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Research report

Intra-household use and acceptability of Ready-to-Use-Supplementary-Foods distributed in Niger between July and December 2010 [☆]

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ABSTRACT

Few studies have looked at consumption of Ready-to-Use-Supplementary-Foods (RUSFs) during a nutritional emergency. Here, we describe the use and acceptability of RUSF within households in four districts of the region of Maradi, Niger during large scale preventive distributions with RUSF in 2010 targeted at children 6–35 months of age. Our study comprised both quantitative and qualitative components to collect detailed information and to allow in-depth interviews. We performed a cross-sectional survey in 16 villages between two monthly distributions of RUSF (October–November 2010). All households with at least one child who received RUSF were included and a total of 1842 caregivers were interviewed using a structured questionnaire. Focus groups and individual interviews of 128 caregivers were conducted in eight of the selected villages. On average, 24.7% of households reported any sharing of RUSF within the household. Sharing practices outside the household remained rare. Most of the sharing reported occurred among children under 5 years of age living in the household. On average, 91% of caregivers in all districts rated the child's appreciation of the products as good or very good. Program planning may need to explicitly accounting for the sharing of products among children under 5 within household.

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Introduction

Strategies that rely on ready-to-use-therapeutic-foods (RUTFs) have proven effective in the treatment of moderate and severe acute malnutrition (Ciliberto et al., 2005; Dossou, Ndour, Briend & Wade, 2003; Manary, Ndekha, Ashorn, Maleta, & Briend, 2004; Matilsky, Maleta, Castleman, & Manary, 2009; Sandige, Ndekha, Briend, Ashorn, & Manary, 2004). Similarly, distributions of

Abbreviations: CIOMS, Council for International Organizations of Medical Sciences; FCFA, Franc Communauté Financière Africaine; HCW, health community workers; MSF, Médecins Sans Frontières; MUAC, Mid-upper arm circumference; RUSF, Ready-to-Use-Supplementary-Food; RUTF, ready-to-use-therapeutic-food; TFC, Therapeutic Food Centre; UNICEF, United Nations International Children's Emergency Fund; WFP, World Food Program.

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Ready-to-Use-Supplementary-Food (RUSF) have been shown to reduce moderate and severe acute malnutrition (Adu-Afarwuah et al., 2007; Defourny et al., 2009; Kuusipalo, Maleta, Briend, Manary, & Ashhorn, 2006; Patel et al., 2005). Even with these developments, more than 20 million children still develop severe acute malnutrition (SAM) and more than 36 million develop moderate acute malnutrition (MAM) in the developing world every year, resulting in considerable morbidity and mortality (Black et al., 2008).

Few studies have looked at consumption of RUSF during an intervention and investigated caregiver perceptions of RUSF, sharing practices or acceptability. Results from these studies suggest that RUSF is well-accepted by children (Adu-Afarwuah et al., 2008) and does not replace the consumption of other foods or breast milk (Flax et al., 2009, 2010; Galpin et al., 2007). However, because caregiver knowledge, attitudes, and practices of RUSF have an effect on the potential benefits of nutritional supplements, an improved understanding of these questions will be critical for future interventions.

The fifteen million people of Niger (SNIS, 2010), a landlocked country in the Sahel region of Africa, face recurring malnutrition. While the south-central part of the country bordering Nigeria is considered the “bread basket” of the country because of high crop yields, it has reported some of the highest rates of malnutrition in the country over the past decade. Household food production is

linked to rain-fed agriculture, with staple crops such as millet and sorghum harvested annually in September and October. Every year, people experience a decrease in food quantity and quality in the months leading up to the harvest (also known as the “hunger gap”) which is associated with an increase in wasting among children. Numerous nutritional interventions have been implemented in the region using different strategies and nutritional products. (Isanaka et al., 2009; Isanaka et al., 2010; Lapidus et al., 2009; Nackers et al., 2010).

From July to November 2010, RUSF (Plumpy'doz® or Supplementary'Plumpy®) was provided to children in the Maradi, Tahoua and Zinder regions of Niger in large-scale, targeted distributions intended to prevent moderate and severe acute malnutrition. Here, we describe the use and acceptability of RUSF within households in four districts covered by the distribution program. Our study comprised both quantitative and qualitative components. A mixed methods study was chosen to collect detailed information and to allow in-depth interviews. The specific objectives were to identify perceptions, beliefs, social norms and opinions of RUSF among caregivers and to collect information on sharing practices within and outside of the household and on the social pressures experienced.

Methods

The World Food Program (WFP), Médecins Sans Frontières (MSF), three non-governmental organizations registered in Niger (Forsani, Adra and Befen) and the United Nations International Children's Emergency Fund (UNICEF) collaborated in conducting distributions of RUSF and family protection rations on a monthly basis between July and October 2010. The target population and types of products distributed varied by agency and geography. RUSF (Plumpy'doz®, Nutriset, Malaunay, France) was distributed monthly at 250 kcal/day to all children 6–23 months old along with a family protection ration (50 kg cereals, 7.5 kg beans and 3 kg of oil) in Madarounfa, Madaoua and Guidan Roudji districts. In Mirriah district, another RUSF (Supplementary'Plumpy®, Nutriset, Malaunay, France) was distributed monthly at 500 kcal/day to children 6–35 months of age with moderate acute malnutrition or at risk of malnutrition (defined as Mid-upper arm circumference (MUAC) between 115 mm and 134 mm) without any family protection ration (see Table 1 for additional information on RUSF formulations). Further details on the interventions are reported elsewhere (Grellety et al., in press).

We performed a cross-sectional survey in 16 villages (4 in each district) between two monthly distributions of RUSF. First, we stratified villages into two strata based on accessibility defined as presence or absence of a health centre, market, water point, or main road within a 10 km radius (Kalsbeek, 1998). Second, villages within each strata were selected using cluster-based sampling, proportional to population size, within the four districts with RUSF distributions. All households in the selected villages were eligible for inclusion in the study. Households were defined as: a group of people living under the same roof; sharing meals on a regular basis; and with at least one child who received RUSF during the most recent distribution. A minimum sample size of 342 children per district was calculated based on an assumed acceptability of 80%, a precision of 6%, an alpha risk of 5% and a design effect of 2.

Data collection

After agreeing to participate in the study, caregivers were interviewed using two different questionnaires: one questionnaire addressing questions at the household level concerning use of products within the household including sharing and knowledge related to RUSF, and a second questionnaire addressing practices

Table 1

Nutritional composition of Plumpy'doz® and Supplementary'Plumpy® distributed from July to November in 2010 in Niger, per unit energy and per daily intake.^a

Component	Supplementary'Plumpy® (technical file – 02/09)		Plumpy'doz® (technical file 02/10)	
	Per daily intake	Per 100 grams	Per daily intake	Per 100 grams
Quantity, g	92	–	46.3	–
Energy, kcal	500	550	247	587
Protein, g	12.5	15	5.9	13.3
Protein, %kcal	10	10	10	12
Lipid, g	32.9	38	16	36.2
Lipid, %kcal	60	60	58	60
Potassium, mg	511	610	310	737
Magnesium, mg	85	101	60	142
Phosphorus, mg	276	330	275	653
Zinc, mg	12.9	15	9.0	21.3
Calcium, mg	276	330	387	920
Selenium, µg	28	33	0.17	0.41
Iron, mg	10.6	12.6	9	21.3
Iodine, µg	92	110	90	214
Copper, mg	1.6	2	0.3	0.7
Manganese, mg	–	–	0.17	0.41
Thiamine, mg	0.6	1.2	0.5	2.2
Riboflavin, mg	1.7	2	0.5	1.32
Niacin, mg	5	5.8	6	14.8
Pantothenic acid, mg	2.9	3.4	2.0	0.6
Pyridoxine, mg	–	–	–	–
Folic acid, µg	193	252	160	432
Vitamin B6, mg	0.6	0.7	0.5	1.32
Vitamin B12, µg	1.7	2	0.9	2.5
Vitamin C, mg	49	132	30	162
Vitamin A, µg	840	1000	400	1037
Vitamin D, µg	15	22.4	–	–
Vitamin E, mg	18.4	25	6	16.8
Vitamin K, µg	19.3	25	–	–
Biotin	60	72	–	–

^a The daily intake was 1 sachet/day of Supplementary'Plumpy® (92 g) and 3 spoons/day of Plumpy'doz®(46 g).

and attitudes of each eligible child within the household. Sharing was defined as consumption of RUSF by anyone other than the intended beneficiary child, including the trade or sale of the product outside the household. A visual hedonic scale was used to assess a child's level of appreciation of the supplement, as estimated by the caretaker. This scale was a pictorial 5-point scale (from very bad to very good) utilizing “smiley” faces. Three teams of one nutritional assistant, one nurse assistant and one supervisor were trained on the study objectives and procedures for three days. The questionnaire was piloted in one village prior to implementation.

Focus groups and individual interviews of caregivers of children included in the distribution program were conducted in eight of the 16 surveyed villages. The eight villages were selected according to accessibility criteria (one per strata in each of the four districts). Within the selected villages, two group discussions involving six caregivers from 15 to 25 years of age (referred to here as “young mothers”) and six caregivers from 35 to 42 years, (referred as “experienced mothers”) were formed. To ensure the greatest possible diversity in the collected information, the selected participants came from diverse parts of the village and only one woman per household or compound was included in group discussions and individual interviews. Each group discussion lasted 60–90 min and followed an interview guide using open-ended or semi-directive questions. Discussions were conducted in a conversational style. Four individual interviews, two with young mothers and two with experienced mothers, were completed in each of the eight selected villages. Each interview lasted 60–90 min. All group discussions and individual interviews were recorded and transcribed in Hausa, and then translated into French and English. An

interview guide was used during the interviews on the same principle as the discussion guide. Two community health workers (CHW), within the same age range as the study participants, were trained on the study objectives and qualitative methods for five days prior to implementation.

Data analysis

Quantitative data were double entered into EpiData 3.1 software (EpiData Association, Odense, Denmark). The database was cleaned and analyzed using STATA 11 (StataCorp, College Station, TX, USA). The 95% confidence intervals were estimated using generalized equations to adjust standard errors for cluster effect at the district-level.

The content of the transcripts of group discussion and individual interview were analyzed using a list of codes defined before the start of data collection to include all themes related to the study objectives. In addition, to provide a richer analysis, we added additional codes for emerging themes that were not in the initial list. Both inductive and deductive codes were used to provide relevant information. They included beliefs and opinions, social pressures experienced in the use and social norms around RUSF. Social norms were defined as a rule of conduct in a society or social group reflecting the values and ideals of the dominant group. An initial content analysis was done on the first four transcripts to ensure harmonization of data collection in relation to the pre-defined topics. Content analysis was done manually throughout the study and the list of topics was expanded based on the data collected as relevant. In each zone, the most illustrative sentences of the opinions, perceptions, behaviors most frequently expressed were recorded, as well as examples of isolated and unique behavior (Denzin Norman & Lincoln Yvonna, 2005).

Ethical considerations

The National Consultative Ethics Committee of the Niger, Niger's Ministry of Public Health, and authorities in Tahoua, Maradi and Zinder approved the study protocol. The study was conducted in accordance with the principles of the Declaration of Helsinki and the International Ethical Guidelines for Biomedical Research Involving Human Subjects, published by the Council for International Organizations of Medical Sciences (CIOMS). Participation in the study was voluntary and did not affect household participation in the food distribution program. All children from 6 months to 5 years of age residing in selected households were measured for weight, height and MUAC, and checked for the presence of bilateral edema. Any child suffering from severe acute malnutrition or any medical condition was referred to the nearest Therapeutic Food Centre (TFC), hospital or health centre and transported if necessary. No ethnic or identifying information was encoded.

Results

The study took place between October 4, 2010 and November 9, 2010 in the districts of Madarounfa, Mirriah, Madaoua and Guidan Roundji, between two monthly distributions of RUSF. A total of 1842 caregivers was interviewed and 2209 children receiving the RUSF distributions were included in the cross-sectional survey (Table 2). A total of 128 caregivers were included in the qualitative component of the study: 32 caregivers participated in the focus group discussions or individual interviews in each of the 4 districts. We did not find difference in beliefs and opinions regarding RUSF between experienced and young caregivers and therefore results are pooled.

Table 2
Participants' characteristics in the cross-sectional survey by district of distribution, Niger, October–November 2010.

	Madarounfa	Mirriah	Madaoua	Guidan Roundji
No of villages	4	4	4	4
No of caregivers (N = 1842)	668	330	355	489
No of children (N = 2209)	763	412	462	572
Child characteristics	n (%)	n (%)	n (%)	n (%)
Age (months)				
6–23 (6–35 in Mirriah)	640 (84.0)	375 (91.3)	266 (52.7)	435 (75.8)
24 and more (35 and more in Mirriah)	123 (16.0)	37 (8.7)	196 (47.3)	137 (24.2)
Sex				
Male	384 (50.2)	192 (46.3)	247 (53.8)	269 (46.9)
Breastfed ≥ 6 months	449 (60.0)	201 (48.7)	158 (30.2)	259 (45.2)
Caregivers characteristics	n (%)	n (%)	n (%)	n (%)
Status				
Mother	559 (84.2)	322 (97.7)	297 (84.4)	477 (97.6)
Father	98 (14.9)	2 (0.7)	42 (11.3)	0
Other	5 (0.9)	6 (1.6)	11 (4.3)	12 (2.4)
Age (years)				
0–14	3 (0.5)	0	0	2 (0.6)
15–25	281 (51.2)	82 (49.4)	133 (53.5)	142 (42.9)
26–37	196 (36.7)	66 (40.3)	95 (35.2)	129 (39.0)
38–42	41 (8.0)	13 (7.9)	19 (8.1)	40 (12.1)
>42	19 (3.6)	5 (2.5)	7 (3.2)	18 (5.4)
Ever attended formal school (excluding koranic studies)	56 (7.9)	8 (2.3)	52 (15.7)	56 (11.3)
Household characteristics	n (%)	n (%)	n (%)	n (%)
Number of children < 24months in the household (<35months in Mirriah)				
0	160 (23.9)	12 (3.7)	132 (37.2)	186 (38.3)
1	439 (65.7)	198 (60.4)	209 (58.9)	272 (55.4)
2	59 (8.8)	99 (30.2)	12 (3.4)	30 (6.1)
3	7 (1.0)	17 (5.1)	2 (0.5)	1 (0.2)
≥4	3 (0.4)	2 (0.6)	0	0

Table 3
Sharing practices of distributed RUSF in the community, Niger October–November 2010.

	Madarounfa	Mirriah	Madaoua	Guidan Roundji
	N = 668	N = 330	N = 355	N = 489
	n (%)	n (%)	n (%)	n (%)
	[95%CI]	[95%CI]	[95%CI]	[95%CI]
	n (%)	n (%)	n (%)	n (%)
	[95%CI]	[95%CI]	[95%CI]	[95%CI]
<i>Consumption within household</i>				
RUSF consumed by beneficiary child only	538 (80.4) [77.3–100]	215 (65.1) [48.3–79.5]	257 (72.7) [56.0–90.4]	366 (75.4) [59.7–86.3]
RUSF consumed by children between 24 months (35 months in Mirriah) and 59 months old	113 (17.0) [15.2–25.9]	69 (20.9) [17.3–40.3]	59 (16.6) [10.2–52.0]	110 (22.2) [12.4–36.9]
RUSF consumed by children between 5 and 10 years old	12 (1.8) [0.4–10.3]	31 (1.6) [0.8–20.6]	28 (7.9) [2.1–10.6]	13 (2.4) [0.8–9.5]
RUSF consumed by children from 10 to 15 years old and by adults	3 (0.5) [0.0–4.3]	10 (3) [0.0–6.3]	4 (1.1) [0.0–9.8]	0
<i>Consumption outside household</i>				
RUSF shared outside household	2 (0.3) [0.0–3.1]	5 (1.6) [1.0–3.6]	7 (1.7) [0.0–6.3]	0

On average 24.7% of households ($n = 452$, 95%CI [14.5–51.6]) in the four districts reported any sharing of RUSF within the household. Sharing practices outside the household remained rare, with only several households responding that they shared among villages in surveyed areas. There were no reports of selling or exchanging RUSF outside the household. On average 93.8% of households reported RUSF was consumed by children less than 5 years old inside the household in the four districts (Table 3).

When sharing practices occurred, two key moments in time were identified as critical: when the mother returned from the distribution and when the beneficiary child received RUSF. When sharing occurred within the household, priority was given first to siblings (same father, same mother), then other children living in the household (half-brother, cousins) and in very few instances, adults (husband, grandparents) (Box 1).

Box 1: Selected excerpts from interviews and focus groups

“When I returned to the village, I opened a box of ‘koullou’¹ and distributed some to the children who greeted me. I kept the rest for my child.”

~ from an interview with experienced mothers, Madarounfa district

“When we brought the ‘biskit’¹ back, I opened a box and fed my child. My husband told me to continue feeding him ‘biskit.’ At about the same time, the child of my husband’s older brother arrived and my husband told me to give ‘biskit’ to him, as well, so I gave him some.”

~ from an interview with young mothers, Guidan Roundji district.

Caregivers described solidarity with other children in the household and members of the community at large and represen-

¹ “Koullou” “Biskit” are the denominations used in Hausa to talk about RUSF in the villages.

tation of children in the household as important drivers of sharing RUSF. Key factors identified for sharing the RUSF within household were encouragements and pressures perceived by the mothers. Indeed, during the groups and interviews, mothers were asked to talk about the management of the RUSF within the household, focused on their perception of how, for example, their family, friends help them or put pressure on them to share the RUSF with children (or adults) who didn’t receive or who were willing to eat it. Mothers reported these encouragements and pressures came from awareness campaigns and/or other adult family members living in the household. The lack of food present within the household was also mentioned as a factor influencing sharing practices (Box 2).

Box 2: Selected excerpts from interviews and focus groups

“If the beneficiary child has older brothers, we have to give them a little bit, because you cannot refuse to give the product to other children. Even if a neighbor’s child comes when I give the product to my child, I have to give a little bit to the child next door. If we don’t, he will tell his mother and that is not good.”

~ from an interview with young mothers, Madaoua district.

“When my husband is present, he asks me to give some to the other children [older brothers of the beneficiary child] but not the whole packet. If he thinks that the other children will cry, he tells me to give them a little bit of the product, but my husband does not tell me to give a full packet or to distribute the product to other children [not intended as beneficiaries].”

~ from an interview with young mothers, Mirriah district.

“During the second distribution they gave instructions that ‘koullou’ is not for all children, but only those who are less than two years of age – one spoon in the morning, one in the afternoon, and one in the evening. They also said that our children can grow, and be satisfied, even if we do not give them cereals. So we breast-fed them and if they are feeling well, they sleep peacefully. Two weeks later, they returned to control us and told us to bring the rest of the ‘biskit’. They found that we followed the instructions. If we had not only fed it to children less than two, they would have removed our village from the [distribution] list; even if just one woman didn’t follow instructions, they would have deleted all of us from the list.”

~ from an interview with experienced mothers, Madarounfa district.

“But hunger causes everybody to want to share any food received.”

~ from an interview with experienced mothers, Guidan Roundji district.

Mothers were the primary managers of RUSF stocks in 86% of households on average (95% CI [67.2–98.7]) in the four districts. They reported keeping RUSF in their personal possessions and reported that this was to avoid jealousy among other household members. “I am the only one who manages the product; my husband has nothing to do with it. I find a good place to hide the product, usually in my suitcase”² said experienced mothers in Madarounfa district.

Caregivers reported that 84.4% of beneficiary children on average in the four districts consumed RUSF at the correct daily dose (1 sachet/day for Supplementary Plumpy[®] and 3 spoons/day for Plumpy’doz[®]). Mothers did not report mixing RUSF with other products or food. Only the mother administered RUSF in 63.9% of the households on average in the four districts. The child was reported to self-administer RUSF with or without the help of the

² It is common in this region for women to receive a suitcase before their wedding. They bring it to their husband’s home on their wedding day and it contains all of the clothes, shoes, and other items that, in principle, are necessary for their life together. This suitcase is very important and normally only accessed by the woman

Table 4
Behaviors linked to RUSF consumption by the beneficiary child within households, Niger October–November 2010.

	Madarounfa N = 763 n (%) [95%CI]	Mirriah N = 412 n (%) [95%CI]	Madaoua N = 462 n (%) [95%CI]	Guidan Roundji N = 572 n (%) [95%CI]
RUSF sometimes given as snack	520 (69.5) [18.8–95.8]	281 (67.9) [16.9–52.3]	322 (67.2) [59.8–73.8]	382 (67.0) [47.9–81.7]
<i>Person feeding</i>				
Mother all the time	580 (76.2) [48.1–91.1]	277 (67.4) [16.1–54.6]	280 (60.9) [45.2–86.3]	295 (51.6) [45.9–54.0]
Mother and the child himself	164 (21.6) [8.9–51.8]	123 (29.9) [41.2–85.4]	137 (29.8) [22.1–42.6]	266 (46.5) [40.5–54.0]
Mother and another person	9 (1.2) [0.0–2.5]	3 (0.7) [0.1–2.8]	2 (0.4) [0.0–1.5]	2 (0.3) [0.3–0.4]
Other person all the time	6 (0.8) [0.0–1.3]	5 (1.3) [0.1–5.6]	4 (0.9) [0.2–1.9]	4 (0.7) [0.4–2.6]
Other person and the child himself	0 (0)	0 (0)	2 (0.4) [0.0–1.5]	4 (0.7) [0.4–2.6]
The child himself all the time	2 (0.3) [0.0–3.1]	3 (0.7) [0.1–2.8]	35 (7.6) [3.1–15.3]	1 (0.2) [0.0–7.5]
<i>Mode of consumption</i>				
RUSF plain	760 (99.7) [8.7–99.9]	403 (97.8) [96.8–98.5]	452 (97.8) [96.5–99.1]	570 (99.7) [86.1–100.0]
RUSF mixed with porridge	2 (0.3) [0.0–5.6]	9 (1.2) [0.0–5.0]	10 (2.2) [0.2–5.4]	2 (0.3) [0.0–13.9]
<i>Daily intake of RUSF</i>				
1 spoon (or 1 bag in Mirriah)	1 (0.1) [0.0–2.6]	294 (72.3) [63.0–80.1]	3 (0.3) [0.0–4.8]	5 (0.9) [0.0–15.9]
2 spoons (or 2 bags in Mirriah)	11 (13.6) [0.7–2.5]	94 (23.4) [17.3–30.6]	9 (1.7) [0.4–7.0]	9 (1.6) [0.9–2.9]
3 spoons (or 3 bags in Mirriah)	734 (96.3) [93.5–98.0]	16 (3.5) [1.3–8.8]	432 (95.5) [88.0–98.4]	552 (96.5) [89.8–98.8]
>3 spoons (or >3 bags in Mirriah)	16 (2.0) [0.5–3.9]	0 (0)	13 (2.1) [1.1–3.1]	6 (1.0) [0.0–16.3]
Some RUSF left over at the end of the day	44 (5.8) [2.1–15.4]	58 (14.1) [7.6–24.5]	25 (4.1) [2.3–7.4]	30 (5.1) [3.9–6.8]

caregiver in 34% of the households on average in the four districts. The portion of RUSF remaining in the household at the time of the interview was 9.6% on average in the four districts (Table 4).

On average 79.5% of households in the four districts said that awareness campaigns conducted during distributions were crucial for understanding RUSF's purpose, target population and dosage (Table 5).

Perceptions of RUSF as a medicine and/or vitamins were held by 69.1% of caregivers on average (95% CI [34.6–98.4]) in the four districts. To describe the supplements, many of those interviewed individually and in focus groups used words like “madara” or “madara yara” (milk in Hausa), “koullou” (peanut butter in Hausa), “plumpi,” “planti,” “plonti,” or “biskit” (which refers to ready-to-use-therapeutic-food (RUTF) products). RUSF was also perceived as food strictly reserved for young children, or “abinchi yara” in Hausa, by caregivers. A mother in Mafarounfa district said “It's “abinchi yara” [food for young children in Hausa] that we should not to share(. . .) But I can also say that it is a medicine because children quickly recovered their strength and appetite for other foods.”

Between 30.2% of children in Madaoua, where about half were over 24 months at the time of the survey, and 60% in Madarounfa district were reported to be breastfeeding (Table 2). Main reasons for weaning were reported as age of the child or the occurrence of another pregnancy. Individual interviews identified a belief among the Hausa mothers participating in this study that breastfeeding while pregnant puts the fetus at risk of an abortion and increases illness in the breastfed child because the breast milk is of poor quality. Thus in many cases, a mother may quickly wean a breastfed child when she discovers she is pregnant.

On average, 91% (CI 95% [60.0–99.5]) of study participants in all districts rated the child's appreciation of the products as good or

very good. On average 92.4% of respondents in the four districts noted an increased appetite and overall food intake in children who consumed RUSF. Increased breastfeeding in children consuming RUSF was reported in 75.7% of caregivers in the four districts (Table 6). Individual interviews and focus group discussions confirmed the overall positive perception of RUSF among caregivers. Mothers also described improvements of children's health and vitality subsequent to RUSF consumption. No serious allergic reactions were reported (Box 3).

Box 3: Selected excerpts from interviews and focus groups

“It makes kids gain weight and gives them a nice smooth skin and better health.”

~ from an interview with young mothers, Madarounfa district.

“They really like it [RUSF] because now they can run around, jump, and play with their friends.”

~ from an interview with experienced mothers, Madarounfa district.

“It builds up his body and gives him more of an appetite so he eats any food; that's why I said before that “plumpi” is a medicine.”

~ from an interview with experienced mothers, Mirriah district.

“You can find some children who do not eat “madara” but when they are given a little bit at a time, they eventually get used to it. Then the child has more of an appetite, and is begging for food in the morning when the other kids leave for school, so I give him some “madara yara.”

~ from an interview with young mothers, Madaoua district.

Table 5
Caregivers' knowledge related to RUSF, Niger October–November 2010.

	Madarounfa N = 668 n (%) [95%CI]	Mirriah N = 330 n (%) [95%CI]	Madaoua N = 355 n (%) [95%CI]	Guidan Roundji N = 489 n (%) [95%CI]
<i>To whom RUSF should be given?</i>				
To children only	651 (98.5) [87.2–99.8]	324 (98.8) [91.7–99.8]	340 (96.7) [89.5–99.0]	484 (99.1) [80.4–100.0]
To adults only	0 (0)	0 (0)	0 (0)	2 (0.4) [0.0–7.09]
To the whole family	9 (1.5) [0.2–12.8]	4 (1.2) [0.2–8.3]	15 (3.3) [1.0–10.5]	3 (0.5) [0.0–24.1]
<i>How much RUSF should be given per day?</i>				
1 spoon (or sachet in Mirriah)	1 (0.1) [0.0–2.8]	246 (74.6) [66.7–81.2]	3 (0.5) [0.0–7.2]	6 (1.3) [0.0–26.3]
2 spoons (or sachets)	9 (1.3) [1.0–1.6]	72 (22.1) [17.2–27.9]	8 (1.8) [0.8–3.9]	5 (1.0) [0.1–7.8]
3 spoons (or sachets)	642 (97.1) [93.0–98.8]	8 (2.0) [0.4–10.2]	328 (95.3) [90.6–97.7]	473 (96.7) [91.7–98.7]
More than 3 spoons (or sachets)	10 (1.5) [0.2–4.8]	4 (2.3) [0.1–6.7]	16 (2.4) [0.9–3.5]	5 (1.0) [0.0–13.4]
<i>What is the purpose of feeding your child RUSF?</i>				
To feed the child	40 (6.0) [2.1–45.3]	5 (1.5) [0.3–6.2]	13 (3.7) [0.5–6.9]	20 (4.1) [2.3–10.6]
To feed the whole family	0 (0)	0 (0)	0 (0)	2 (0.4) [0.0–6.4]
To prevent and/or treat malnutrition	606 (91.1) [81.2–96.8]	307 (93.0) [71.7–100.0]	319 (89.9) [81.6–100.0]	462 (94.6) [90.2–99.5]
Don't know	20 (3.0) [0.0–50.0]	18 (5.5) [1.4–18.2]	23 (6.5) [0.9–8.6]	5 (0.9) [0.3–2.6]
<i>Where did you obtain information regarding RUSF?</i>				
In the community	58 (8.7) 3.6–25.1	24 (7.1) [1.5–27.2]	62 (17.4) [3.2–40.6]	5 (1.1) 0.6–1.9
At the distribution point	452 (67.9) [51.4–90.9]	225 (68.4) [58.6–79.6]	239 (62.5) [35.6–80.1]	446 (91.3) 62.5–98.5
At the distribution point and in health center or TFC	42 (6.3) [5.6–17.4]	31 (9.4) [3.1–16.1]	17 (4.8) [3.1–11.2]	2 (0.4) [0.0–6.4]
In health center or TFC	105 (15.7) [5.1–40.8]	21 (6.3) [2.3–8.9]	48 (13.5) [5.6–16.3]	32 (6.2) [0.6–42.3]
No information received	8 (1.3) [0.2–5.4]	28 (8.8) [3.3–21.2]	6 (1.7) [0.4–2.3]	6 (1.2) [0.6–2.1]

On average 54.2% of the participants said they would buy Plum-py'doz[®] in the three districts where it was distributed if a box cost from 276 to 329 Franc Communauté Financière Africaine (FCFA) (\$0.6 to \$0.7 USD) while 40% of households in Mirriah said they would buy Supplementary'Plumpy[®] if it cost 117 FCFA (\$0.2USD) per sachet.

Discussion

To our knowledge, this is one of the first studies combining quantitative and qualitative components to describe the intra-household use and acceptability of RUSF distributed in a large-scale distributions. Overall, most caregivers reported that RUSF was primarily consumed by the beneficiary child and rated the child's acceptability as good or very good in all the study areas. Almost all of the low to moderate sharing reported across the districts occurred with children under 5 years of age within the same household. Supplements were perceived by many as having a positive impact on the child's health, vitality, and appetite, including on increased breastfeeding. The overall positive perception of RUSF is also reflected in the fact that many caregivers reported a willingness to purchase RUSF. They were willing to expend from 1 to 2 day's cash income (0.3–0.7 USD/day (Save the children, 2009)) every week to purchase the RUSF.

Few children were reported as having decreased appetite or decreased total food intake. Given the context, and although children were referred for medical care if showing clinical signs of illness, it

may be that these children had co-morbid conditions such as intestinal parasites or a chronic disease that could interact with RUSF consumption thereby impact food intake and appetite. Collecting additional information on this group of children using qualitative methods is certainly a direction for future research.

We did not find differences in the use and acceptability based on the district of distribution, the type of RUSF (Plumpy'doz[®] or Supplementary'Plumpy[®]) or on villages' distance to a health center, main road, water point, or market. Although we did not find statistically significant differences between districts in the quantitative component of our study or in the qualitative analysis, there may be differences between villages that we were unable to capture here. Unquantifiable and uncontrollable differences between villages may have existed. However, the inclusion criteria of villages were sufficiently strict in an effort to reduce these potential biases and the prevalence of global acute malnutrition, ethnic and cultural groups were comparable between study areas. Further, the low to moderate sharing reported here is comparable to previous studies in Somalia and Malawi, which also found sharing mainly among children under 5 years of age within the same household, as well as good knowledge of RUSF among caregivers and high acceptability among children and caregivers (Flax et al., 2009; Matilsky et al., 2009; Phuka et al., 2009; Prost, 2010).

Focus group and individual interviews gave a more nuanced picture where caregivers think of RUSF as both a food and medicine. In two districts, the term "yara abinchi," or "food strictly

Table 6
Beneficiary child attitudes towards RUSF consumption, Niger October–November 2010.

	Madarounfa N = 763 n (%) [95%CI]	Mirriah N = 412 n (%) [95%CI]	Madaoua N = 462 n (%) [95%CI]	Guidan Roundji N = 572 n (%) [95%CI]
<i>RUSF appreciation by beneficiary child</i>				
Good to very good	707 (93.3) [60.0–100.0]	348 (85.0) [70.7–92.8]	440 (97.2) [78.5–99.5]	503 (88.0) [79.2–99.3]
Indifferent	47 (6.2) [1.5–22.7]	59 (14.0) [6.5–27.8]	16 (2.5) [1.2–4.8]	69 (12) [5.3–25.3]
Bad to very bad	3 (0.4) [0.0–2.3]	4 (1.0) [0.0–5.9]	2 (0.3) [0.0–4.5]	0 (0)
<i>Change in appetite of the beneficiary child</i>				
Increase	725 (95.3) [83.6–98.8]	357 (87.1) [71.8–94.7]	447 (97.6) [95.3–98.8]	501 (87.7) [80.4–92.5]
Stable	2 (0.3) [0.0–3.1]	4 (0.9) [0.2–4.3]	2 (0.4) [0.0–5.2]	5 (0.8) [0.2–4.4]
Decrease	32 (4.4) [1.2–14.9]	51 (12.0) [4.3–29.2]	13 (2.0) [0.6–6.6]	66 (11.5) [6.6–19.1]
<i>Change in global food intake of beneficiary child</i>				
Increase	717 (94.8) [74.7–99.1]	352 (87.0) [73.2–94.2]	447 (97.6) [95.3–98.8]	498 (87.2) [79.6–92.2]
Stable	3 (0.4) [0.0–2.9]	4 (0.9) [0.2–4.3]	2 (0.4) [0.0–5.2]	2 (0.4) [0.2–4.4]
Decrease	34 (4.9) [0.8–23.3]	51 (12.1) [4.7–27.5]	13 (2.0) [0.6–6.6]	69 (12.0) [7.2–19.4]
<i>Change in breastfeeding of breastfed beneficiary child</i>				
Increase	365 (78.9) [45.7–94.3]	145 (73.1) [62.0–81.8]	116 (73.4) [50.8–88.0]	187 (72.5) [67.7–76.9]
Stable	56 (11.3) [3.0–34.3]	22 (11.1) [6.9–17.4]	25 (16.9) [11.0–25.1]	31 (11.9) [7.9–17.6]
Decrease	45 (9.7) [3.1–26.8]	33 (15.8) [7.4–30.6]	17 (9.7) [2.5–30.8]	40 (15.6) [10.0–23.5]

reserved for children” in Hausa was used to describe RUSF. In Niger, the perception of RUSF as a medicine or food was higher than in Malawi, where RUSF was mostly considered a food by caregivers. However, feeding patterns and behaviors related to RUSF consumption were also similar to those reported in previous studies (Flax et al., 2008, 2010; Galpin et al., 2007), adding further evidence that RUSF can be incorporated into the daily diets of children in different contexts without having a negative impact on other feeding habits like breastfeeding.

Respondents in our study reported high levels of social pressures: the fear of negative consequences for the entire community if one caregiver does not follow the instructions was highlighted in several districts. Including caregivers in the development and implementation of such targeted distributions program and give them a role in the settlement of rules and practices could help the community to take the ownership of such interventions and improve their potential benefits.

It is important to note that these results are only representative of the populations residing in the districts investigated. The quantitative component of the study was based on four cross-sectional using a questionnaire, and as in all studies of this kind, subject to response and recall bias. Data collection was based on reported data and not on direct observations of attitudes and practices related to RUSF within households. A study conducted in Malawi in 2009, based on repeated observations of practices within households showed sharing of RUSF greater than that reported in several previous studies in the same context (Flax et al., 2010). Such discrepancies between reported and observed practices have also been identified in other areas of interest and indicate that respondents may not report practices deemed inappropriate, particularly in a context of important social pressures (Curtis et al., 1993).

Sharing practices within households were difficult to document using quantitative methods. The use of individual interviews and focus group discussions, led by individuals close in age and culture

to caregivers, yielded more detailed information highlighting, for example, how caregivers defined sharing differently than the quantitative questionnaire. When caregivers spoke of “sharing” in the discussions, they understood it to mean when RUSF was given to children older than 5 or adults either inside or outside the household. This discrepancy may pose some difficulties in the interpretation and comparability of quantitative data available in the literature on RUSF sharing practices. Further studies using diverse methods including socio-anthropological approaches are needed to explore and describe the use of supplementary products within households given the impact such actions have on the effectiveness of targeted distribution programs.

The use of a structured questionnaire, individual interviews and discussion groups provided a detailed picture of the proper usage and high levels of acceptability of RUSF in four districts of Niger. Future preventive programs distributions should involve caregivers in the development and implementation of such programs. Results of this study suggest that program planning may need to explicitly accounting for the sharing of products among children under 5 within household as well as awareness campaigns specifically addressing issues of social pressure.

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