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The contribution of school milk programmes to the nutrition of children worldwide

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The contribution of school milk programmes to the nutrition of children worldwide – Edition 2020

ABSTRACT

School milk programmes (SMP) are common in many countries around the world, for good reason. The benefits of providing school children with milk are plentiful. Dairy's well-known natural nutrient-richness provides an abundant supply of high-quality protein, calcium, phosphorus, potassium, iodine, and vitamins B2 and B12.

Analysis also shows that a quality education, combined with a guaranteed package of health and nutrition interventions at school, such as school feeding, can contribute to child and adolescent development and build human capital.

Following on from its previous research into SMP, The International Dairy Federation (IDF) has developed a new report which compiles data from global experts in the field on different programmes around the world. The report provides insights on the range of products, implementation and population, accompanied by raw data. The new edition also includes a review on the evidence of the nutritional benefits of these programmes, offering new insights into the global impact of SMP.

Keywords: School milk programmes, dairy, children, nutrition, consumption, eating habits, global

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Foreword

Caroline Emond
IDF Director General

Enjoying school milk is a memory many of us share, and the prevalence and longstanding history of school milk programmes around the world makes it a social reference that crosses countless borders and generations.

Our data shows that at least 160 million children around the world currently receive and benefit from receiving milk at schools, and evidence showing the multiple benefits generated through school feeding programmes is growing. It is vital that intergovernmental organisations (IGOs) and governments continue to recognise the importance of school milk programmes in promoting good health in our children. Research has demonstrated that the school environment can have a major impact on attitudes to food, with school milk programmes helping to address nutritional status of a vulnerable population and encouraging healthy eating habits. Analysis shows that a quality education, combined with a guaranteed package of health and nutrition interventions at school, such as school feeding, can contribute to child and adolescent development.

Since 1993, IDF has undertaken to provide an overview of the experience of developing, implanting and improving school milk programmes. Surveys conducted by IDF provided the foundation for the FAO survey conducted in 1998, published in IDF bulletin 341/1999. In 2013, the FAO and IDF again worked collaboratively to gain insights into milk programmes in operation, in the largest global review ever conducted. The new data was compared to the 1998 results, enabling a unique insight invaluable to those involved in running programmes and those within the dairy sector supplying the milk, and the results were published in the 2015 IDF bulletin 480/2015.

IDF's updated bulletin on school milk provides further recognition for the importance of school milk programmes and their positive contribution to children's health and nutrition. IDF with its vast network and knowledge on the topic is a key element in bringing all this information together, compiling data from global experts in the field on different programmes around the world. The 2020 report provides insights on the range of products, implementation and population, accompanied by raw data. In addition, the new edition also includes a review on the evidence of the nutritional benefits of these programmes, offering new insights into the global impact of school milk programmes and the opportunity to learn and share from past results.

Section One of the bulletin provides an assessment of school milk programmes currently in operation. Section Two details scientific data supporting their contribution to nutrition. We hope that this new research provides a useful guide to those seeking to implement or improve school milk programmes in their own region.

Caroline Emond
Director General
International Dairy Federation
March 2020

Introduction

Introduction

Improving child nutrition is imperative for sustainable development (United Nations System Standing Committee on Nutrition, 2017). Current research recognizes the critical importance of health and nutrition during the first 1000 days of a child's life and emphasizes that the time up to young adulthood offers a continuous opportunity for productive intervention in development (Bundy et al., 2017). Poor diets and malnutrition have devastating effects on children's health, their school performance and the ability to learn (Victora et al., 2008). However, with about one in five children (approximately 400 million in total) receiving a meal at school every day (Bundy et al., 2018), school feeding programmes represent a valuable opportunity to positively affect child and adolescent development through increasing the access to education, improving nutrition and health, and stimulating local economies. Together these translate into human capital growth and sustainable development (Food and Agriculture Organization (FAO) et al., 2019).

The provision of milk as part of a formal feeding scheme in schools has a long history, with accounts of organised school milk programmes dating back to the 1920s in the UK and the 1940s in the US. These programmes were initially established as a social safety net to improve the nutritional status of vulnerable and food-insecure children (Atkins, 2007; Gunderson, 2019). Over the years, SMPs have been introduced in many countries across the world, with many of these programmes running for decades (European Commission, 2019; Ishida, 2018; Land O'Lakes, 2014).

Support for these programmes stems from recognizing milk and milk products as a nutritionally advantageous food for children owing to the unique nutrient profile of dairy (FAO, 2013). Milk and dairy products provide an abundant supply of high-quality protein and micronutrients such as calcium, phosphorus, potassium, iodine and vitamins A, B2, B12 and D. The unique package of essential nutrients in dairy products contributes to addressing all forms of malnutrition, and regular intake of milk and dairy products has been widely shown to be associated with better growth, micronutrient status, cognitive performance and motor function development in children (Caroli et al., 2011; Dror & Allen, 2014; FAO, 2013).

THE PROVISION OF MILK AS PART OF A FORMAL FEEDING SCHEME IN SCHOOLS HAS A LONG HISTORY, WITH ACCOUNTS OF ORGANISED SCHOOL MILK PROGRAMMES DATING BACK TO THE 1920s IN THE UK AND THE 1940s IN THE US

The versatility of milk and dairy products allows for varied use and incorporation into various dietary patterns and across different cultures. Offering milk at school as part of an organized programme can therefore improve the nutritional status of millions of children across the globe. The value of milk in childhood nutrition and development is well recognized, illustrated by countries around the world celebrating World School Milk Day on the last Wednesday of September every year. Introduced by the FAO in 2000, the event focuses on school milk programmes and their value in promoting the nutritional benefits of milk among school-aged children.

However, despite the value of these programmes being understood at a practical level, there has been limited formal assessment of the operational aspects and actual efficacy of such programmes. The IDF has therefore conducted two surveys (in 2013 and again in 2019) as follow-up to FAO's initial (1998) assessment, to better understand the drivers of and barriers to effective provision of milk in schools. The 2019 assessment involved two parts:

i. an extensive questionnaire-based survey among programme organizers across the world, conducted in partnership with Tetra Laval, and
ii. a comprehensive literature review to create a solid theoretical framework for understanding the nutritional impact of school milk programmes

The survey provided data on implementation of school milk programmes and several operational

aspects of these programmes, including waste management and nutritional value. We further expanded our target focus to also include general school feeding programmes in which milk is offered, rather than focusing exclusively on school milk programmes, so as to form a comprehensive understanding of milk in schools. In this bulletin, we present the findings of the assessment, which we believe will give valuable insight both to those already involved in programmes and to those planning to establish such programmes.

There is growing recognition of the need for evidence-based nutritional guidelines for school feeding programmes, which focus on promoting intake of recommended food groups and overall healthy eating patterns among students. The potential reach and nutritional impact of providing milk in schools is considerable given the extent of programmes already in place. Although seminal research on the nutritional impact of early school milk programmes exists, only a limited number of peer-reviewed studies have investigated the nutritional impact since. We therefore conducted a literature review to identify the current evidence regarding the nutritional impact of milk being provided in schools through a structured programme.

Section 1

Assessment of milk and milk products in schools

Key results from the survey

Healthy nutrition is a critical component of optimal childhood development. Improving children's nutritional status positively affects not only their health but also their ability to learn and perform at school, thereby contributing to the sustainable development of future generations. With approximately 400 million children receiving a meal through a school feeding programme every day, these programmes present a valuable opportunity to make a meaningful contribution to children's health and nutrition.

Milk is recognized as a good source of high-quality protein, minerals such as calcium, potassium, magnesium and iodine, and vitamins A, B2 and B12 – all nutrients that support growth and development yet are lacking in many children's diets. Owing to its unique nutrient profile, milk is a core food in many school feeding programmes – to such an extent that dedicated school milk programmes exist in many countries.

Programmes span a diverse socioeconomic range, with the nutrition and health benefits of including milk and milk products in school meals recognized by industrialized and developing countries alike. However, despite the value SMPs being understood at a practical level, there has been limited formal assessment of the operational aspects and actual efficacy of these programmes. Following the initial assessment by the Food and Agriculture Organization in 1998, the IDF has therefore conducted two subsequent assessments to date, to better understand the drivers of and barriers to effective provision of milk in schools.

SCHOOL MILK PROGRAMMES SPAN A DIVERSE SOCIOECONOMIC RANGE, WITH THE NUTRITION AND HEALTH BENEFITS OF INCLUDING MILK AND MILK PRODUCTS IN SCHOOL MEALS RECOGNIZED BY INDUSTRIALIZED AND DEVELOPING COUNTRIES ALIKE

The 2019 assessment reported on in this bulletin included a comprehensive literature review to create a solid theoretical framework for understanding the nutritional impact of SMPs, together with an extensive questionnaire-based survey among SMP participants across the world. The questionnaire consisted of two parts to collect data on the overall scope and nature of the different programmes as well as insights into operational aspects. The assessment expanded its target focus to also include general school feeding programmes in which milk is offered, rather than focusing exclusively on SMPs, so as to form a comprehensive understanding of milk in schools.

A total of 62 questionnaires were considered for the survey, representing 55 countries. For the purpose of estimating the total number of countries implementing SMPs worldwide and the number of children benefitting from these programmes, additional data was collected with the help of Tetra Laval. The analysis showed that 160 million children across 62 countries benefit from SMPs. The participation rates vary across countries, but a participation rate of over 70% was found in at least 23 countries.

Through the SMPs or feeding programmes, the majority of children receive a glass-size serving of milk more than twice a week, many daily. Plain whole or semi-skimmed milk was reported to be the most commonly available product, although yogurt, flavoured milk and lactose-reduced milk were also offered. This shows that administrators of SMPs take current consumer demands into account to offer a product profile that allows as many children as possible to benefit from the health and nutrition benefits of milk and dairy products. Health and nutrition benefits of milk are subsequently also the main focus of marketing messages used to promote milk in schools. This aligns well with the majority of respondents' reporting that improving children's health and nutrition is the primary objective of the programme in their country or region.

Although milk is provided at a subsidized cost in the majority of programmes, many respondents noted cost and delivery or supply chain problems as barriers to effective implementation. Formal statistics or studies on the programmes and


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their outcomes were rarely available, which suggests that better evaluation and monitoring mechanisms are needed to ensure that programmes run effectively. In addition, the analysis showed that many of the programmes are run as collaborative projects. Although a government department or local representative body often takes the lead, they are well supported by the dairy sector (farmers, processors or distributors). This points to SMPs being an opportunity for multidisciplinary collaboration between public and private stakeholders to impact children's lives in a meaningful way.

The insights gained from this assessment can contribute to scaling successful aspects of SMPs, which is an essential component of systems change. By showing how markets can be connected with local farmers, the examples of well-designed, sustainable SMPs in this study present an opportunity to help move other programmes forward, thereby continuing to provide vulnerable populations with nutritional value and so helping to reach the goal of supporting sustainable, healthy and thriving future generations.

Data collection and analysis

This survey followed on from two previous ones (in 1998 and 2013, respectively). The questionnaire consisted mostly of newly developed questions, although some questions from the previous surveys were retained. Direct quantitative comparison between earlier and current data was therefore not possible, although some comparable aspects are discussed qualitatively. The questionnaire was organized into two sections: one dealing with the overall scope and nature of SMPs and the second focused on the operational and nutritional aspects of an SMP (see Notes I).

The questionnaires were distributed through organizations worldwide, including IDF members and Tetra Laval representatives. Not all respondents were able to complete their questionnaires in full, either because no official programmes had been implemented in their country or region or because of the required data not being available. SMPs recorded in the survey do not necessarily represent all the programmes in a country or region, and should be considered examples of the types of programme implemented.

A total of 62 questionnaires were considered, representing 55 countries. Multiple questionnaires were received from some country representatives within the dairy sector, in which case those identified as most relevant and complete were included in the final analysis. Questions for which no responses were given (that is, questions left blank) were excluded from the analysis. For some questions, respondents could indicate more than one response and in those cases the total proportion of responses may be greater than 100%. Responses that were incoherent or given in an incorrect format were excluded from the analysis, as were those in which the question required only a single answer but more than one response were given. Open-ended questions were recoded to find common themes. The subsections on logistics, economics, nutritional aspects and marketing were optional and therefore not all questions were answered by all respondents.

For the purpose of estimating the total number of countries implementing SMPs worldwide and the number of children benefitting from these programmes, additional data were collected with the help of Tetra Laval.

A TOTAL OF 62 QUESTIONNAIRES WERE CONSIDERED, REPRESENTING 55 COUNTRIES. MULTIPLE QUESTIONNAIRES WERE RECEIVED FROM SOME COUNTRY REPRESENTATIVES WITHIN THE DAIRY SECTOR

Results and discussion

The following results are presented and discussed as per the respective questions in the SMP questionnaire.

Part 1: Overall scope and nature of milk in schools

Approximately 85% of respondents (n = 54/62; 87%) indicated that some form of programme for providing milk in schools exists in their country or region. Of these, milk was indicated to be provided as part of a school feeding programme by 22 respondents, whereas 29 respondents indicated that a dedicated SMP fulfilled this function. A school feeding programme was indicated to exist by 39 respondents (72%), irrespective of whether milk was part of the programme or not.

Information about recommended intakes specified by a programme could be given per day (Table 1a) or per week (Table 1b). Responses were recoded to provide intakes in millilitre amounts. The majority of the respondents noted that a serving of milk was recommended every day. In over two thirds of the programmes (71%) the serving size was stated as 200–299 ml, with a portion of 50–199 ml being recommended in 11% of the programmes. Among respondents who expressed the intakes in weekly amounts, 50% indicated that milk is recommended three times per week. The results show that although a number of programmes recommend milk daily, there are also some programmes that provide milk less often. This may be related to funding or logistical aspects, which are discussed later.

Table 1a: Recommended daily serving sizes specified by programme (N = 35)

Daily serving size	Number of respondents, n (%)
50–199 ml	4 (11%)
200–299 ml	25 (71%)
300–499 ml	2 (6%)
>500 ml	4 (11%)

Table 1b: Recommended milk intake per week (N = 12)

Country	Amount per week (ml)	Times per week
Croatia, Republic of	200	3
Cyprus, Nicosia	250	3
Czech Republic	250	No data provided
India, Gujarat	1000	No data provided
Iraq	No data provided	4
Kenya, Burundi	250	3
Lithuania	No data provided	3
Mexico	1250	No data provided
Myanmar	180	3
South Africa	200	1
Switzerland	4200	No data provided
Turkey	200	3

Availability of specific dairy products in schools

The types of dairy product available through feeding programmes at schools and SMPs vary. Plain whole milk was the most commonly available product. Plain semi-skimmed milk also ranked high. This reflects guidelines from the World Health Organization (WHO) and other international authorities, which recommend whole milk for children under 5 years and semi-skimmed milk for children older than 5 years.

Yogurt was reported to be available by 87% of the respondents who answered this question. Lactose-free milk was reported to be available by 15 of 19 respondents. Country-specific forms of acidified or fermented dairy were mentioned by some respondents in an open-ended question. The availability of fermented or lactose-free dairy products means that children who are lactose intolerant do not have to be excluded from the programme and can therefore still benefit from the nutritional value of milk.

Flavour additives and buttermilk were mentioned by less than 30% of respondents. The full results are given in Table 2, with Figure 1 showing overall product availability ranked from least to most commonly available.

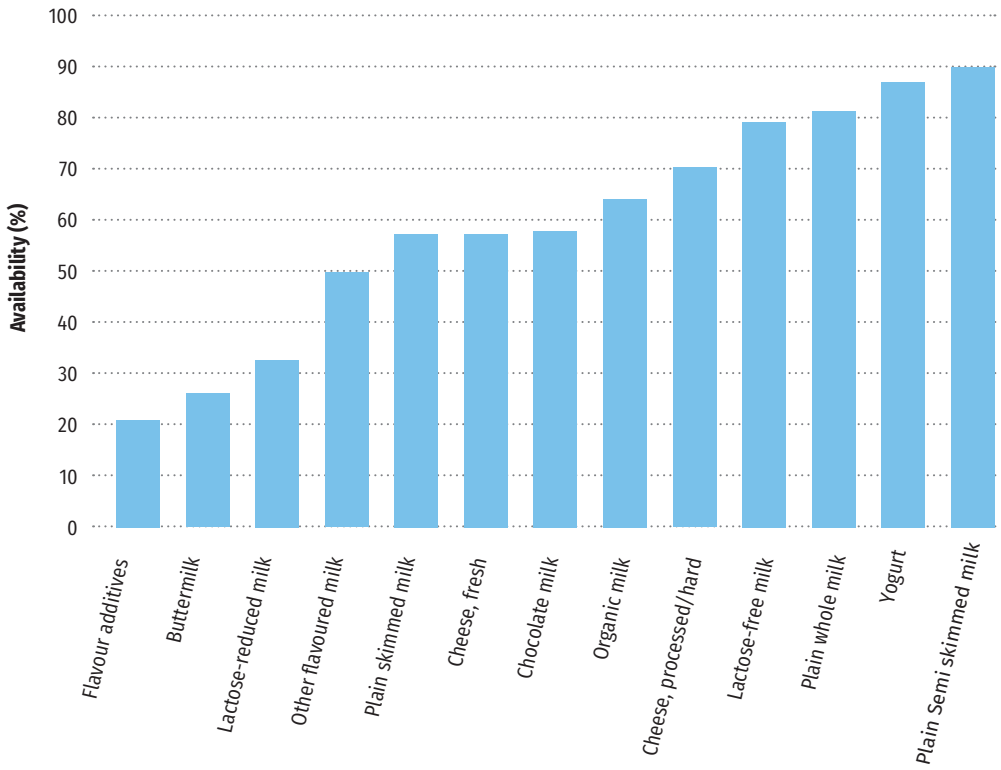
Respondents were also asked to specify whether the products were available in long-life or chilled form, or both. Plain whole milk was available mostly in long-life form, whereas the other products were mostly available in chilled form (Table 2).

Table 2: Dairy products available in schools, across 46 countries

Group	Product	Availability	Long-life	Chilled	Both long-life and chilled
		n/N (%)	n/N (%)	n/N (%)	n/N (%)
Milk	Plain whole milk	30/37 (81)	13/26 (50)	6/26 (23)	7/26 (27)
	Plain semi-skimmed milk	26/29 (90)	6/18 (33)	7/17 (41)	5/17 (29)
	Plain skimmed milk	11/20 (55)	1/9 (11)	5/10 (50)	3/10 (30)
Miscellaneous	Buttermilk	5/19 (26)	1/3 (33)	2/3 (67)	0/0 (0)
	Chocolate milk	14/23 (60)	3/10 (30)	2/10 (20)	5/10 (50)
	Other flavoured milk	12/23 (52)	3/10 (30)	6/10 (60)	1/10 (10)
	Flavour additives	4/19 (21)	2/2 (100)	0/2 (0)	0/2 (0)
	Lactose-reduced milk	6/18 (33)	1/4 (25)	1/4 (25)	2/4 (50)
	Lactose-free milk	15/19 (79)	2/9 (22)	5/9 (56)	2/9 (22)
	Organic milk	14/22 (64)	2/7 (29)	4/7 (57)	1/7 (14)
Yogurt	Yogurt	26/30 (87)	3/17 (18)	14/17 (82)	0/18 (0)
Cheese	Cheese, fresh	12/21 (57)	2/7 (29)	5/7 (71)	0/7 (0)
	Cheese, processed/hard	15/22 (68)	2/9 (22)	7/9 (77)	0/10 (0)

N = total number of responses per product

Figure 1: showing overall product availability ranked from least to most commonly available (without considering the weight of the responses)



Close to three-quarters of respondents (34/48; 71%) indicated that their country or region partakes in milk promotion on an ad hoc basis, typically through events such as World Milk Day and World School Milk Day. Other examples of ad hoc initiatives included:

- proactive marketing events to teach children about the importance of milk and other dairy foods in their diet
- awareness campaigns focused on healthy bones and physical activity
- visits to dairy farms
- opportunities to learn about animal husbandry and the origin of dairy foods
- promotional newsletters, seminars and social media campaigns.

Marketing and promotional activities are discussed further later in the report.

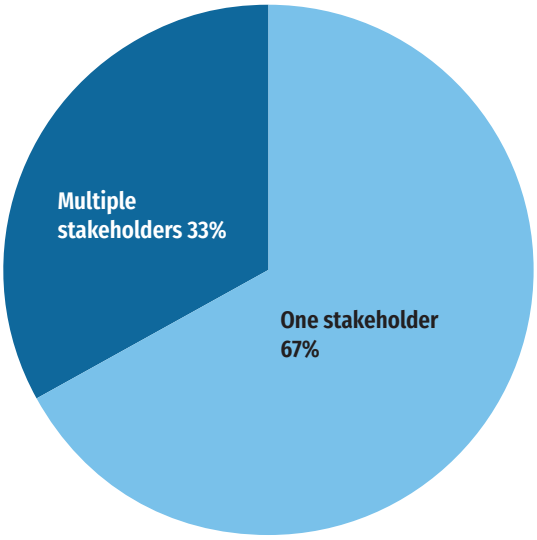
Management of the programmes

School feeding programmes have a positive influence on children's food choices and can be funded and supported in several ways. For most of the programmes (67%), one stakeholder was


Smilky

reported to be responsible for implementation (Figure 2). In programmes with multiple stakeholders, implementation was reported to be handled jointly by distributors and dairies (as in the Czech Republic), by a collaboration between schools, dairy organizations and processors (such as in Alberta, Canada), or a bigger group, such as schools, local governments, dairies, distributors and a national dairy council (for example, in France). In Switzerland specifically, implementation is handled by a collaboration between the Swiss Association of Country Women and Female Farmers and the national producers' organization.

Figure 2: Stakeholder involvement in implementation or management of programmes



For programmes in which only one entity was responsible for implementation or management, local governments and communities appeared to be the most commonly involved (35%), followed by schools (28%), national dairy councils (9%), dairies (6%) and distributors (3%). The category "Others" includes bigger organizations, such as national governments or the World Food Program.

Government involvement in SMPs referred to the department or ministry of agriculture in half the reported programmes (50%), followed by the ministries of education (31%), regional government (19%), and local municipalities or ministries of health (14% each). In some countries, multiple government departments are involved in the management of the programmes. In the UK, for example, the programme is handled jointly by the ministries of agriculture and health. In Cyprus and Croatia, the programmes are managed by the ministries of agriculture, education and health. Management by three government entities was reported also to be active in Gujarat, India, with the departments for tribal development, education, and women and child development all participating in the management of the programme.

Implementation of the Dutch programme is handled by a public–private partnership. The government department responsible for nature and food quality provides the subsidy and the largest dairy company in the country manages the distribution. In some countries, such as in Norway, Myanmar and New Zealand, the programmes are managed entirely by dairy companies, without any government involvement.

The majority of respondents (67%) indicated that the programmes are put in place to reach a broad target group. Additional measures are in place in several countries to reach disadvantaged socioeconomic groups, such as the programmes in Belgium, which offers increased serving frequencies, in Korea, which offers milk for free, and in South Africa, where specific schools are targeted. Almost all the programmes reported to target primary schools (children aged between 5 and 11 years), although pre-primary (under fives) and secondary schools (children older than 12) are also included by almost half of the programmes (45% and 47%, respectively).

Programme objectives and coverage of school milk programmes worldwide

According to questionnaires from 37 countries, and additional data from another 25 countries (sourced from Tetra Laval, EU statistics and public websites) the total number of children benefitting from school milk worldwide are around 160 million.

The actual participation rate ranged from less than 1% to 100%. Countries with a 100% participation rate include Bolivia, Botswana, Colombia, Finland, Ireland, the Netherlands, Norway, Paraguay and UK. Although Turkey shows a 100% participation rate, this is only for a certain period in the year. A participation rate of 70% or higher was reported for 23 countries such as Bulgaria, Croatia, the Czech Republic, Estonia, Poland, Latvia, Lithuania, Hungary and Chile to name a few.

Table 3: Participation rate, according to submitted questionnaires, Tetra Laval data, EU statistics and public websites

Country	Number of children benefitting from school milk	Estimated percentageb of total number of school going children in the target group
1 Argentina[e]	206 000	No information available
2 Austria[d]	346 610	26
3 Belgium[d]	138 480	11
4 Bolivia[c]	10 250	100
5 Botswana[c]	368 293	100
6 Brazil[f]	No information available	No information available
7 Bulgaria[d]	470 885	95
8 Burundi[c]	37 000	10
9 Canada, Alberta[c]	No information available	No information available
10 Canada, British Columbia[c]	No information available	No information available
11 Canada, New Brunswick and Nova Scotia[c]	217 000	No information available
12 Canada, Regina[c]	193 381	No information available
13 Canada, Ontario[f]	351 201	25
14 Chile[c]	2 400 000	> 80
15 China[c]	22 000 000	15
16 Colombia[f]	5 433 995	100
17 Croatia[c]	251 000	77
18 Cyprus, Nicosia[c]	12 773	20
19 Czech Republic[c]	1 000 000	86
20 Denmark[d]	326 800	42
21 Dominican Republic[f]	1 300 000	No information available
22 Ecuador[f]	1 860 000	60
23 El Salvador[f]	1 168 837	No information available
24 Estonia[c]	228 222	91
25 Finland[d]	839 638	100
26 France[d]	260 224	2
27 Germany[d]	934 218	6-30
28 Hungary[c]	432 152	59
29 India, Gujarat[c]	2 250 000	No information available
30 India, Karnataka[f]	10 000 000	No information available
31 India, Madhya Pradesh[f]	6 031 000	100
32 Iraq[c]	87 000	No information available
33 Republic of Ireland[c]	51 895	5.5
34 Italy[c]	380 000	14
35 Jamaica[f]	300 000	No information available

[a]For some countries, a region or city is specified.

[b]Percentages are rounded to the nearest whole number.

[c]Data according to submitted IDF questionnaire

[d]EU data sourced from monitoring reports for the 2017/18 school year for EU school fruit, vegetables and milk scheme: https://ec.europa.eu/agriculture/school-scheme/eu-countries_en

[e]Tetra Laval data based on Tetra Pak dairy processing customers' school milk supplies in 2018

[f]Public source/website

Country	Number of children benefitting from school milk	Estimated percentageb of total number of school going children in the target group
36 Japan[c]	9 678 000	92
37 Kenya[e]	330 000	No information available
38 Republic of Korea[c]	5 750 000	51
39 Kosovo, Prishtina[c]	18 000	No information available
40 Latvia[c]	229 617	84
41 Lebanon[c]	34 000	10
42 Lithuania[c]	245 000	92
43 Luxembourg[d]	45 464	43
44 Malta[d]	35 770	No information available
45 Mexico[c]	5 000 000	33
46 Myanmar[c]	36 838	<1
47 Netherlands[c]	1 440 480	100
48 New Zealand[c]	140 000	35
49 Norway[c]	600 000	100
50 Paraguay[f]	1 085 942	100
51 Peru[e]	4 014 756	No information available
52 Poland[c]	1 900 000	96–98
53 Portugal[d]	451 871	99
54 Romania[d]	1 705 616	98
55 Russia[c]	1 300 000	15
56 Rwanda[f]	83 575	No information available
57 Slovakia[d]	466 713	55
58 Slovenia[d]	82 464	45
59 South Africa[c]	9 131 836	71
60 Spain[d]	125 201	8
61 Sri Lanka[f]	400 000	24
62 Sweden[d]	1 666 237	81
63 Switzerland[c]	340 000	39
64 Thailand[f]	7 450 000	No information available
65 Turkey[c]	6 000 000	100
66 United Kingdom[c]	9 800 000	100
67 United States of America[c]	30 000 000	59
68 Vietnam[e]	800 000	No information available
Total	160 274 234	

[a]For some countries, a region or city is specified.

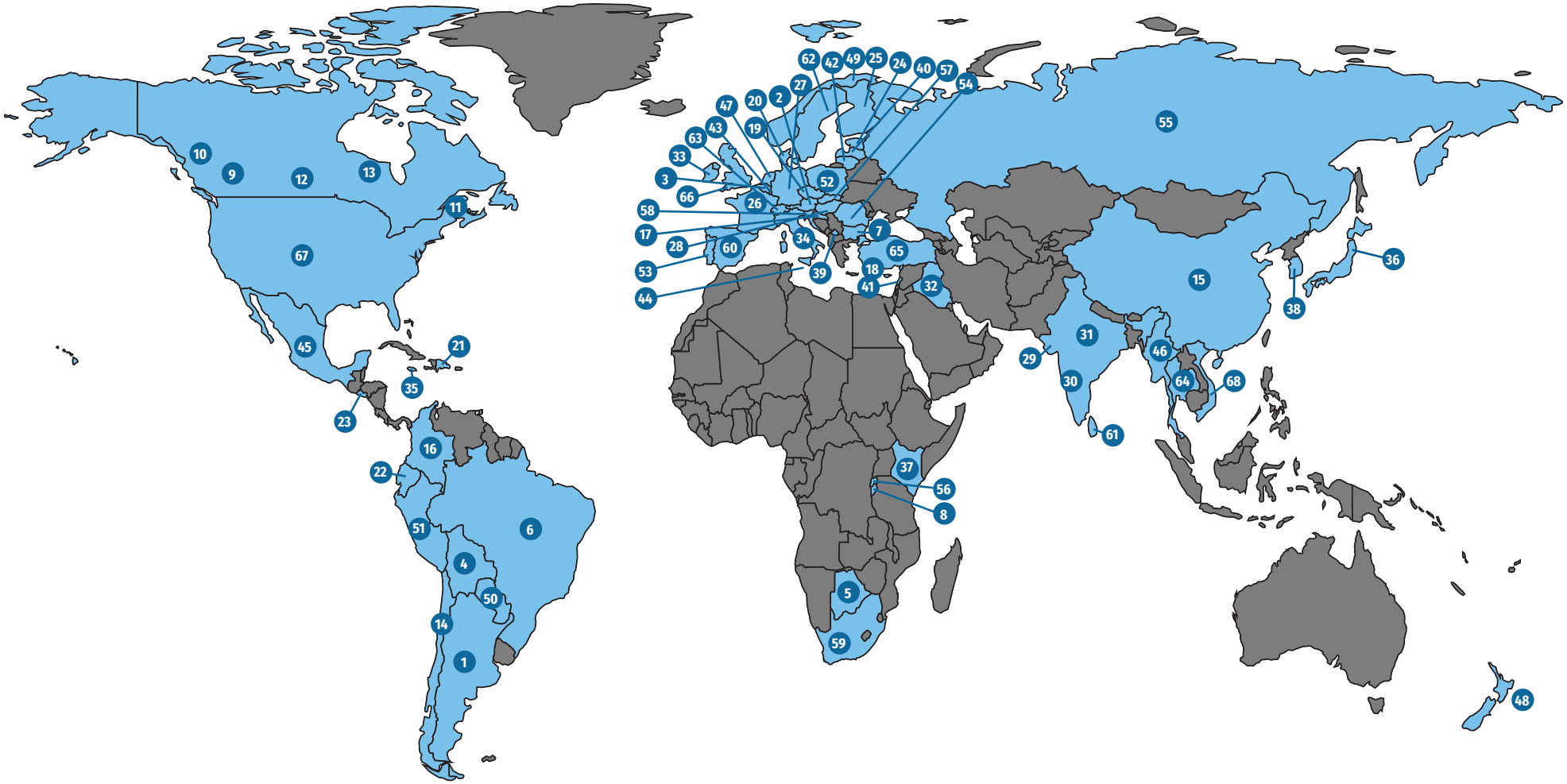
[b]Percentages are rounded to the nearest whole number.

[c]Data according to submitted IDF questionnaire

[d]EU data sourced from monitoring reports for the 2017/18 school year for EU school fruit, vegetables and milk scheme: https://ec.europa.eu/agriculture/school-scheme/eu-countries_en

[e]Tetra Laval data based on Tetra Pak dairy processing customers' school milk supplies in 2018

[f]Public source/website



Map of Table 3:

Geographical representation

Insight into the main objectives of a programme contributes to understanding the target and to set monitoring mechanisms. The majority of respondents (83%) indicated that the reported SMP focused on improving child health and nutrition. Attracting children to school through increased enrolment and attendance, and promoting local milk production were cited as the two next most common objectives (17% and 14%, respectively). Other objectives of SMPs included: reducing school dropout; creating good habits; ensuring the recruitment of future consumers; reconnecting children with agriculture; introducing the taste; promoting local production; and focusing on a dairy market target.

The evaluation of programmes appears to need improvement, as 62% of respondents stated that they did not have any studies or data to show whether the programme objectives had been achieved or what the impact of the programme was.

The main barriers to promoting milk in schools were listed as:

- funding/the cost of milk (14 responses)
- delivery or supply chain problems (7 responses)
- misconceptions related to dairy and health (7 responses, with 2 specifically mentioning ethical reasons and pushback from vegans/ vegan activist groups)
- availability of milk (5 responses)
- restrictions on marketing to children (3 responses)
- governmental structures or approval (3 responses)
- competitors (for example, manufacturers of sugary drinks) having more prominent advertising and more stock (3 responses)
- food safety issues (2 responses)
- staffing issues (2 responses)
- dislike of taste, time constraints, allergies or food bans in schools, acceptability and lack of engagement with schools (1 response for each).

Promoting milk in schools is discussed in the next section (practical implementation of the programmes).

Part 2: Practical implementation of the programmes

Part 2 of the questionnaire focused on aspects related to the practical implementation of the programmes, including logistics, costs, nutrition and marketing.

Figure 3: Involvement of dairy sector in school milk programmes

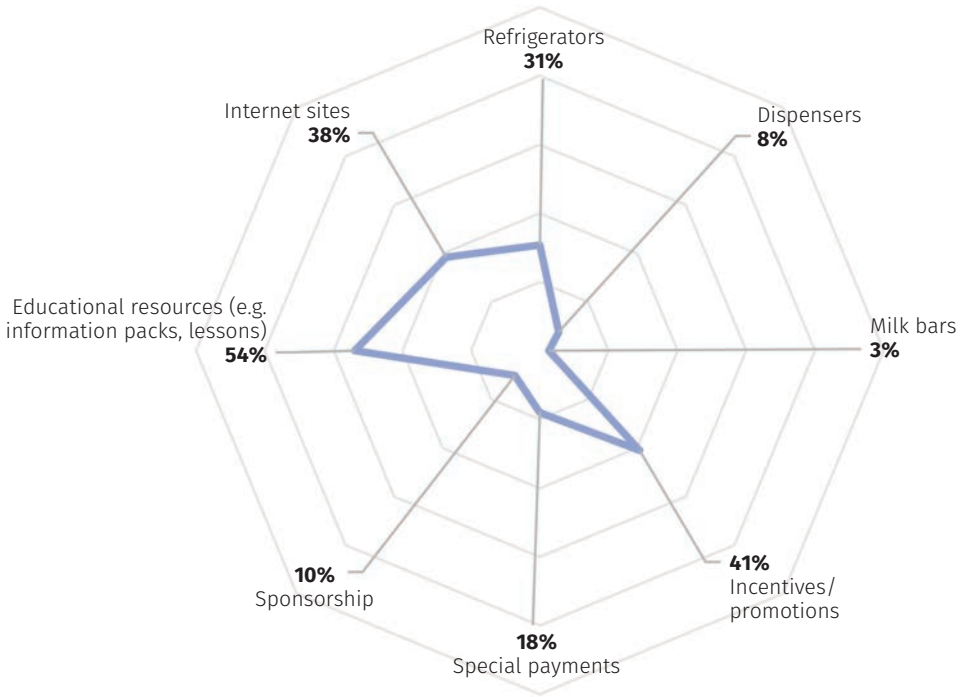
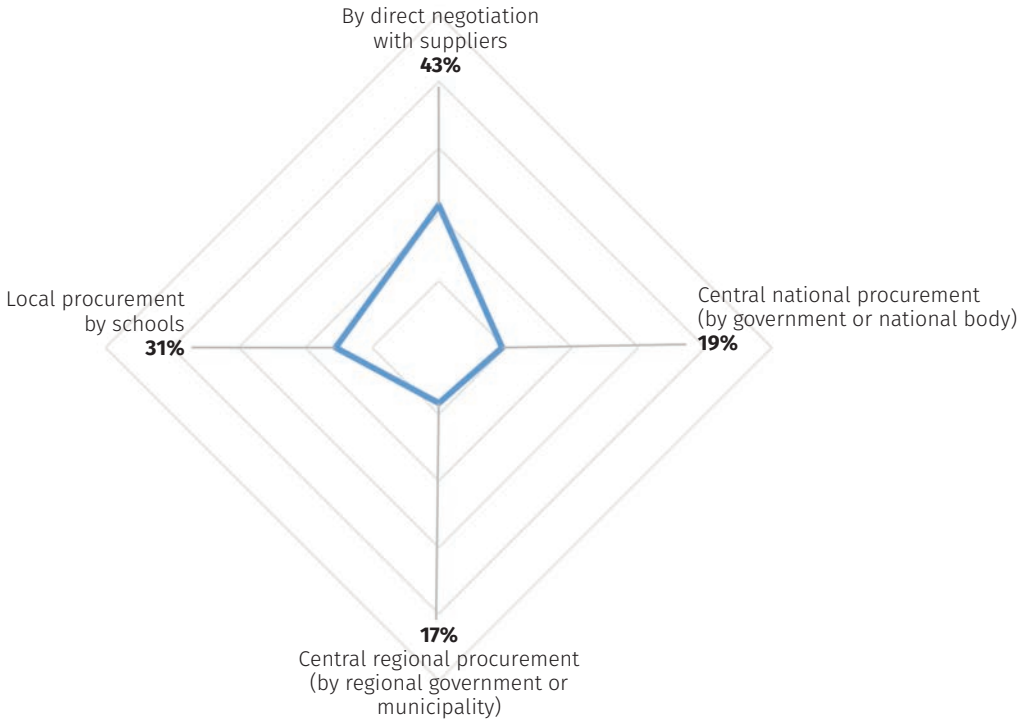


Figure 4: Procurement strategies used in school milk programmes



Logistics and economics

This section included questions on the involvement of the dairy sector, procurement and distribution strategies, cost models and packaging. The dairy sector is involved in SMPs in several ways, as shown in Figure 3. The most common activities include providing educational resources such as information packs or teaching material, incentives or promotions, hosting internet sites or supplying refrigerators. Five countries stated that the dairy sector is not involved in their SMPs.

Milk is procured mostly through a single avenue (Figure 4): either through direct negotiation with suppliers or through centralized structures such as an organization or government entity. However, procurement methods that involve a combination of structures are used in some countries (UK, Kosovo and Croatia).

In close to two-thirds of the participating countries, at least half of the milk used in the programme has to be sourced locally. In 17 of the programmes, all milk (100%) has to be sourced locally, whereas no specific requirement was in place in 12 programmes.

Milk is mainly handed out in classrooms (77%), although school restaurants or cafeterias (27%) and vending machines (7%) were also noted as distribution methods. Switzerland highlighted that milk is handed out at school assembly. Estonia stated that there is no harmonised procedure for milk distribution in their country.

Milk is most often distributed by teachers (55%), similar to findings in the 1998 and 2013 surveys, or else by staff in restaurants or tuck shops. In some countries milk is distributed by pupils (14%), a milk delivery service (9%), parents (7%), a concierge/janitor (7%), administration staff (2%) or external parties such as volunteers (2%), agricultural organizations and farmers (2%) and industry franchisees (2%).

In most of the programmes (84%), some kind of financial assistance is available (Figure 5), most commonly in the form of a subsidy (43%). Milk is provided free of charge in 32% of the programmes and according to a mixed sliding price in some programmes (2%). In a small number of programmes (9%), milk is charged

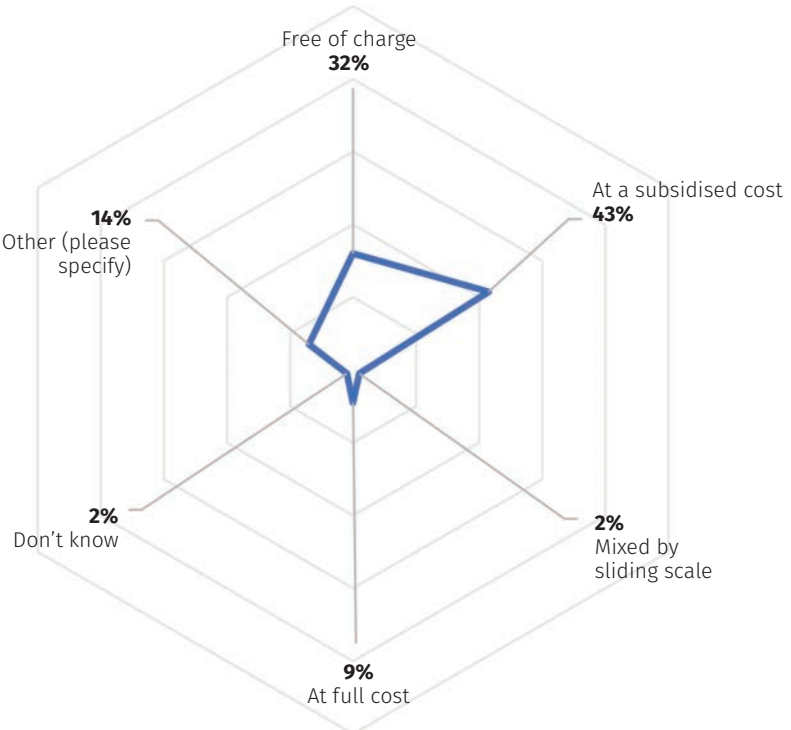
at full cost. A mixture of free and subsidised or full cost is used in 14% of the programmes.

Subsidised programmes are supported mostly by the European Commission or a country's government (46% each). The European Commission's subsidies are limited to EU member countries, although some countries outside the EU are also supported with aid (for example, Burundi). Subsidies are also offered by local governments (10%), dairy processors (10%) or farmers (8%), donors (3%) and international organizations (3%). Subsidies apply mostly to whole white milk (68%), followed by semi-skimmed/low-fat milk (51%), yogurt (37%), flavoured milk (29%), cheese (22%) and fermented milk (24%). In some countries, more specific dairy products are also included in the subsidy (for example, lactose-free/lactose-reduced and kosher products in the UK, butter in Germany, and skyr in the Czech Republic).

Respondents indicated that milk is supplied most often in cartons (81%) or plastic bottles (30%). In less than 5% of the programmes, milk is supplied in cups, sachets or as milk powder that is made up and served in a glass. Milk is most often supplied to schools in pack sizes of 200 ml or 250 ml (62%), followed by a pack size of 1000 ml (17%). Other common pack sizes ranged between 125 ml and 340 ml. A size of 10 000 ml (10 L) was also mentioned. The most common serving size was 200 ml (46%), with 237 ml and 250 ml also indicated as popular options. In the majority of programmes (71%), milk is served as individual portions of 200–250 ml. Other common serving sizes included 100 ml, 125 ml, 150 ml, 189 ml and 340 ml. Cheese slices of 80–100 g were also mentioned as a commonly used serving size in schools.

Milk was reported to be served either at room temperature (as long-life products) or chilled (if served fresh). The distribution of formats was fairly equal (55% long life; 45% chilled). With regard to food safety, respondents mentioned that quality assessments are performed by a mandated regulatory authority according to predefined food safety standards or that certain safety standards have to be in place before the programme can qualify for

Figure 5: Cost models for providing milk to schools



implementation in schools. In some countries a complete cold chain has to be maintained, for which refrigerators or milk bags are supplied to schools in some countries. Educating distributors and teachers was also mentioned as measures to improve safety of dairy products.

Not much data were available regarding wastage of dairy products. Of the 22 respondents who answered this question, only 5 were able to provide statistics. The reported wastage was below 5%.

Various strategies are used to encourage or optimize the supply of milk and milk products to schools, including government-based initiatives to encourage more local milk production (Botswana), producing milk under a specific manufacturing contract (Burundi) or wholly market-driven strategies (UK). In some countries, promotional activities are used to encourage more schools to participate in the programme (Croatia) and in others there is regular communication with participating suppliers and schools (Cyprus).

Many respondents indicated that strategies aligned with effective distribution systems and monitoring exist in their country's programme. These include delivery of dairy products based on orders received from schools or parents (Denmark), monitoring systems installed by schools or caterers, and timely delivery of products. In New Zealand, an online system is available, where schools can regularly update their product requirements. Other strategies include centralized supply and distribution strategies (Spain), proper planning of distribution routes to decrease transportation cost (India), and using local suppliers close to schools (Ireland and Hungary). Packaging was also noted by some respondents as a way to optimize supply (a specific example was Lebanon's use of carton packaging). From the responses it is clear that many different strategies are in place and that programme managers continue to explore refinements.

A recycling or collection programme for packaging material is in place in just over half (56%) of the SMPs surveyed, mostly for cartons or plastic containers. Although 34% of the respondents indicated that no specific recycling or collection initiative was associated with their programme, some form of recycling or collection facility is available in 6% of the respondent countries where these programmes run. Limited quantitative information is available on packaging waste. More than 95% of the milk cartons used in the Norwegian programme in 2017 were reported to have been collected for recycling.

Nutritional aspects

As discussed in the literature review, school feeding programmes are recognized for their positive impact on the nutrition needs of school-aged children to support their growth and development. Furthermore, as dietary habits established in childhood often persist into adulthood (Duns, 2000), school feeding programmes may positively influence children's lifelong food choices. Providing milk as part of such programmes is specifically beneficial, as regular intake of milk is indicative of better dietary quality and associated with improved calcium intake and anthropometric measures such as weight and height, all of which are important components of ensuring good health in children during critical growth windows (see the literature review for further discussion). The results of the survey confirm that nutritional benefits are a primary justification for investing in such programmes. Close to two-thirds of the respondents (64%) indicated that nutrition-based evidence was used as framework for implementing the programme. The type of evidence included: food consumption data that identified nutrient gaps (24%); statistics on children's nutritional status (34%); and international evidence on the effectiveness of such programmes to improve nutritional outcomes in children (27%).

Milk and dairy products are regarded as versatile foods and are served as a beverage (58%), as part of the lunch meal (53%) or as a snack (49%) at schools. Multiple opportunities for serving milk exist during the course of the school day. Respondents further indicated that the most popular alternatives to milk as a beverage in schools were soft drinks (carbonated drinks) and water. Water was reported to be available on school premises by 86% of the respondents. Carbonated beverages were reported to be available by 34% of respondents, although 48% specifically noted that such beverages were not available at schools. Other beverage options available at schools include pure fruit juice (in about half of the responses) and also tea and coffee (this is more common at higher grade levels). These alternative beverage options are available from

student stores, cafeterias, vending machines and water fountains (also for refilling own water bottles).

School feeding programmes or SMPs often form part of a wider-reaching school nutrition plan. In fact, 59% of the respondents indicated that this was the case. Other components of such plans include home-grown school feeding (for example, school gardens – 10%), school meal guidelines (29%) and nutrition education (44%). The large number of respondents noting nutrition education as a component of schools' nutrition plans is encouraging; in many cases this component is incorporated into the curriculum (29%). This was noted by respondents from both industrialized and developing countries. Approximately a quarter of the respondents (26%) indicated that nutrition education was an extracurricular activity in their country or region, while 13% noted that it was a specific time-bound aspect. Slightly more than a third of the respondents (39%) reported that nutrition education was provided as a combination of the previously mentioned approaches. For example, nutrition education curricula are available in the US from various dairy councils and from the US Department of Agriculture's Team Nutrition.

Although regular water consumption is a healthy habit, SMPs should focus on water being a good hydration choice but milk being a nutrient-dense beverage at meal and snack times. Continued education is recommended to encourage pupils and staff to reduce their consumption of soft drinks, fruit drinks and other sugar-sweetened beverages, which are generally high in energy but lack other nutrients.

Marketing and promotion of dairy products as part of school milk programmes

Close to two-thirds of the programmes (62%) reportedly include activities to promote milk and dairy consumption. This is comparable but slightly lower than what was reported in the 2013 survey (66%). However, when comparing results from countries that participated in all previous surveys, there was no notable change (79% and 74% of programmes included a promotional component in 1998 and 2013, respectively). Educational resources provided by the dairy industry was the most common promotional activity (80%). Other activities included the provision of dispensers, milk bars, incentives and sponsorships. A third of the respondents indicated that the dairy industry provided refrigerators to schools. A notable number of respondents indicated that their programmes intended to either increase (43%) or maintain (38%) the current level of promotional activity. Examples of some promotional materials or outcomes of activities are shown in Figure 6a–d.

As mentioned earlier, the most common objective of SMPs is to improve child health and nutrition. It is therefore not unexpected that most of the marketing messages used to promote milk in schools focus on the health benefits of the nutritional profile of milk. Respondents indicated that milk and milk products are described as a source of calcium (86%), protein (79%), minerals (74%) and vitamins (71%). This is closely followed by messages about milk contributing to growth (81%) and forming part of healthy and balanced diets (83% and 74%, respectively). Milk and dairy consumption as part of an active lifestyle was promoted by more than half of the respondents, through the messages that milk provides energy (67%) and tastes good (52%).

Messaging may be influenced by specific regulations, locally relevant conditions or historical circumstances. For example:

- In Ireland, milk is presented as promoting healthy growth in children because of its protein and iodine content.
- Campaigns in Canada highlight the convenience of having milk available in schools making it easier for parents to prepare packed lunches.
- In Germany, promotion is handled by local dairy organizations and as such, there is no national promotion campaign which can be leveraged in a SMP.
- In Estonia, all promotional claims have to be authorized by the government.
- In South Africa, the government, who sponsors the programme, stipulates that no promotional claims should be made.

Messages were largely aimed at teachers (80%), parents (71%), and learners/pupils (71%), while education authorities (44%) and nutritionists (29%) were also the target of communication efforts.

Various communication channels are used by the participating countries to promote their respective activities. The use of social media

Figure 6a: Milk Hero & Heroine picture contest for primary school pupils in Japan makes opportunities to understand the importance of food (milk) as part of education. The 2018 winning entries (two characters shown here) were selected from total 30,612 pieces submitted.

Figure 6b: Milk South Africa uses the Super Moo character in educational resources distributed for World School Milk Day. The character is also an anchor feature in their "3-A-Day Gives You Go" campaign.

is most prevalent (65%), followed by personal visits (45%), direct mail (45%) and advertising (45%). Communication campaigns in the schools, such as with the school's dining room manager (23%) or nutritionist (18%), were also noted. Several countries indicated that they also make use of other channels (40%), including: education material such as books and flyers distributed to the teachers and principals at the schools, or working with other bodies (such as the School Development Association and National Nutritionists Associations, as applies in Zimbabwe and Korea, respectively).

Local culture, changing consumer demands and special needs should be considered when promoting milk in schools. Although plain milk remains the most common product distributed through SMPs (see Table 2), products such as lactose-free milk, yoghurt, chocolate milk and processed cheese were all reported to be available in many programmes. Buttermilk was also noted as being available fairly commonly. These findings suggest that market preferences and specific needs, such as lactose intolerance, taste preferences (chocolate milk) and local culture are taken into account in determining

the product profile of a programme. The high availability of organic milk can be interpreted as a response to an increasing demand for benefits beyond nutrition, such as natural foods and sustainable production processes, a message that is popular in many countries.

In a final comment about marketing messages, it should be noted that although the survey probed the availability of non-dairy products as alternative beverage options at schools, the focus was not on the messages used to promote these alternatives. It may be worthwhile to highlight milk and milk products as being nutritionally superior to other beverage options in future marketing messages.

Conclusion

Current SMPs are diverse. They run in different settings, which span diverse socioeconomic conditions, are aimed at different target markets and many different stakeholders are involved in the operations. This review was, therefore, a valuable opportunity to gain insight into the successes of programmes and better understand the drivers of SMPs in different settings. A survey like this further presents an opportunity to learn from one another and to share successes and challenges.

It is clear from the survey that organized programmes for providing milk at schools are recognized as contributing to children's improved nutritional status and healthy development. Given the increasing trend of childhood obesity, mainly due to a lack of physical activity and the consumption of "empty-energy" foods (which are high in sugar and fats but lack notable other nutrients), milk can make a meaningful contribution to improving the nutritional status of schoolgoing children. Milk is a nutrient-dense food source and regular intake of milk and other dairy products can help to address issues across the nutrition spectrum, from malnutrition to food insecurity to, increasingly, issues of childhood obesity and making healthy food choices. The majority of the programmes target children between the ages of 5 and 11 years, which represents an important period of growth and development. Childhood and adolescence are key periods for health and development interventions that will have a lasting productive impact on future generations' wellbeing.

Figure 6c: Height charts such as these, supplied by the FAO, have been used in the EU, Chile and Thailand.

Figure 6d: Swissmilk uses milk carton art-and-craft projects to engage children.

Signet «vache»
Pratique et amusant

Matériel
paire de ciseaux, carton, ruban adhésif, cutter, crayon à papier, gouache, vernis

Most programmes are run with support from the dairy industry (farmers, processors, dairy associations) and government. The survey showed that these programmes are a valuable opportunity for multidisciplinary collaboration that involves both the public and the private sector, and can impact lives in several domains, including the alleviation of hunger, advance nutritional intake for improved health, generate employment opportunities and improve access to education.

The insights gained from this assessment can contribute to scaling successful aspects of SMPs, which is an essential component of systems change. By showing how markets can be connected with local farmers, the examples of well-designed, sustainable SMPs in this study present an opportunity to help move other programmes forward, thereby continuing to provide vulnerable populations with nutritional value and so helping to reach the goal of supporting sustainable, healthy and thriving future generations.

Section 2

The nutritional impact of school milk – providing initiatives

The nutritional impact of school milk – providing initiatives

Author: Leigh Underhill, MHSc, RD

Background

Milk is provided at schools in many countries. The history of official school milk programmes (SMPs) can be traced back almost a hundred years, with school milk interventions originally created as a social safety net to support nutritionally vulnerable and food-insecure children.

- In the 1920s, milk clubs that provided milk to schools flourished across the county of London. In 1934, the UK launched its Milk in Schools scheme, although many children were already receiving milk at school via various local programmes, which typically targeted undernourished children and those from low-income households (Atkins, 2007).
- In 1940, the first federally funded SMP for low-income students was implemented in 15 schools in Chicago. Milk was provided for free or at 1 cent. The programme was considered a success based on school and student uptake, and was subsequently expanded to other schools in Chicago and 11 other cities in the first year. By 1946, the programme had been incorporated into the National School Lunch Program, which was open to all students (Gunderson, 2019).
- In 1949, Japan started to include skim milk donated by UNICEF in a school lunch programme. The programme won wide public support following physical improvements seen in children who participated compared with those who did not. The current Japanese school lunch programme, based on the School Lunch Act of 1954, still includes milk (Ishida, 2018). (The programme's nutritional standards aim to meet 50% of students' recommended dietary allowance for calcium.)
- A school milk scheme was established across the European Union in 1977 to encourage students to drink milk and consume dairy products. It was incorporated into the school fruit, vegetables and milk scheme in 2017 (European Commission, 2019).

Published accounts also describe that milk has been provided to food-insecure students in schools in many low- and lower-to-middle-income countries for a few decades, including as part of school nutrition programmes (Land O'Lakes, 2014).

Although the spread of SMPs was largely influenced by agricultural, economic and educational considerations, the initiatives also sought to leverage the nutrient profile of milk to impact the nutritional status and growth of food-insecure and undernourished or malnourished students (Food and Agriculture Organization, 2013). This is still true for programmes in low-income and some middle-income countries (Land O'Lakes, 2014). Milk and dairy products are nutrient-rich foods that provide up to 16 essential nutrients, including protein, calcium and a number of other micronutrients that are important to ensure optimal bone growth and development in childhood (Caroli et al., 2011). However, there is growing recognition of the need for evidence-based nutritional guidelines for school feeding programmes, which focus on promoting intake of recommended food groups and overall healthy eating patterns among students (Aliyar et al., 2015; Food and Agriculture Organization, 2019). Already in place and mandatory in some (mostly high-income) countries, such guidelines include nutrients from milk and dairy (Ishida, 2018; Food and Agriculture Organization, 2019; Department for Education (UK), 2019; Department of Agriculture (USA), 2012).

The potential reach and nutritional impact of providing milk in schools is considerable, given the extent of programmes already in place, which provide milk or dairy products to students via a dedicated SMP or as part of a school nutrition programme. For example:

- During the 2017–2018 school year, an estimated 16 634 603 children participated in the UK school fruit, vegetables and milk scheme, and drinking milk was distributed in

27 UK counties (European Commission, 2019).

- During the 2015 fiscal year, 30 500 000 and 14 000 000 students participated in the (US) National School Lunch Program and School Breakfast Program, respectively (Roy & Stretch, 2018). As mentioned earlier, the official SMP was incorporated into the bigger lunch programme in 1946, which requires milk or alternative dairy products to be provided (Department of Agriculture (USA), 2012).

Although seminal research on the nutritional impact of early SMPs exists (Atkins, 2007), only a limited number of peer-reviewed studies have investigated the nutritional impact of SMPs since, as highlighted by a FAO-mandated systematic review of SMPs in developing countries in 2013 (Food and Agriculture Organization, 2013). The current literature review was therefore conducted as part of the IDF's 2019 report on milk provision in schools, to identify the current evidence regarding the nutritional impact of milk being provided in schools through a structured programme.

Methods

Peer-reviewed studies

This literature review is based on studies published in peer-reviewed journals as included in the electronic databases PubMed, Cochrane Library and Google Scholar. The following search terms were used: school milk; school milk program* (to capture the terms programs, programme, programming); and variations on this, including school feeding program*, school food program* and school nutrition program* (to capture research on school meals that included milk or dairy). These terms were also combined with "evaluation" AND "milk" AND "dairy". Citations and similar articles (the first 20 on the list shown in the PubMed feature) were searched, and the references of selected studies were hand searched. Studies that appeared relevant to the research question were reviewed and selected for inclusion if they specifically:

- included interventions that targeted primary or secondary students AND
- identified milk or dairy as a component of a nutrition intervention AND
- milk or dairy was provided directly to students, for consumption at school (for free or at a subsidised cost, or for sale; on its own or as part of a snack or meal, such as breakfast or lunch; fortified or non-fortified) AND
- metrics included a nutrition outcome that could be specifically related to the provision of milk or dairy products (including anthropometric outcomes such as weight and height changes) AND
- were published between 1990 and June 2019.

Studies were excluded if the intervention was milk powder being added to a food, as this may not contribute to the development of a preference for milk or dairy, or promote intake of milk or dairy as dietary behaviour, which is a primary goal of SMPs. To ensure a wide review, the strength or quality of evidence or study design were not considered as an inclusion factor; the aim was to identify and characterize the entire current body of evidence regarding the nutritional impact of programmes or interventions that provide milk at schools.

Grey literature

Relevant grey literature was identified via citations in journal-published studies and personal communication with IDF and Tetra Laval. These documents were retrieved, reviewed and selected as applicable using Google or Google Scholar or a database through a university library. Selected grey literature includes credible publications and reports from governmental and national or international organizations with specific interest in agricultural commodities and child nutrition, and provides relevant information and data that contribute to our characterization of the current body of evidence.

Results: Peer-reviewed studies

Based on the specified review criteria, 35 journal studies were included in the analysis (12 from 1990 to 2009, and 23 from 2010 to June 2019). Findings from the included grey literature are described separately later.

Types of programme or intervention identified

According to the reviewed literature, milk is provided to students at school via the following programmes:

1. SMPs, which involve the provision of regular milk with or without a snack
2. School breakfast programmes, where milk (or another dairy product) is typically provided either as a beverage or with cereal
3. School lunch programmes, where milk (or another dairy product) is typically provided at lunch time, usually as a beverage
4. Interventions that offer fortified milk (FM) to students as a carrier of specific micronutrients to supplement their dietary intake (usually nutrients that the target group are deficient in or likely to be deficient in)

- *Four selected studies are categorized as assessments of SMPs.*
  Three studies assessed an SMP (Kruger et al., 2017; Marsh et al., 2018; Rahmani et al., 2011), while a fourth categorized as such is a literature review regarding the effectiveness of dairy interventions, which included SMPs (Hendrie et al., 2013).
- *Eight studies are categorized as assessments of school breakfast programmes.*
  Of these, eight assessed breakfast programmes (Au et al., 2018; Condon et al., 2009; Crepinsek et al., 2006; Cullen & Chen, 2017; Friedman & Hurd-Crixell, 1999; Gates et al., 2013; Powell et al., 1998; Skinner et al., 2012), of which six considered actual school breakfast programmes (Au et al., 2018; Condon et al., 2009; Cullen & Chen, 2017; Cullen et al., 2011; Friedman & Hurd-Crixell, 1999; Powell et al., 1998) and two studies (Gates et al., 2013; Skinner et al., 2012) looked at school snack programmes that specifically aimed to improve the intake of milk and other dairy products among students at First Nations schools in the Canadian Far North. They are categorized as breakfast programmes because the snacks are provided in the morning (Gates et al., 2013; Skinner et al., 2012) and consist mainly of breakfast-type foods (Skinner et al., 2012), although some students also received an afternoon snack (Gates et al., 2013).
- *Twelve studies are categorized as assessing a school lunch programme.*
- *Fourteen studies are categorised as FM interventions.*
- Three studies assessed both breakfast and lunch programmes (Au et al., 2018; Condon et al., 2009; Cullen & Chen, 2017), and therefore the number of categorized studies by programme type (38) exceeds the total number of studies reviewed (35).

Types of nutritional impact identified

A nutritional impact lens was applied to identify themes or (milk-related) nutritional impact measures that could be categorized as impacting on the following:

1. Intake of milk or dairy (as a food group) as a measure of dietary quality
2. Calcium and vitamin D status (owing to milk and dairy being a predominant source of calcium in the diets of populations represented in the research, and milk being commonly fortified with vitamin D and being a predominant source of vitamin D in the diets of some populations represented in the research)
3. Intake or dietary status of other nutrients, for example vitamin A and zinc
4. Anthropometric measures such as height, weight and related measures
5. Other nutritional markers (physiological or biochemical), such as haemoglobin levels or anaemia
6. Indicators of bone and dental health, such as bone mineral content or dental caries
7. Other health-related markers of nutritional intake, such as faecal bacteria

Table 1 presents the categorization of each study according to the type(s) of programme, and the associated significant nutritional impact(s). Author names are set in bold, italic or regular type for studies conducted in high-income, upper middle-income or lower middle-income countries, respectively, as per World Bank 2019 classification.

TABLE 1: Nutritional impacts of different types of school-based milk initiative. Author names are set in bold, italic or regular type for studies in high-income, upper middle-income or lower middle-income countries, respectively, as per World Bank 2019 classifications. The study by Bánóczy et al. (2013) is not country specific.

Nutritional impact	School milk programme	School breakfast programme	School lunch programme	Fortified milk intervention
Milk or dairy intake (as a food group; as a measure of dietary quality)	**Hendrie et al., 2012 (dairy intervention); Kruger et al., 2017; Marsh et al., 2018**	**Au et al., 2018; Cullen & Chen, 2017; Condon et al., 2009; Crepinsek et al., 2006; Gates et al., 2013 (snack); Skinner et al., 2012 (snack)**	**Au et al., 2018; Condon et al., 2009; Cullen & Chen, 2017; Cullen et al., 2011; Harrison et al., 2013;** Murphy et al., 2003; **Stevens et al., 2013; Wordell et al., 2012**	
Calcium intake or status		**Friedman & Hurd-Crixell, 1999; Crepinsek et al., 2006; Gates et al., 2013 (snack); Skinner et al., 2012 (snack)**	**Clark & Fox, 2009; Cullen et al., 2011; Kohri et al., 2016;** Murphy et al., 2003; **Nozue et al., 2013; Stevens et al., 2013**	**Du et al., 2004**
Vitamin D intake or status		**Gates et al., 2013 (snack); Skinner et al., 2012 (snack)**		Benjeddou et al., 2019; **Du et al., 2004;** Khadgawat et al., 2014; *Neyestani et al.*, 2013; Trinidad et al., 2015
Intake or status of other nutrients (macro or micro, e.g. vitamin A, zinc)		**Crepinsek et al., 2006**	Murphy et al., 2003	Kuriyan et al., 2016; Lien Do et al., 2009; Sazawal et al., 2013; Trinidad et al., 2015; Zahrou et al., 2016
Anthropometric measures (e.g. height, weight)	**Kruger et al., 2017;** *Rahmani et al., 2011*	*Powell et al., 1998*	Neumann et al., 2007	Bardosono et al., 2009; **Du et al., 2004;** Hall et al., 2007; Lien Do et al., 2009 Sazawal et al., 2013; **Zhu et al., 2006**
Other nutrition markers (e.g. haemoglobin, anaemia)				Kuriyan et al., 2016; Sazawal et al., 2013
Bone/dental health indicators	**Kruger et al., 2017**		**Kohri et al., 2016**	Bánóczy et al., 2013; **Du et al., 2004;** *Mariño et al., 2016*
Other				Lien Do et al., 2009 (improved faecal bacteria count)

Comments on design of included studies and target groups

Various designs were used in the reviewed studies, including cross-sectional observational studies, literature reviews and double-blind randomized controlled trials (Table 2). Of the 35 reviewed studies, approximately two-thirds (n = 22; 63%) were randomized controlled trials (n = 12), controlled trials (n = 8) or review studies (n = 2), which indicates a high strength and quality of the evidence in more than half the studies that met the inclusion criteria. Furthermore, the observational studies assessing the nutritional impact of government-funded SMPs in the US or UK were typically well designed and included large numbers of participants. However, as mentioned in the Methods section, study design or strength or quality of evidence was not considered as an inclusion criterion; rather, the current review intends to capture the existing empirical evidence as per the criteria and thus also includes evidence from credible grey literature.

Despite it being well known that adolescent girls generally have a lower intake of milk and dairy than their male counterparts (which may negatively impact peak bone mass and increase their risk of osteoporosis later in life), only one of the reviewed studies included a gender-based design (Du et al., 2004). In that study, the authors assessed the bone health, nutrient intake and anthropometric measures among 10-year-old girls in Beijing who received fortified milk, non-fortified milk or no milk at school over a period of two years. Two-thirds of the reviewed studies (n/N = 23/35; 66%) focused on children aged 12 years or younger. Of the remaining studies, seven focused on students at middle or high school and five involved students across a wide age range (5–18 years of age) (Table 3). The three assessments of SMPs (Kruger et al., 2017; Marsh et al., 2018; Rahmani et al., 2011) included children between 6 and 9 years of age. Only studies that assessed breakfast and lunch programmes included students of high-school age, and also involved the widest range of ages.

Ten of the included peer-reviewed studies assessed programmes in lower middle-income countries, six assessed programmes in upper middle-income countries, and 18 assessed programmes in high-income countries. One study was not country specific (Bánóczy et al., 2013). A preponderance of the studies were assessments of the nutritional impact of the national school breakfast or lunch programmes in the USA (Table 3). Studies in lower middle-income countries tend to be assessments of FM initiatives (n = 8), of which the aim is to improve the nutritional status of food-insecure, undernourished or malnourished students. It should be noted that although Canada is classified as a high-income country, the two Canadian studies included in the review are assessments of SMPs (providing a morning snack together with a dairy product) in remote communities in the Far North, targeting Aboriginal students. Food insecurity is more common in these remote communities (Skinner et al., 2012) and in the Aboriginal population compared with the general population (Gates et al., 2013), and milk or dairy intake is known to be low among the Aboriginal population (low intake of calcium and vitamin D of students) (Gates et al., 2013; Skinner et al., 2012). This context is more reflective of included studies taking place and targeting students in middle-income countries compared with assessments of national meal programmes in high-income countries.

TABLE 2: General design of reviewed studies. Author names are set in bold, italic or regular type for studies in high-income, upper middle-income or lower middle-income countries, respectively, as per World Bank 2019 classifications. The study by Bánóczy et al. (2013) is not country specific.

Reviews	Randomized controlled trials	Controlled trials	Before–after comparison	Longitudinal observations	Cross-sectional observations
Hendrie et al., 2012; Bánóczy et al., 2013	Bardosono et al., 2009; **Crepinsek et al., 2006; Du et al., 2004 (girls only);** Khadgawat et al., 2014; Kuriyan et al., 2016; Lien Do et al., 2009; Murphy et al., 2003; Neumann et al., 2007; *Neyestani et al., 2013; Powell et al., 1998; Rahmani et al., 2013;* Sazawal et al., 2013; **Zhu et al., 2006 (follow-up to Du et al., 2004)**	Benjeddou et al., 2019; Hall et al., 2007; **Kohri et al., 2016; Kruger et al., 2017;** *Mariño et al., 2016;* Trinidad et al., 2015; **Wordell et al., 2012;** Zahrou et al., 2016	**Gates et al., 2013; Marsh et al., 2018**	**Stevens et al., 2013**	**Au et al., 2018; Clark & Fox, 2009; Condon et al., 2009; Cullen et al., 2011;** *Nozue et al., 2013;* **Cullen & Chen, 2017; Friedman & Hurd-Crixell, 1999; Harrison et al., 2013; Skinner et al., 2012**

TABLE 3: Included studies organised by country and noting student age and type of programme. Light-shaded rows represent lower middle-income countries, unshaded rows represent upper middle-income countries, and dark-shaded rows represent high-income countries, as per World Bank 2019 classification.

Country	Studies	Age group (years)	SMP	SBP	SLP	FM
Bangladesh	Sazawal et al., 2013	6–9				x
Canada (Far North)	Gates et al., 2013	10–14	Snack			
	Skinner et al., 2012	10–18	Snack			
China	Du et al., 2004	10–12 (girls)				x
	Zhu et al., 2006 (follow-up to Du et al., 2004)	13–15				x
Great Britain	Harrison et al., 2013	9–10	Dairy interventions		x	
	Hendrie et al., 2012	5–12				
	Stevens et al., 2013	11–18			x	
India	Khadgawat et al., 2014	10–14				x
	Kuriyan et al., 2016	7–10				x
Indonesia	Bardosono et al., 2009	7–9				x
Iran	Neyestani et al., 2013	9–12				x
	Rahmani et al., 2013	6–8	x			
Jamaica	Powell et al., 1998	7–10		x		
Japan	Kohri et al., 2016	9			x	
	Nozue et al., 2013	10–11			x	
Kenya	Murphy et al., 2003	7			x	
	Neumann et al., 2007	7			x	
Morocco	Benjeddou et al., 2019	7–9				x
	Zahrou et al., 2016	7–9				x
New Zealand	Marsh et al., 2018	7–9	x			
	Kruger et al., 2017	5–10	x			
Philippines	Trinidad et al., 2015	6				x
Thailand	Mariño et al., 2016	12				x
United States	Au et al., 2018	4–15		x	x	
	Clark & Fox, 2009	5–18			x	
	Condon et al., 2009	5–18		x	x	
	Crepinsek et al., 2006	8–11		x		
	Cullen & Chen, 2017	5–18		x	x	
	Cullen et al., 2011	11–13			x	
	Friedman & Hurd-Crixell, 1999	5–12		x		
	Wordell et al., 2012	12–13			x	
Vietnam	Hall et al., 2007	6				x
	Lien Do et al., 2009	7–8				x
Not specific (literature review)	Bánóczy et al., 2013	Not specific				x

SMP = school milk programme; SBP = school breakfast programme; SLP = school lunch programme; FM = fortified milk (for micronutrient supplementation)

Reported nutritional impacts

This section details the type of nutritional impact reported by the reviewed studies. Table 4 (refer to page 23) provides a visual presentation of the number and variety of studies and findings, including type of nutritional impact noted, type of milk-providing initiative, and country.

1. Milk or dairy intake as an indicator of dietary quality

Milk or dairy intake, as a measure of dietary quality, was noted as nutritional impact by the greatest number of studies (n = 15). These studies included all of the programme types mentioned in this review, except FM interventions. Information regarding the fat content of the milk or dairy products provided was often not detailed.

i. Nationally funded programmes

Many of the studies included in the review were American evaluations of the nutritional impact of the national school breakfast or lunch programmes. Findings generally indicated that participants of the breakfast and lunch programmes were more likely to consume milk at these meals than non-participants (Au et al., 2018; Condon et al., 2009; Cullen et al., 2011) or than students who participated in the programmes less frequently (Au et al., 2018). Crepinsek et al. (2006) further found that when national (US) school breakfast programmes were universally offered for free in treatment schools (that is, to all students), more dairy was consumed compared with control schools that provided free or reduced-cost programmes dependent on student eligibility (although the behaviour of skipping breakfast was not affected). Marsh et al. (2018) noted that after two years of participating in a free SMP, Auckland students aged between 7 and 9 years were drinking more milk over baseline, and a greater proportion of the students were meeting the recommended milk or milk product intakes. Kruger et al. (2017) also reported an increased frequency of milk consumption among students who participated in the SMP. Cullen & Chen (2017) noted that the participants of US national school meal programmes consumed 77% of their daily milk intake with their school meals (with the authors concluding that this high percentage indicated the importance of school meals for the mostly low-income sample in this study). Similarly, in British studies that focused on the national school lunch programme, the authors noted that participants of the school lunch programmes consumed more dairy at lunch than non-participants (Harrison et al., 2013; Stevens et al., 2013), that students who received lunch at school consumed more dairy than those who brought lunch from home (Stevens et al., 2013), and that the higher dairy intake was also reflected in the overall diet (that is, programme participants also consumed more dairy in their daily diets) (Harrison et al., 2013).

Wordell et al. (2012) assessed the effect of modifying the school lunch programme environment by restricting the availability of beverages that were considered competitive to milk among students aged 12–13 years. In intervention schools, vending machines offered only water, and only milk and vegetables and fruit were available for a la carte purchase. In control schools, juice was offered for sale but no sugar-sweetened beverages. After three years, surveys indicated that students from intervention schools were 24% more likely to drink milk outside of school, and 27% less likely to drink juice in school compared with their counterparts from control schools. The authors also noted a socioeconomic effect across intervention and control schools, where students who qualified for free or reduced-cost school meal programmes consumed more milk and juice in school (and less outside school) compared with students paying a full fee.

ii. Other school breakfast or lunch programme initiatives

The studies by Skinner et al. (2012) and Gates et al. (2013) investigated the nutritional impact of snack programmes in schools in the Canadian Far North, which specifically included milk or dairy and which aimed to improve students' intake of the milk and other dairy food group. Skinner et al. (2012) did not find a higher intake of milk products among programme participants compared with non-participants during the 2004 data collection period (although calcium intake was higher); however, the 2007 data collection period did show a higher intake of milk and alternatives. (It should be noted that the finding did not hold for girls when data were separated according to gender.) Gates et al. (2013) noted an increased intake of milk and other dairy products over baseline after one year of participating in a programme that offered milk and a supplementary snack. However, the evaluation of a similar pilot programme at another school found that the intake of milk and

other dairy products decreased from baseline after one year; an initial increase in calcium intake relative to baseline also disappeared after one year. Programme implementation issues related to communities' remote locations, as reported by these authors, may have contributed to inconsistent findings.

Murphy et al. (2003) conducted a randomized controlled intervention (for five consecutive school terms) and assessed the nutritional impact of providing a traditional plant-based stew supplemented with a glass of milk, with meat or added oil (compared with a control group that did not receive a meal) at lunch in Kenyan schools sampled from areas where students were at risk of food insecurity and malnourishment. The researchers concluded that dietary quality improved for the group who received stew and milk based on the demonstrated improvements in students' vitamin B12, B2 (riboflavin), vitamin A and calcium status compared with the control group. However, dietary quality also improved for both of the other treatment groups. Energy intake improved only for the stew-with-meat group, as food intake outside of school decreased for the two other treatment groups. Available iron and zinc also increased for the stew-with-meat group. This study was included in the category related to the nutritional impact of milk or dairy intake, as the authors specifically identified that finding; however, it is also discussed at the nutrient intake categories later.

2. Calcium and vitamin D status

Eleven studies found a positive nutritional impact on calcium intake or status (Table 4). Three were assessments of school breakfast programmes, seven were assessments of school lunch programmes and one was of a calcium-fortified milk intervention initiative. The study by Friedman & Hurd-Crixell (1999) was included because it measured students' calcium intake, despite the intakes not being compared with a control group. Seven studies found a positive impact on vitamin D intake or status (Table 4), of which two were assessments of breakfast programmes and five of vitamin D-fortified milk interventions.

i. School breakfast and lunch programmes

Clark & Fox (2009), Cullen et al. (2011) and Stevens et al. (2013) all noted a higher calcium intake among students participating in a school lunch programme compared with non-participants. In addition, Crepinsek et al. (2006) reported a higher calcium intake among students participating in a pilot programme that offered breakfast meals for free to all students compared with control schools where breakfast was offered for free or at a reduced cost depending on student eligibility. Similarly, both Nozue et al. (2013) and Kohri et al. (2016) found that students (fourth and fifth graders, respectively) participating in a programme that offered milk with lunch had a higher calcium intake, and fewer students were below the estimated average requirement for calcium compared with students who brought lunch from home. (The estimated average requirement for a nutrient is the intake level at which the need of 50% of the population is met.)

Evaluation of the programmes that offered milk with a snack to Aboriginal students in schools in the Canadian Far North (Gates et al., 2013; Skinner et al., 2012) found an increased calcium intake among participants, although it was not sustained a year later in one of the schools

(Gates et al., 2013). Improved intake of vitamin D was noted for one of the programmes assessed by Gates et al. (2013) (along with the milk and other dairy products intake). Vitamin D intake also improved in the 2007 data collection period reported by Skinner et al. (2012).

ii. Fortified milk interventions

Du et al. (2004) found higher calcium and vitamin D intakes among 10-year-old girls who received 330 ml calcium-fortified milk (560 mg calcium in total) or milk fortified with both calcium (5 or 8 mg) and vitamin D every school day for 24 months compared with a control group. A higher serum vitamin D level was noted in participants who received milk fortified with both calcium and vitamin D (participants were 12 years old after two years' intervention).

Other studies also found improved vitamin D intake or status in response to programmes that offered milk fortified with vitamin D:

- In a study in Delhi, Khadgawat et al. (2013) noted an improved vitamin D intake or status among students aged 10–14 years who received 200 ml of milk fortified with 600 or 1000 IU vitamin D daily for 12 weeks compared with control groups receiving non-fortified milk.
- In Morocco, Benjeddou et al. (2019) found an improved vitamin D intake or status among students aged 7–9 years after they received 200 ml of milk fortified with 3 g vitamin D daily over a period of nine months compared with the control group who received non-fortified milk (although the milk naturally contained 1.5 g vitamin D).
- The study by Trinidad et al. (2015) found improved vitamin D intake or status among 6-year-old students in the Philippines who received one or two glasses (200 ml) of milk fortified with multiple micronutrients (including vitamin D, but amount not specified) for four months compared with a control group (who received water).
- Neyestani et al. (2014) found that vitamin D intake or status had improved among students in Tehran (aged 9–12 years) after they had received 200 ml of milk or orange juice fortified with 100 IU vitamin D (or a vitamin D supplement) daily for 12 weeks compared with control groups who received non-fortified beverages or placebos (osteocalcin was also measured but no change was noted).

3. Intake or dietary status of other nutrients

Six studies reported a positive nutritional impact for nutrients other than calcium and vitamin D (Table 4), and which are either found naturally in milk [magnesium and phosphorus (Crepinsek et al., 2006); vitamin B2 (riboflavin), B12 and vitamin A (Murphy et al., 2003); energy and protein (Lien Do et al., 2009)] or provided via single- or multimicronutrient FM interventions [iodine (Zahrou et al., 2016; Sazawal et al., 2013)]; iron and vitamin A [Lien Do et al., 2009; Sazawal et al., 2013)].

i. School breakfast and lunch programmes

Crepinsek et al. (2006) noted that in the US, students participating in breakfast programmes that were offered universally for free consumed more magnesium and phosphorus (along with calcium and milk or dairy as noted earlier) than students at control schools (where the programme was free or offered at a reduced cost depending on student eligibility).

Murphy et al. (2003) found that students consuming a lunch meal consisting of a vegetable stew supplemented with a glass of milk had a greater increase in intake of vitamin B12, riboflavin and vitamin A (and also calcium, as described earlier) compared with the control group (who received no school meal), but not compared with the group who received a portion of either meat or oil with their stew.

ii. Fortified milk interventions

In a double-blind controlled trial among Moroccan students (7–9 years old) who were extremely iodine deficient or had a high prevalence of malnourishment, Zahrou et al. (2016) found that those receiving milk fortified with iodine over a period of nine months had a significantly improved iodine status over baseline, but not relative to the control group, who received non-fortified milk (they also demonstrated an improved iodine status). Conversely, in a study in Bangladesh, Sazawal et al. (2013) did not observe an increase in iodine levels in either the treatment or control group in a study where students (6–9 years old) received yogurt fortified with multiple micronutrients (at 30% RDA for iron, zinc, iodine and vitamin A) for a year. However, the authors did note a smaller reduction of iodine levels among participants who received the fortified yogurt compared with those in the control group. Improvements in the intake or status of other nutrients were not noted.

Kuriyan et al. (2016) also reported a positive impact on the intake or status of so-called other nutrients among participants who received milk fortified with multiple micronutrients. They noted an improved status with regard to folate, vitamin B12 and B2, and a reduced prevalence of iron and B2 deficiency compared with the control group, who received non-fortified milk.

Lien Do et al. (2009) noted a positive nutritional impact for multiple nutrients (improved intakes of energy, protein, iron, and vitamin A) among Vietnamese students (7–8 years old) who received FM (milk with vitamins, minerals and inulin) compared with those who received regular milk or no milk for a period of six months. In a study by Trinidad et al. (2015), 6-year-old Philippine students received either one or two glasses of FM (with iron, zinc, and vitamins A, D and C) or water (control) every school day of the week. Serum zinc improved in both of the FM treatment groups compared with the control group.

4. Anthropometric measures

Nine studies noted a positive impact of providing milk at schools on anthropometric measures among students (Table 4), such as changes in weight, height, body mass index (BMI; weight-for-height metric), mid-arm circumference (proxy metric for growth), weight/height for age, underweight, and stunting. Only one study compared adequately nourished students with undernourished students (Powell et al., 1998). Similarly, only one noted an anthropometric impact associated with gender (girls) (Rahmani et al., 2011), although Powell et al. (1998) also noted a subgroup effect among girls. The study by Kruger et al. (2017) did not show a significant difference in height, weight, BMI, waist circumference, body fat or lean body mass between controls and students who participated in the study.

i. School milk programmes, school breakfast programmes and school lunch programmes

Rahmani et al. (2011) noted a positive impact on the weight of female students (6–8 years old) participating in an SMP in Tehran over three months, compared with the control group. No improvement in weight was observed for male participants. Similarly, Neumann et al. (2007) found a subgroup effect in their analysis of the intervention used by Murphy et al. (2003) (milk, meat or oil provided with a vegetable stew at lunch, or no meal). They found an improvement in height only among students in the stew-and-milk group (mean age: 7 years). However, the effect was noted only for younger or stunted students. A slight increase in mid-arm muscle area was also observed in this group (compared with a near doubling of mid-arm muscle area in the stew-and-meat group). Conversely, Powell et al. (1998) found that weight, height and BMI increased among students (7–10 years old) who received a cheese sandwich and flavoured milk as part of a school breakfast programme compared with the control groups. The treatment groups were divided into adequately nourished and moderately undernourished groups. The noted improvement in anthropometric measures was more pronounced among adequately nourished students than undernourished students (and also more so for girls than boys).

ii. Fortified milk interventions

Hall et al. (2007) noted an improvement in weight of Grade 1 students (mean age: 6 years) who received milk fortified with vitamins A and D and biscuits over 17 months in Vietnam compared with a control group (no intervention). The authors also reported a subgroup effect, with the smallest improvements observed among the most undernourished participants.

In an intervention that provided milk fortified

with either calcium or calcium and vitamin D, or no milk (control) to 10-year-old female students in Beijing over two years, Du et al. (2004) reported an improvement in weight, height and sitting height over baseline for the treatment groups (that is, within-group changes) compared with the control group. However, in a follow-up study three years later, Zhu et al. (2006) found that only the improvement in sitting height was sustained and only among students who had received calcium-fortified milk.

In an intervention that provided Vietnamese students (aged 7–8 years) with milk fortified with a vitamin/mineral/inulin combination (vs non-fortified milk vs no milk), Lien Do et al. (2009) noted that weight-for-age and height-for-age scores improved (and underweight and stunting dropped by 10%) after six months for both groups who received milk (compared with the control group, who received no milk). Similar positive impacts were reported among underweight students (7–9 years old) in Jakarta and Solo who received milk fortified with iron and zinc (vs non-fortified milk) for six months (Bardosono et al., 2009), with improvements noted in the BMI-for-age score, weight, weight-for-age score and prevalence of underweight among the treatment group compared with the control group. (No difference was found in haemoglobin or serum ferritin levels, despite the fortification, and serum zinc levels decreased for both groups.)

In one of the few studies that used a dairy product other than milk, Sazawal et al. (2013) provided fortified yogurt (with 30% RDA for iron, zinc, iodine and vitamin A) to students aged 6–9 years in Bangladesh for one year. Results showed that students who received the fortified yogurt had a greater height gain velocity and better height-for age scores compared with the control group, who received non-fortified yogurt.

5. Other nutritional markers

Two FM studies noted a positive impact of milk provided at school for other nutrition markers (serum ferritin or haemoglobin) (Table 4). Although Bardosono et al. (2009) noted a positive impact on anthropometric measures, they reported that, compared with a control group, haemoglobin and serum ferritin levels did not change in students who received milk fortified with iron and zinc.

In a study by Kuriyan et al. (2016), undernourished students (7–10 years old) in Karnataka (India) received milk fortified with multiple micronutrients or non-fortified milk (control) for five months. The findings showed maintained haemoglobin levels in the treatment group compared with a reduction observed in the control group (significant difference). The authors also reported a reduced prevalence of iron deficiency (as indicated by serum ferritin levels) in the treatment group compared with the control group.

Sazawal et al. (2013) also noted an improvement in haemoglobin levels and a significantly smaller reduction in retinol-binding protein (and iodine) levels among students who received fortified yogurt (with 30% RDA for iron, zinc, iodine and vitamin A) compared with the control group, who received non-fortified yogurt.

6. Indicators of bone and dental health

Six of the studies assessed the impact of milk provided at school on bone or dental health (Table 4). Four were FM interventions, one was a school lunch programme and one was an SMP.

i. Fluoride-fortified milk interventions

Mariño et al. (2018) reported a 34% reduction in dental caries among students who received fluoridated school milk for a period of six years compared with a comparable group of students receiving non-fluoridated school milk. In an analysis of peer-reviewed literature regarding fluoridated milk, including SMPs, Bánóczy et al. (2013) concluded that providing the optimal amount of fluoride in milk is effective at reducing dental caries (for example, when fluoridation of drinking water is inadequate).

ii. Milk fortified with calcium or vitamin D

In a randomized controlled trial in which 10-year-old girls in Beijing received milk fortified either with calcium or with a combination of calcium and vitamin D (treatment groups) or no milk (control group) for two years, Du et al. (2004) noted an improvement in bone mineral content and density over baseline (that is, within group) for the treatment groups. Those receiving the calcium–vitamin D combination showed a greater improvement than the group who received milk fortified only with calcium. In a follow-up study three years later, Zhu et al. (2006) noted that within-group improvements seen in bone mineral content and density for the treatment groups had been lost. However, the authors did note that the participants who received calcium-fortified milk (as opposed to those who received the combined fortification) still had a greater sitting height compared with the control group.

iii. School lunch programmes and school milk programmes

Kohri et al. (2016) reported a greater bone area ratio (as an indicator of bone growth) of the right calcaneus among fourth-grade students who participated in a lunch programme, compared with those who brought lunch from home. Kruger et al. (2017) reported an improved bone mineral content among children who participated in the SMP compared with controls.

7. Other health-related markers of nutritional intake

Only one of the analysed studies considered markers that could be classified under this category (Lien Do et al., 2009). Although it is a FM intervention, a positive effect was seen in both treatment groups (receiving either fortified or non-fortified milk) compared with the control group. In this study, Lien Do et al. (2009) provided Vietnamese students (7–8 years old) with milk fortified with a vitamin-mineral-inulin combination, non-fortified milk or no milk (control) for three months. They noted a significant improvement in the faecal bacteria count of the FM treatment group compared with the control group, and the faecal counts of Bacteroides species and bifidobacteria were also higher in this group than in the group who received non-fortified milk. The authors reported that low levels of bifidobacteria may increase the risk of lowered immunity.

Results: Grey literature evidence

An independent review of the European Union school milk scheme published in 2013 (AFC Consulting Group, 2014) concluded that the scheme positively increased milk consumption among the target group (students in nursery school, pre-school or primary school). However, the report also noted a lack of data regarding the impact of the scheme on long-term consumption patterns.

Other sources in this category provide evidence of a positive nutrition impact of programmes that provided milk at school, primarily in lower middle-income countries. Such programmes typically provide milk and a fortified biscuit at schools where students are at risk of food insecurity, undernourishment or malnourishment (Land O'Lakes, 2014; Tetra Pak, 2019). Table 5 lists the reported reach and nutritional impact of these programmes for eight such countries (Dominican Republic, Myanmar, Pakistan, Philippines, Sudan, Thailand, Vietnam, Zambia) (Elmusharaf et al., 2014; Land O'Lakes, 2005, 2014; Tetra Pak, 2019).

These reports do not provide the same level of information regarding data collection, evaluation and analysis methods as would be required by peer-reviewed studies (including fat content and amount of milk provided). However, positive anthropometric effects are reported for each country, based on increases in measured weight, height or BMI (or related health outcomes, such as malnutrition, underweight, stunting, wasting). Four of the programmes (Myanmar, Pakistan, Philippines and Vietnam) indicated that the improvements were relative to a control group, whereas within-group changes were reported for the remaining countries (that is, measurements before and after the intervention). Two initiatives reported a positive effect on the following other nutritional markers:

- In the Dominican Republic, participating

TABLE 5: Impact of school milk or nutrition programmes reported in grey literature sources

Country (and product provided, if applicable)	Nutritional impact
Dominican Republic* 1 090 000 students reached in 2018 (flavoured and white milk, and juices)	· Reduced anaemia (from 43.4% in 1993 to 16.7% in 2012 among children between the ages of 6 and 14 years) · Reduced chronic malnutrition (from 19.4% in 2002 to 1.9% in 2012 based on anthropometric data between 2002 and 2012) · Data from 2012 showed a 12.6% prevalence of "lower than normal" vitamin B12 levels compared with the average of 22% among children elsewhere in Latin America
Myanmar* 29 732 students reached in 2018 (white milk)	· Weight increase of 146 g in targeted students compared with the control group (July 2015 – February 2017) · BMI increase of 0.05 in targeted students compared with the control group (July 2015 – February 2017) · Mid upper-arm circumference increase of 0.13 cm in targeted students compared with the control group
Pakistan* 187 000 students reached in 2005 (fortified milk)	· An increase of 6 cm in height among participating students compared with 5.1 cm among the control group (17.1% difference) · An increase of 2.8 kg in weight among participating students compared with a gain of 1.9 kg among the control group (47.3% difference) · In the treatment group wasting decreased from 10.2% to 7% · Decrease in the number of children classified as stunted in the treatment group (from 11.4% to 9%)
Philippines**	· Students in the treatment group gained an average of 2.7 kg and grew 5 cm compared with children who did not participate in the programme
Sudan*** 22 528 students reached in 2018 (white milk)	· Thinness, stunting, underweight and wasting improved significantly, by 32%, 55%, 40% and 17%, respectively ($p < 0.05$) among participating students after six months · Anaemia decreased, although not significantly
Thailand* 7 450 000 students reached in 2018 (white milk)	· Among participating students, malnutrition decreased from 19% to 10% between 1990 and 1996/1997, and to 5% in 2006 · Participating students grew an additional 3 cm per year, relative to before the programme's implementation
Vietnam** 330 000 students reached – no year specified (fortified milk)	· An increase of 3.4% in height and 8.1% in weight among participating students, relative to the control group
Zambia* 17 000 students reached – no year specified (white milk).	· BMI increased by 11.2% among girls and 5.2% among boys in the participant group

* Primary source: Tetra Pak (2019). Data from the School Feeding Programmes Impact Studies, received via personal communication and reviewed June 2019

** Land O'Lakes (2014); report received via personal communication

*** Elmusharaf et al. (2014)

**** Land O'Lakes (2005); report received via personal communication and reviewed June 2019

students had a lower prevalence of "lower than normal" vitamin B12 levels (12.6% prevalence compared with the Latin American average of 22% prevalence), and reduced anaemia (43.4% prevalence of anaemia in 1993 reduced to 16.7% in 2012) (Tetra Pak, 2019).

- Reduced anaemia was reported among participating students in Sudan, although not at a statistically significant level (Elmusharaf et al., 2014).

The positive nutritional impact of the programme in Thailand was supported by an independent evaluation of the programme [report published in Thai, as reported by Smitasiri & Chotiboriboon (2003)], which indicated that participating students improved their intake of protein, energy, calcium and vitamin B2, and that students had increased in height compared with those not participating in the programme.

Discussion

Generally, there is a considerable amount of evidence to indicate that initiatives that provide school milk have a positive nutritional impact, specifically with regard to milk or dairy intake as a measure of dietary quality, calcium and vitamin D status, and anthropometric measures as indicators of growth. There is less evidence, or less consistent evidence, regarding the initiatives' impact on intake or status of other nutrients, other nutritional markers and bone or dental health. Inconsistencies across these latter categories are not surprising given the heterogeneity of study designs (for example, differences in type of programme, target groups, geographical location, length of intervention, and so on) and a smaller number of studies that investigated these impacts.

Improved milk or dairy intake (as a measure of dietary quality) and improved calcium intake were most often reported as nutritional impacts. A number of large, well-designed assessments of national school breakfast or lunch programmes commented on these outcomes, with the majority of these assessments from high-income countries, where nutritional guidelines for school feeding programmes are in place. Such guidelines include milk serving recommendations to support students in meeting dietary reference intakes for specific nutrients (Aliyar et al., 2015; Department of Agriculture (USA), 2012; Ishida, 2018), and also likely drive evaluation of the nutritional impacts of these programmes. This likely contributes, in part at least, to the preponderance of such studies from higher-income countries in the current review.

Good evidence supports the importance of adequate intake of milk or dairy products throughout life for good health and to prevent chronic diseases (Gil & Ortega, 2019). However, research also demonstrates that many children and adolescents do not consume the recommended number of servings of milk or dairy per day, or do not meet the recommended intakes of milk- or dairy-related nutrients (Baird et al., 2012; Garriguet, 2007; Office of Disease Prevention and Health Promotion, 2019).

In an earlier study, Friedman & Hurd-Crixell (1999) confirmed that a breakfast programme met (and exceeded) the calcium content requirement stipulated by the USDA for a school breakfast programme (257 mg at that time), but that students were consuming only 63% (mean) of the provided calcium owing to plate waste. Programmes that provide milk at school can obviously contribute to the intake of milk and dairy (and related nutrients), but as Friedman & Hurd-Crixell (1999) note, implementation challenges need to be identified and addressed to ensure optimization of nutrient intake, including strategies and offerings that appeal to the students.

Given that programmes that provide milk at school contribute to improved intake of milk and dairy, it is not surprising that calcium status of participants were typically improved (where measured). This is also the case for vitamin D intake or status, with five of the seven studies that reported on this outcome being FM interventions (vitamin D). The effectiveness of vitamin D fortification of food is well recognized (Black et al., 2012), and cow's milk, for example, has been fortified with vitamin D in Canada (mandatory) and the US for decades as part of a public health initiative to support bone growth in children and to combat rickets (Institute of Medicine, 2011).

It is surprising that only three studies assessed the bone health impact of school-milk initiatives, given the well-recognized effect of milk and dairy on bone growth and which is the basis of recommendations for milk and dairy intakes for children and adolescents [for example, as included in the USDA Choose My Plate dietary guidelines for Americans (US Department of Agriculture). The National Osteoporosis

Foundation in the US further notes in their position statement that "calcium, vitamin D and milk product consumption are key factors for achieving peak bone mass in young adulthood, which is an important predictor of osteoporosis and fractures later in life" (Weaver et al., 2016). However, the three studies did note an improvement in bone growth markers, but not relative to controls in all cases. Regardless, good evidence exists regarding the importance of dairy for the development of peak bone mass during growth in childhood and adolescence (Weaver et al., 2016).

Similarly, given the consistent evidence supporting the positive effect of milk or dairy intake on dental health (Dror & Allen, 2014), it is also surprising that only two of the studies included in this review reported on this outcome. Both were interventions with fluoridated milk and reported a reduction in dental caries. These findings are substantiated by other research that demonstrates the cost-effectiveness of programmes that provide communities and young children at school with fluoridated milk (O'Mullane et al., 2016), although they do not comment on the role of regular milk consumption in dental health.

Increases in anthropometric measures such as weight and height (and reductions in underweight in stunting as an indicator of growth) was reported in nine studies. The findings likely reflect the focus of school-milk initiatives targeting students in disadvantaged and food-insecure regions, with five of the reports being from lower middle-income countries and two from upper middle-income countries (Jamaica and Iran); only two were from a high-income country (China).

Inconsistencies were noted in the effect of school feeding programmes on weight. For example, only female students gained weight in an Iranian SMP for students aged 6 to 8 (Rahmani et al., 2011); only younger students or undernourished students gained weight in a Kenyan school lunch programme for students aged 7; the smallest weight gain occurred for the most undernourished participants in a Vietnamese FM initiative for students aged 6 (Hall et al., 2007). Powell et al. (1998) further also found that although students (aged 7–10) participating in a free breakfast programme in Jamaica showed improved weight and height relative to the control group, a subgroup effect indicated that greater improvement occurred among adequately nourished participants than among undernourished participants (and more so in girls than in boys). Such inconsistencies with regard to the impact of school feeding programmes on growth are reflected in the peer-reviewed literature (Kristjansson et al., 2007). However, grey literature reviewed in this analysis appear to report more consistent findings with regard to positive anthropometric changes, with findings from all eight countries reviewed (mostly lower middle-income countries) pointing to improved anthropometric measures such as weight, height, BMI, stunting and wasting (Elmusharaf et al., 2014; Land O'Lakes, 2005, 2014; Tetra Pak, 2019). These findings align with those of the large SEANUTS study, which assessed the dairy intake and nutrition status of children between 1 and 12 years old in Indonesia, Malaysia, Thailand and Vietnam (Nguyen Bao et al., 2018), indicating that milk or dairy intake has a positive impact on weight and height as growth metrics. A controlled trial review by De Beer (2012) further concluded that evidence indicates that dairy intake stimulates linear growth in children and adolescents between 2 and 18 years.

Despite the positive impact on weight described here, and the prevalence of overweight and obesity among children and adolescents being noted as a public health concern in many high-income countries (Aliyar et al., 2015), anthropometric measures of overweight or obesity were not highlighted in any of the assessments of national programmes. The study by Powell et al. (1998) might give pause, because it noted that adequately nourished students gained more weight (and increased their BMI more) than undernourished students, but the perspectives of the authors was that of nutritional benefit and growth. In addition, a recent review of the literature (Dougkas et al., 2019) concludes that dairy products are not associated with obesity or other indicators of adiposity in children, and that this generally holds true no matter the dairy product type or fat content.

As noted previously, less peer-reviewed evidence supports the impact of school milk initiatives on intake or status of other nutrients or nutritional markers, owing to inconsistent findings and the small number of relevant studies. However, these controlled trials do note positive findings, such as improvement in nutrient levels (such as of vitamin B12 or zinc) (Kuriyan et al., 2016; Lien Do et al., 2009), maintenance of or smaller decreases in marker levels (such as for haemoglobin and iodine) (Kuriyan et al., 2016; Sazawal et al.,

2013), and reduced prevalence of deficiency (for example, iron deficiency) (Kuriyan et al., 2016) in treatment groups relative to control groups. A report by Tetra Pak on the nutritional impacts of school milk/nutrition programmes (Tetra Pak, 2019) noted improvements in anaemia (reflective of haemoglobin levels) among participants in two of the eight programmes (Dominican Republic and Sudan), although the levels were not compared with those of controls, and the improvement in Sudan did not reach significance.

Only three studies (Kruger et al., 2017; Marsh et al., 2018; Rahmani et al., 2011) reviewed in the current analysis assessed the nutritional impact of a dedicated SMP (that is, a programme that provides milk to students for direct consumption, and not as part of a snack or meal). A fourth study (Hendrie et al., 2013) is a literature review of the effectiveness of dairy interventions (and included an SMP). However, each of these studies found a positive nutritional impact of the programme. Marsh et al. (2018) noted that the number of students meeting their milk and milk product recommendations increased from 72% before the programme was implemented to 94% after implementation. Rahmani et al. (2011) found that only female students improved their weight through participation in the SMP (and no changes in height or mid-arm circumference were noted for girls or boys), However, the study lasted only three months, which may not have been long enough to see notable changes in growth, especially if the students were not undernourished. Kruger et al. (2017) reported that at one-year follow-up, 98% of students who participated in the SMP were consuming at least two servings of milk per week, compared with 85% of the control group. Hendrie et al. (2013) concluded that interventions that target an increase in children's intake of dairy foods or calcium, especially those that provide a dairy food directly, could potentially increase children's dairy food intake by about one serving daily.

The small number of SMP studies, plus the recognition that many school feeding programmes specifically provide milk or milk products, prompted the inclusion of peer-reviewed studies of such programmes in the current analysis. In addition, although interventions that provide students with micronutrient-fortified milk might not be considered a regular SMP, they do have a similar objective, namely to effect a nutritional impact (and often also students' preference for and attitude towards drinking milk). The increase in scope resulted in a total of 35 peer-reviewed studies being included, each reporting a significant finding that supports the nutritional impact of providing milk to students at school. Further, close to two-thirds of the studies (n/N = 22/35; 63%) were reviews, randomized controlled trials or controlled trials, which strengthens the weight of the evidence. However, in general, the aim of this review was to identify and characterize the current body of evidence regarding the nutritional impact of school milk initiatives.

While nutritional impacts have been a primary consideration for providing milk at schools, the FAO report of 2013 indicated that educational, agricultural and economic goals historically have also been a driving force in these programmes (Food and Agriculture Organization, 2013). However, this seems to be changing, as indicated by the increase in national school feeding programmes and nutritional guidelines for school meals to help ensure the quality, adequacy and nutritional composition of foods provided at school (Food and Agriculture

Organization, 2019). These changes, and the impetus that provides for evaluating school meals, are likely reflected in the observation that only 12 of the studies included in this review are from 1990 to 2009, while 22 are from 2010 to June 2019. This may bode well for the body of evidence demonstrating the positive nutritional impact of school milk initiatives, but only if the initiatives are evaluated by well-designed studies that include specific metrics focused on milk-related nutritional impacts.

Conclusion and recommendations

Milk or dairy is provided to children and adolescents for consumption at school via SMPs, school breakfast or lunch programmes, or initiatives that provide micronutrient-fortified milk. There is good evidence that school milk initiatives have a positive impact on milk and dairy intake, calcium and vitamin D intake or status, and anthropometric measures. The evidence regarding the impact on intake or status of other nutrients, other nutritional markers and bone or dental health is less strong, owing to less research or inconsistent findings.

Research shows that many children and adolescents are not achieving the recommended intakes for milk or dairy foods and milk-related nutrients, and nutrition experts agree that school feeding programmes can have a positive effect on child and adolescent nutrition and health outcomes. School milk initiatives are thus well positioned to positively impact dietary habits and nutritional status of children and adolescents. However, the current review identified gaps and issues of implementation and evaluation of such initiatives. The recommendations listed here aim to (1) address gaps and issues to improve the efficacy of school milk initiatives in achieving nutritional impacts related to milk or dairy consumption, and (2) improve the quality and quantity of evidence demonstrating the positive nutritional impact of school milk initiatives.

- Every programme needs to identify specific milk-related nutrition objectives and that respect best practices with regard to marketing to children.
- Based on objectives, specific nutrition metrics related to milk consumption need to be developed, to measure whether the objectives have been achieved. This includes short-term, medium-term and long-term objectives (for example, whether participants will continue to consume milk and dairy as adults).
- Programme administrators should plan to include metrics that can be used to assess intakes or status of dairy-related nutrients, as well as accurate records of consumption, to validate both nutrient intake and food group intake (which supports milk and dairy as an important source of those nutrients).
- Metrics should be collected and monitored regularly, and regular, well-designed evaluation of metrics should be performed to assess whether objectives are being met (including comparisons of metrics before and after implementation, and relative to a control group). Administrators should include a plan to identify, and subsequently address, issues when objectives are not being met, and continue to monitor progress.
- Regular input or feedback from the target group is needed to ensure successful uptake and effectiveness of the programme (including the potential barrier of cost to participants).
- Explicit educational and behaviour strategies relevant to the target group should be considered to support uptake, effectiveness and maintenance of milk consumption habits.
- Administrators should plan for sustainability and therefore long-term implementation of a programme to ensure effectiveness.
- Sharing evaluation processes and findings will build credibility, support other programmes and raise awareness of effectiveness.
- Administrators should advocate for evaluation of existing school milk initiatives, including the collection and monitoring of metrics related to milk and dairy nutrition.

TABLE 4: Reviewed studies organised by country and noting student age, type of programme and type of nutritional impact. Light-shaded rows represent lower middle-income countries, unshaded rows represent upper middle-income countries, and dark-shaded rows represent high-income countries, as per World Bank 2019 classification.

Country	Studies	Student age (years)	Programme type	Milk intake	Calcium	Vit D	Other nutr	Anthro	Other markers	Bone/ dental	Other
Bangladesh	Sazawal et al., 2013	6–9	FM				x	x	x		
Canada (Far North)	Gates et al., 2013	10–14	Snack	x	x	x					
	Skinner et al., 2012	10–18	Snack	x	x	x					
China	Du et al., 2004	10–12 (girls)	FM		x	x		x		x	
	Zhu et al., 2006 (follow-up to Du et al., 2004)	13–15	FM					x		x	
Great Britain	Harrison et al., 2013	9–10	SLP	x							
	Hendrie et al., 2012	5–12	Dairy inter-ventions	x							
	Stevens et al., 2013	11–18	SLP	x	x						
India	Khadgawat et al., 2014	10–14	FM			x					
	Kuriyan et al., 2016	7–10	FM				x		x		
Indonesia	Bardosono et al., 2009	7–9	FM					x			
Iran	Neyestani et al., 2013	9–12	FM			x					
	Rahmani et al., 2013	6–8	SMP					x			
Jamaica	Powell et al., 1998	7–10	SBP					x			
Japan	Kohri et al., 2016	9	SLP		x					x	
	Nozue et al., 2013	10–11	SLP		x						
Kenya	Murphy et al., 2003	7	SLP	x	x		x				
	Neumann et al., 2007	7	SLP					x			
Morocco	Benjeddou et al., 2019	7–9	FM			x					
	Zahrou et al., 2016	7–9	FM				x				
New Zealand	Marsh et al., 2018	7–9	SMP	x							
	Kruger et al. 2017	5–10	SMP	x				x		x	
Philippines	Trinidad et al., 2015	6	FM			x			x		
Thailand	Mariño et al., 2016	12	FM							x	

PROGRAMME TYPE: SMP = school milk programme; SBP = school breakfast programme; SLP = school lunch programme; FM = fortified milk (for micronutrient supplementation)

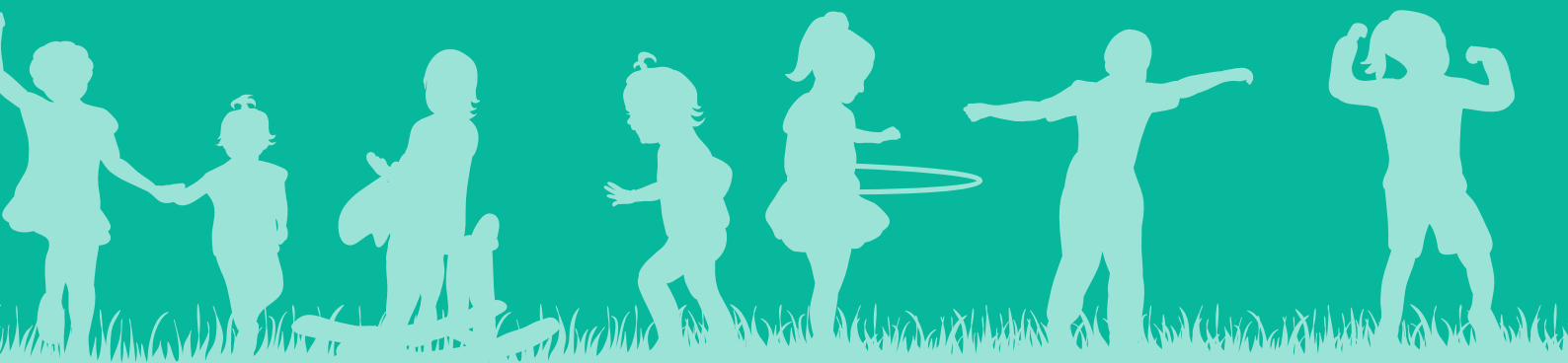
TYPE OF NUTRITIONAL IMPACT: Milk intake = milk/dairy intake; Calcium = calcium intake/status; Vit D = vitamin D intake/status; Other nutr = other nutrient intakes; Anthro = anthropometric measures; Other markers = other nutrition markers; Bone/dental = bone and dental health indicators; Other = other metrics

Country	Studies	Student age (years)	Programme type	Milk intake	Calcium	Vit D	Other nutr	Anthro	Other markers	Bone/ dental	Other
United States	Au et al., 2018	4–15	SBP/SLP	x							
	Clark & Fox, 2009	5–18	SLP		x						
	Condon et al., 2009	5–18	SBP/SLP	x							
	Crepinsek et al., 2006	8–11	SBP	x	x		x				
	Cullen & Chen, 2017	5–18	SBP/SLP	x							
	Cullen et al., 2011	11–13	SLP	x	x						
	Friedman & Hurd-Crixell, 1999	5–12	SBP		x						
	Wordell et al., 2012	12–13	SLP	x							
Vietnam	Hall et al., 2007	6	FM					x			
	Lien Do et al., 2009	7–8	FM				x	x			x
Not specific (review)	Bánóczy et al., 2013	Not specific	FM							x	

PROGRAMME TYPE: SMP = school milk programme; SBP = school breakfast programme; SLP = school lunch programme; FM = fortified milk (for micronutrient supplementation)

TYPE OF NUTRITIONAL IMPACT: Milk intake = milk/dairy intake; Calcium = calcium intake/status; Vit D = vitamin D intake/status; Other nutr = other nutrient intakes; Anthro = anthropometric measures; Other markers = other nutrition markers; Bone/dental = bone and dental health indicators; Other = other metrics

Notes



Notes I: Survey Template

Copy of original survey circulated to respondents in 2019

MILK AND MILK PRODUCTS IN SCHOOLS 2019

AIM AND OBJECTIVES OF THE SURVEY

AIM:

- To describe the current nature and scope of School Milk Programmes in different countries/states/cities.

OBJECTIVES:

- To outline the (A) logistics, (B) economics, (C) nutrition aspects and (D) marketing of the SMPs used, so as to guide others who wish to extend or start their own programme.
- To compare (where feasible) the development of the programmes worldwide.

WORKING DEFINITIONS:

In this survey, a SMP is defined as a programme in which any type of milk (whole, semi-skimmed or low-fat) or milk products from animals such as but not limited to cows, buffalo, sheep, goats or camels are made available at schools.

The survey consists of two parts.

Part 1: Questions about the overall scope and nature on the programme

Part 2: Specific questions related to

A – Logistics

B – Economics

C – Nutritional aspects

D – Marketing

Name of your country.....

Name of your organisation/institution.....

Your name.....

Title .....

Email .....

Where is the programme you are commenting on implemented (country/state/city)?.....

.....

Please provide the source you will be using with reference to the data you will be providing. .....

.....

Your national currency.....

Approximate exchange rate to the US dollar.....

PART 1: OVERALL SCOPE AND NATURE

1. a) Is there a school feeding programme (SFP) in your country/state/city?

Yes ☐

No ☐

2. a) Are milk and milk products (milk, yogurt, cheese, fermented dairy, etc.) served in schools in your country/state/city? This can be: as part of a school feeding programme (SFP); in addition to an SFP; or as a dedicated school milk programme (SMP).

Yes, as part of a school feeding programme (SFP) ☐

Yes, in addition to a school feeding programme (SFP) ☐

Yes, as a dedicated school milk programme (SMP) ☐

Milk or milk products are not served in schools ☐

b) If no, the survey stops here. Please indicate whether there are plans to introduce an SMP.

.....

.....

c) If yes, what are the recommended number of servings for milk per day or per week per child? If per week, please indicate the frequency

☐ ml per day OR ☐ ml ☐ × per week

3. a) Which dairy products are available in schools in your country or district?

	Yes	No	Long-life	Chilled
Plain whole milk	☐	☐	☐	☐
Plain semi-skimmed milk	☐	☐	☐	☐
Plain skimmed milk	☐	☐	☐	☐
Buttermilk	☐	☐	☐	☐
Chocolate milk	☐	☐	☐	☐

	Yes	No	Long-life	Chilled
Other flavoured milk	☐	☐	☐	☐
Flavour additives	☐	☐	☐	☐
Lactose-reduced milk	☐	☐	☐	☐
Lactose-free milk	☐	☐	☐	☐
Organic milk	☐	☐	☐	☐
Other types of milk	☐	☐	☐	☐

(specify) .....

Yogurt	☐	☐	☐	☐
Cheese – fresh	☐	☐	☐	☐
Cheese – processed/hard	☐	☐	☐	☐
Other products	☐	☐	☐	☐

(specify) .....

b) Does your country participate in any milk promotion initiatives on an ad hoc basis (e.g. World School Milk day)?

Yes ☐

No ☐

c) If yes, please provide more detail.

.....

.....

4. a) Please indicate which programme you will be reporting on

SFP ☐

SMP ☐

b) Who implements the programme? (More than one option is possible.)

Schools ☐

Communities/local governments ☐

National government ☐

Dairies ☐

Distributors ☐

National Dairy Council (or equivalent) ☐

Other (specify).....

c) If government is involved, which entities are responsible for managing the programme and/or distribution of milk and milk products at schools? (More than one option is possible.)

Ministry of Agriculture or Livestock ☐

Ministry of Education ☐

Ministry of Health ☐

Municipality ☐

Regional government ☐

Other (specify).....

5. Is the programme aimed at specific socio-economic target groups?

Yes ☐

No ☐

If yes, please elaborate.....

.....

6. At what age group is the programme targeted? (Select all that apply.)

Nurseries/kindergarten (younger than 5 years) ☐

Primary schools (5–11 years) ☐

Secondary schools (12–17 years) ☐

7. How many children are eligible for receiving milk as part of your programme?

Total number of children: .....

Number of children as a percentage (%) of total number of schoolgoing children in the same age group of the specific country the survey relates to: .....

8. What are the main objectives of the programme?

(If more than one, rank in order of importance, with '1' indicating the most important objective.)

Promoting local production of milk ☐

Serving as an avenue for surplus milk supply ☐

Improving child health and nutrition ☐

Improving scholastic performance ☐

Attracting children to school (increased enrolment and attendance) ☐

To provide milk to schools in the absence of government subsidy or intervention ☐

Any other objective (specify) .....

9. Do you have any studies or surveys (data) showing whether the programme objectives are achieved or what the impact of the programme is?

Yes ☐

No ☐

If yes, please provide further details. (Please provide references or upload documents)

.....

.....

10. What do you consider to be the most important problem in your country regarding promoting or providing milk and milk products at schools?

.....

.....

11. Is there any published material relating to the use of milk and milk products in schools in your country (e.g. website information, information packs, articles, statistics, etc.)? Please provide references or attach copies to the questionnaire.

I am not aware of any applicable material. ☐

I have provided references to/attached applicable material. ☐

References

.....

.....

PART 2: PRACTICAL INFORMATION

The questions in this part of the survey are applicable should you be able to provide us with information on the four topics specified. Answers will depend on the participation of your country/state/city in a programme, the period the programme has been running for and available information, and will be valuable in providing information to members who want to extend or start their own programme.

The questions in this section relate to the following aspects of programmes:

A. Logistics
B. Economics
C. Nutritional aspects
D. Marketing

You may complete any or all of the sections.

A. Logistics

1. What does the milk industry in your country provide as part of their involvement in the programme? (Tick as many boxes as appropriate.)

The industry provides:

Refrigerators ☐

Dispensers ☐

Milk bars ☐

Incentives/promotions ☐

Special payments ☐

Sponsorship ☐

Educational resources (e.g. info packs, lessons) ☐

Internet sites ☐

Others (specify) .....

.....

2. How is milk procured for the prgoramme? (More than one option is possible.)

- By direct negotiation with suppliers ☐
- Central national procurement (by government or a national body) ☐
- Central regional procurement (by regional government or a municipality) ☐
- Local procurement by schools ☐

3. a) How are the milk and milk products of the programme distributed at schools? (Tick as many boxes as applicable.)

- Handed out in classrooms ☐
- Vending machines (outside school restaurants/classroom) ☐
- Available in school restaurants ☐
- Brought to school from home ☐

Other (specify).....

b) Who usually distributes milk and milk products at school?

- Concierge/janitor ☐
- Teachers ☐
- Pupils ☐
- Parents ☐
- Elderly/pensioners ☐
- Staff in restaurant/shop ☐
- Milk man (milk delivery service) ☐

Other (specify).....

4. Which cost model is used to make milk and milk products available to recipients at schools? (Tick one box only.)

- Free of charge ☐
- At a subsidised cost ☐
- Mixed by sliding scale ☐
- At full cost ☐
- Don't know ☐

Other (specify).....

5. a) **If the milk or milk products provided are subsidised, please indicate who provides the subsidy.**

- International organisation (e.g. WFP, Foundations, etc.) ☐
- European Commission ☐
- National government ☐
- Local government/municipality ☐
- Dairy processors ☐
- Dairy farmers ☐
- Donor support ☐

Other (specify).....

b) **Which products are subsidised? (Indicate all the appropriate products.)**

- Whole milk (white) ☐
- Semi-skimmed/low-fat milk (white) ☐
- Flavoured milk ☐
- Yogurt ☐
- Cheese ☐
- Fermented milk ☐

Other (specify).....

c) **Other comments regarding funding of milk at schools:**

.....

6. a) **What package types (e.g. carton, plastic, glass) are commonly used?**

Most commonly used packaging: .....

Next most commonly used packaging:.....

b) **What pack sizes are commonly used?**

Most common pack size.....(unit)

Next most common pack size .....(unit)

Most common serving size .....(unit)

Next most common serving size .....(unit)

c) Which is the more common type of serving temperature used?

Long life ☐

Chilled ☐

d) What other food safety measures are taken to ensure the safety of milk and milk products in the programme?

.....

.....

7. How much of the milk used in the programme is mandatory to be sourced locally? ..... **%**

8. a) If statistics are available with regard to wastage of products (e.g. products not consumed by or exceeding the 'use by' date, damaged or leaking packages), what percentage of supply is wasted?

.....

.....

b) How do you optimise the supply of milk and milk products?

Please provide further information

.....

.....

c) Is a recycling or collection programme in place for packaging material (e.g. for used carton or plastic containers)?

.....

.....

d) Are statistics, studies or reports available about handling of packaging waste from programmes? If so, please provide them.

.....

.....

A. Economics

For question 1, please:

(i) express prices in your own currency

(ii) use the most common pack size as stipulated in A.6(b)

(iii) specify the type of milk (e.g. whole, semi-skimmed/low-fat or skimmed milk/fat-free).

1. a) How much do recipients pay for a serving of milk at school? (Note that this can be zero if the product is made available free of charge.)

Price: .....

Pack size: .....

Type of milk: .....

b) How much does an organising or funding body (e.g. school/government) currently pay for a serving of milk available in schools?

Price: .....

Pack size: .....

Type of milk: .....

c) What is the current average retail price in your country for a litre of milk?

Price .....

Type of milk .....

2. Specify the (approximate) total volume of milk distributed at schools as part of the programme in your country over the last 5 school years.

Total volume per year in litres:

2018 [ ] L

2017 [ ] L

2016 [ ] L

2015 [ ] L

2014 [ ] L

3. **How much of your country's total milk sales are represented by a school programme? (Express as a percentage of total sales.)**

.....%

B. Nutritional aspects

1 a) **Was evidence used to justify the investment in a programme from a nutritional perspective?**

Yes ☐

No ☐

b) **If yes, what kind of evidence? (Select all that apply.)**

Children's food consumption data from the country or local area (nutrient gaps) ☐

Children's nutrition status from the country or local area ☐

International evidence on effectiveness of programme to i mprove the nutritional outcomes of schoolgoing children ☐

Other .....

2. **How are milk products served or consumed at school? (Tick as many boxes as appropriate.)**

As a beverage ☐

As part of lunch ☐

As a snack ☐

3. a) **Are the following drinks available for consumption in schools? (Tick as many options as appropriate.)**

	Yes	No	Don't know
Carbonated drinks/sodas	☐	☐	☐
Pure fruit juice (100%)	☐	☐	☐
Tea	☐	☐	☐
Coffee	☐	☐	☐
Water	☐	☐	☐

Other (specify).....

b) **What is the most popular alternative to milk, how much does it cost a pupil, what is the pack size and how can it be obtained?**

Product: .....

Price:.....

Pack size.....

Source of availability (cafeteria, vending machine...).....

4 a) **Does the programme form part of a larger school nutrition programme?**

Yes ☐

No ☐

b) **If yes, what other components are included in the programme?**

Home-grown school feeding ☐

School meal guidelines ☐

Nutrition education ☐

Other .....

.....

b) **If nutrition education is included, is it delivered:**

As part of the national school curriculum? ☐

As an extracurricular activity? ☐

As a specific time-bound programme? ☐

A mix of the above? ☐

Other .....

.....

D. Marketing

1. a) **What nutritional claims regarding milk and milk products does your company or organisation use when promoting milk at schools? (Tick as many boxes as applicable.)**

Milk and milk products are a source of calcium. ☐

Milk is a source of protein. ☐

Milk is a source of vitamins. ☐

Milk is a source of minerals. ☐

Milk forms part of a healthy diet. ☐

Milk forms part of a balanced diet. ☐

Milk provides energy. ☐

Milk helps with growth. ☐

Milk tastes good. ☐

Other (specify).....

.....

b) Who does your company/organisation target in their programme-related promotional activities? (Tick as many boxes as applicable.)

- Parents ☐
- Teachers ☐
- Learners/Pupils ☐
- Nutritionists ☐
- Education authorities ☐
- Others (specify) ☐

.....

c) Which communication channels do you use in your promotional activity?

- Social media ☐
- Personal visits ☐
- Direct mail ☐
- Advertising ☐
- Communication with school dining room manager ☐
- Communication with school nutritionist ☐
- Others (specify) ☐

.....

.....

Notes II: Survey Results

Results of survey can be extracted in a separate folder on the IDF catalogue
https://store.fil-idf.org/product/school-milk-programmes-2020/

Notes III: References

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