogenic bacteria, especially in children, the official protocol for anemia management includes targeting only those who are diagnosed as anemic (< 11 g/dL hemoglobin). Clinical determination of anemia is requested for children 12-18 months old and around 5 years old before starting the primary school, and as early as possible during pregnancy. The USAID-projects HSD and JCAP, aware of the

⁸ As the Jordan valley is below the sea level, inhabitants of this region may need lower concentrations of hemoglobin as the oxygen pressure is higher and, erroneously, be identified as "anemic" when they are not.

deleterious impact of iron deficiency in the mental capabilities of infants and young children, decided to extend yearly the clinical diagnosis of anemia to children 2-5 years old. JCAP has also launched a national campaign aimed to create the demand for this service, and it is ready to repeat it in 2019.

However, other national micronutrient surveys⁹ that determined the hemoglobin concentration using venous blood, instead of capillary blood from finger pricking as it is done by the JPFHS's, estimated half the prevalence of anemia (see **Table 1**): 17% for pre-school age children in 2010, and 20% for women in 2017-18. Iron deficiency was calculated at 14% and 29%, respectively. Here it is important to point out that most anemia in children is mostly concentrated in those younger than 24 months of age, and this may be an overestimation because the use of the same cut-off point for the hemoglobin concentration (< 11 g/dL). For the youngest children lower values of hemoglobin concentration to diagnose anemia may be applicable¹⁰. WHO is currently reviewing this subject.

The overestimation of anemia in the DHS's is not unique for Jordan; the same problem has been identified in many other countries (**Table 2**). In all cases, the larger values estimated in the DHS's are attributable to the use of blood obtained through finger pricking instead of venous blood. Nevertheless, in Guatemala "pooled" capillary blood extracted through finger pricking has approximated well the values obtained with venous blood. "Pooled" means several drops of blood and mixed before determining the hemoglobin concentration using a HemoCue.

In summary, prevalence of anemia in Jordan might be much lower than it has been reported in the JPHFS's. Thus it is important to wait for the results of the coming Micronutrient Survey that is going to be carried out with the support of UNICEF and WFP in 2019 to know the actual situation. Meanwhile, it is prudent to maintain the official protocols of anemia management without stressing additional clinical determinations of the hemoglobin concentration in children.

⁹ Jordan Ministry of Health, 2002. Vitamin A and Anemia Survey; Jordan Ministry of Health, GAIN, US-CDC, UNICEF. National Micronutrient Survey, Jordan 2010. 2011; Abdo *et al.* The prevalence and determinants of anemia in Jordan. *Eastern Mediterranean Health J* 2018, accessible at: <https://doi.org/10.26719/emhj.18.047>

¹⁰ Domellöf M, *et al.* The Diagnostic Criteria for Iron Deficiency in Infants Should be Reevaluated. *J Nutr* 2002; **132**:3680-3686.

Country	DHS	MNS*	DHS/ MNS	Reference*
Guatemala-2014 /2015	32 %	12 %	2.7	SESAN-Guatemala, in collaboration with INCAP, and CDC/IMMPaCt
Jordan- 2009/2010	34 %	17 %**	2.0	Jordan MOH, GAIN, CDC, and UNICEF
Bangladesh- 2011/2012	51 %	33 %	1.9	Icddrb, et al. 2013
Ethiopia- 2016	57 %	34 %	1.7	Ethiopia Public Health Institute, 2016
Malawi- 2015/2016	63 %	28 %	2.2	Malawi NSO, Nutr, and HIV/AIDS in collaboration with CDC/IMMPaCt

Sources: DHS's: Country partner plus ICF; MNS collected by SPRING/USAID, 2018.
**** Important:** MNS's of Jordan did not include 6-11 months old children.

Table 2. Prevalence of anemia for 6-59 months old children in several countries through different national surveys

Recommended solutions

Anemia seems to be a mild to moderate public health problem in Jordan, and mostly preventable through the increment of iron supply, either through foods (naturally iron rich or fortified) or the judicious use of iron supplements during pregnancy and for treating moderate and severe anemia in children. Mild anemia in children (10.0 -10.9 g hemoglobin/dL) may not need the provision of iron supplements. In any case, the current official protocols for the clinical diagnosis of anemia (early in pregnancy, and 9-12 months and near to 59 months old children) might be sufficient. Furthermore, clinical determination of the hemoglobin concentration should be done using "pooled" capillary blood or, preferable, venous blood. The latter has the advantage that it permits the identification of iron deficiency as well as the presence of hemoglobinopathies (thalassemia minor, e.g.), and therefore justifying or not the use of iron supplements. Public campaigns for the reduction of anemia should emphasize dietary diversity, including naturally iron-rich and bioavailable sources and the avoidance of mixing with the meals iron-absorption inhibitors (tea, e.g.), as well as hygienic practices to prevent infectious diseases.

Vitamin D deficiency

Defining the problem

A recent consultation on vitamin D¹¹ has recommended the cut-off point of 30 nmoles/L (15 ng/mL) of 25-hydroxy-vitamin D₃ in serum to diagnose deficiency of this vitamin. This serum concentration has been associated to rickets, osteoporosis, and risk and seriousness of respiratory ailments. Here, it is important to point out that the causality between vitamin D deficiency and lack of response to asthma treatment was confirmed by Jordanian researchers¹². The same consultation suggested categorizing a country with high prevalence of vitamin D deficiency if more than 20% of the population is classified as deficient. The Jordanian micronutrient survey of 2010¹³ revealed a serious vitamin D deficiency in adult women, especially urban and highly educated, as well as urban girls (**Table 3**).

Strata	Women	Children
Urban	64.5%	21.4 %
Rural	42.1 %	13.4 %
No education	57.2 %	-
Higher education	63.5 %	-
Female	-	25.9 %
Male	-	14.0 %
Country	60.3 %	19.8 %

Table 3. Prevalence of vitamin D deficiency (< 30 nmol/L; 12 ng/mL) in Jordan in 2010

This epidemiological situation of Jordan is similar to the nearby Palestinian communities of the West Bank and Gaza (**Table 4**), as well as the neighboring countries of Turkey and Iran¹⁴. Deficiency in women and girls but not in men and boys, and in urban populations more than in rural communities, is clearly associated to the avoidance of the skin exposure to sunlight. Although motivation to increase exercise outside is important to minimize overweight and

¹¹ Roth *et al.*, Global prevalence and disease burden of vitamin D deficiency: a roadmap for action in low- and middle-income countries. *Ann. N.Y. Acad. Sci.* 2018; 1430: 44–79. Accessible at: <https://nyaspubs.onlinelibrary.wiley.com/doi/epdf/10.1111/nyas.13968>

¹² Samrah *et al.* Vitamin D deficiency and level of asthma control in women from North of Jordan: A case-control study. *J Asthma* 2014; **51**:832-838.

¹³ Jordan Ministry of Health, GAIN, US-CDC, UNICEF. National Micronutrient Survey, Jordan 2010. 2011.

¹⁴ Roth *et al.*, 2018. See reference above.

obesity, and the associated non-communicable diseases, it is going to be insufficient to correct vitamin D deficiency in these population groups.

Strata	Women	Men
Children	7.0 %	5.3 %
Adolescents	31.9 %	0.6 %
Pregnant	70.0 %	-
Lactating	30.0 %	-

Table 4. Prevalence of vitamin D deficiency (< 25 nmoles/L; 10 ng/mL) in Palestinian Communities in 2013.

Note: The 25(OH)Vit.D cut-off point was lower than the recommended of 30 nmoles/L; therefore the prevalence rates are higher than those presented in the table.

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High coverage interventions are needed to prevent and correct the deficiency of vitamin D in women of Jordan. The National Center for Diabetes, Endocrinology and Genetics is recommended use of vitamin D supplements (50,000 IU; 1,250 ug vitamin) twice a months. However, reaching a large number of women with supplements is very difficult, and therefore food fortification may work better. Indeed, it was because the finding of the 2010 survey that vitamin D deficiency was a public health problem that this vitamin was incorporated into the fortification formulation of wheat flour. However, at that moment, the Estimated Average Requirement (EAR) of vitamin D was half of the current one (10 micrograms/day for adults), and the program was designed to supply 44% of the EAR. Consequently, the actual formulation is only providing 22% of the vitamin D EAR and this is clearly insufficient to correct this deficiency. Therefore, a higher content of vitamin D in wheat flour is necessary.

Recommended solutions

Jordan should increase the content of vitamin D in fortified wheat flour. However, as doubts about the effectiveness of this measure may exist among the Jordanian public health researchers and the increment in the cost of the fortification program (mostly supported by the government: about \$1.7 million/year) is going to be around 25% higher, a pilot trial is recommended. Once positive results of this measure are demonstrated, the country and the government might be in a more favorable position to adopt this change. **Table 5** summarizes the characteristics of the current and the proposed fortification formulation of wheat flour.

The coming Jordan micronutrient survey sponsored by WHO and WFP may provide additional information about the current performance of the wheat flour fortification program, as well as influence that it has had on the nutritional situation of vitamin D, vitamin A, iron, folate, and

¹⁵ Elmadfa I, *et al.*, Palestinian Micronutrient Survey (PMS) 2013. Ministry of Health (Palestinian Authority), United Nations Children's Fund (UNICEF), University of Vienna. 2014.

vitamin B₁₂. In any case, strengthening of the enforcement of this program at factories and retail stores is needed to ensure its effectiveness, as only checking for supply of the premix -as it is done now- is insufficient.

Current		Proposal	
Nutrient (Content)	Contribution for women (%EAR)	Nutrient (Content)	Contribution for women (%EAR)
Vit. D (0.014 ppm)	22%	Vit. D (0.070 ppm)	109%
Vit. A (1.5 ppm)	65%	Vit. A (1.5 ppm)	65%
Folic acid (1.5 ppm)	131%	Folic acid (1.5 ppm)	131%
Vit.B1, B2, B6 (3.0-3.6 ppm)	43-67%	Vit.B1, B2, B6 (3.0-3.6 ppm)	43-67%
Niacin (35 ppm)	65%	Niacin (35 ppm)	65%
Vit. B12 (0.008 ppm)	68%	Vit. B12 (0.008 ppm)	68%
Iron (34 ppm)	26%	Iron (34 ppm)	26%
Zinc (20 ppm)	49%	Zinc (20 ppm)	49%
Premix amount	250 g/MT	Premix amount	300 g/MT
Approx. cost	\$8.00/MT	Approx. cost	\$10.00/MT
Cost per person	\$0.58/year	Cost per person	\$0.72/year

Based on calculation using: Dary and Hainsworth, 2006. Food Fortification Formulator.

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Table 5. Characteristics of current and recommended fortification formulation of wheat flour for Jordan

¹⁶ Dary and Hainsworth, 2008. The Food Fortification Formulator: Technical Determination of Fortification Levels and Standards for Mass Fortification. Accessible at: <http://a2zproject.org/~a2zorg/pdf/Food-Fortification-Formulator.pdf>

Summary of recommendations

Overarching

- Need changes at the academic curricula at all levels
 - Nutrition must be part of all medicine and related careers curricula
 - Need coursework and research in public health nutrition
 - Design and promote online courses in IYCF
 - Support breastfeeding promotion project initiated by Dr. Eman Badran of Community Health at the University of Jordan
- Need better coordination for nutrition and IYCF nationally
 - Coordination focused primarily on refugees thus far
- Need better coordination for SBC (messaging, materials, and campaigns)
 - Consider providing capacity building or another form of motivation to MoH Awareness and Health Information Directorate so that they provide coordination on SBC in nutrition and other areas

Nutrition and health promotion at the community level

- Within HSD, allow for Community Health Committees to share experiences and learn from each other several times per year
- Focus on support to break down barriers and increase motivation for priority behaviors rather than raising awareness
 - Always have an “ask”
- Consider using human-centered design to design an innovative and appropriate way to reach communities in Jordan

Preventing overweight and obesity through appropriate IYCF practices

- Need to work with MCH Department of MoH for policies and programs related to infant and young child feeding
- Focus on gaining support for breastfeeding from all members of the family
- Ensure that all hospitals (public and private) are certified as Baby Friendly and required to maintain this certification to be accredited
- Improve scientific and programmatic attention to breast milk and breastfeeding in the medical professions and professional societies
- Initiate efforts to make breastfeeding possible in workplaces
- JCAP should publish and share their qualitative research on breastfeeding and anemia so that it can be used beyond the current project
- Discourage consumption and advertising of unhealthy commercial foods for children; exchange of experiences with Latin America, especially Chile, may trigger useful interventions
- Further qualitative research is needed on complementary feeding and family diets

Holistic approach to healthy families

- Consider how the family's diet and habits impact pregnant women and children
 - Strengthen good dietary practices for entire family
 - Promote and facilitate physical exercise
 - Reduce smoking, including reduction of second-hand smoke
- Interventions are needed at all levels of society - individual, community, health facility, academia/research centers, and government/policy - to bring long-lasting healthy habits.

Anemia

- Discontinue anemia mass media campaigns as the approach is based on clinical assessment of anemia rather than preventive measures
 - It's okay to continue the outreach portion of the campaign with small adjustments
- Discourage determination of hemoglobin concentration using finger pricking and wicking especially for children. If HemoCues are used, ensure that the sample is either "pooled" capillary blood or, preferable, venous blood.
- Wait for results of the incoming micronutrient survey sponsored by UNICEF and WFP to have a clear idea of the anemia prevalence in children. Based on recent publication by Jordanian researchers, anemia prevalence is moderate in women and low in males.
- Public campaigns for the reduction of anemia should emphasize dietary diversity, and the avoidance of mixing with the meals iron-absorption inhibitors (tea, e.g.), as well as hygienic practices to prevent infectious diseases.

Vitamin D and other deficiencies

- Wait for results of the incoming UNICEF/WFP sponsored nutritional survey to characterize the current prevalence of vitamin D and other micronutrient deficiencies, as well as know the current performance of the wheat flour fortification program.
- Motivate MoH to introduce inspection of fortified wheat flour at factory and retail levels as only depending on the purchasing of the micronutrient premix is insufficient.
- Extend the use of Household Income and Expenditure Surveys from estimations in per capita intakes -as currently done by the Dept. of Nutrition and Dietetics of the Jordanian University- to adult male equivalent intakes and density of nutrients per energy supply.

Research recommendations

- Further qualitative research is needed to better understand complementary feeding practices and the key drivers influencing food choices for family diets to define small, doable actions that can be targeted to improve under the community health and nutrition project
- Promote anemia-related research studies in local institutions:
 - anemia etiology;
 - determination of hemoglobin concentrations in healthy 6-24 months old children;
 - appropriate interpretation in combination with other hematological and indicators of infection/inflammation (acute-phase proteins);

- influence of thalassemia minor, and “normal” hemoglobin concentrations in the presence of this genetic trait; and
 - the hemoglobin concentration in healthy populations living below the sea level (i.e. the Jordanian valley).
- Propose a pilot study to determine biological impact of increasing vitamin D content of fortified wheat flour from 0.014 ppm to 0.070 ppm (as collaboration among the Dept. of Nutrition MoH, the Dept. of Nutrition of the University of Jordan, and the Center for Diabetes, Endocrinology and Genetics)