



A Case Study of Malnutrition Interventions Crecemos DIJO, Oaxaca, Mexico

Children are especially vulnerable to the negative impacts of malnutrition, and sustainable early interventions are vital to help children recover and lead healthy lives. AVSI's partnership with the Mexican NGO Crecemos offers hundreds of children the chance to develop physically and socially, yet how effective are Crecemos' programs over time?

Background Information

The comprehensive and practical programs conducted by Crecemos are vital to helping residents climb above the poverty threshold. Through programs and advocacy, Crecemos helps children realize new opportunities in their lives and guides them with the tools needed to be successful in achieving their greatest capacities and hopes for the future.

Alleviating malnutrition is the fundamental basis of the services offered by Crecemos, yet the organization's holistic approach to comprehensively improving multiple facets of child's life is the key to the program's effectiveness. At the heart of the many activities that Crecemos offers, is the belief that truly successful development is interconnected with building cooperative relationships with the people one is trying to help. The director and the staff members do not see the children as merely statistics or as unfortunate children, but as people full of value who are worthy of investment. The level of respect showcased at the Crecemos Maria de Guadalupe center in Monte Alban is clear and strikingly different from the lack of respect which children may witness in other areas of their lives. This respect upholds their dignity and demonstrates how to have healthy and peaceful social interactions.

In order to better understand the positive impacts of the programs at Crecemos, research was conducted on the nutritional outcomes of 41 children over the course of five years. The analysis seeks to gauge how the nutritional programs are effective over time, and to explore the effectiveness of Crecemos' activities in promoting childhood development. To perform this research, both quantitative statistical data and qualitative interviews were conducted with each of the participants to gain further background information, and to understand how the adolescents viewed their lives and goals in light of the opportunities provided by Crecemos. In addition to the qualitative interviews with the adolescents, interviews were also conducted with

mothers, or other caregivers, whose children are enrolled in the programs that Creceemos offers. The dual perspective of both mothers and children gives the twofold opportunity for understanding the realities of malnutrition not only from the perspective of public policy or those working in social service programs, but from the perspective of those who experience firsthand the difficulties related to malnutrition. A person senses when they are treated respectfully, and the fact that the mothers and children interviewed expressed this consistently throughout the interviews shows that they have grown to trust the staff members and the organization. This is actualized by learning the names of the children and building positive relationships with them and their families, not only through feeding and educational programs, but in walking alongside them through life.

Fulfilling some of the basic needs of the local children is done in cooperation with the effort to form relationships with their families or households. A child's family, no matter which form that takes for each child, is the foundation of their life and so it is important to also engage family members in program initiatives so that they are more holistic. Parents are also offered services at Creceemos, and many of these services predominantly benefit mothers, or maternal figures, who are often the most present in the lives of the children. Prior to conducting any of the interviews, it was suspected that the interviews with the children would provide most of the insight needed for this study. It was a great surprise after the first couple of interviews with mothers, which were conducted subsequent to those with children, that the mothers were much more open and eager to share. Their interviews typically had a duration double the time of the average adolescent interview. The women shared about their experiences with Creceemos and their experiences about food access and childhood nutrition in Oaxaca and in Monte Alban. The mothers expressed that trust in Creceemos usually grew gradually because those who work there have supported them both in good times and in bad. Their honest accounts evidence the earlier point that sustainable development is deeply interlinked with building positive and personal relationships with the community one is trying to help.

This topic has significant relevance today more than ever because according to the UN's Food and Agriculture Organization (FAO). In 2019, it was estimated that more than 820 million people went hungry worldwide and that, "Around 9 million people die every year of hunger and hunger-related diseases. This is more than AIDS, malaria and tuberculosis combined." Those who are most severely impacted by this are those who live in the global south and those in developing communities, especially children.¹ This is an absolute tragedy considering the advancements in

¹ Food and Agriculture Organization (FAO) and the Instituto de Estudios del Hambre. (2012). *A Comparative Study on Institutional Frameworks for Food Security and Nutrition at the National Level*. The Food and Agriculture Organization of the United Nations.
<http://fpmu.gov.bd/agridrupal/sites/default/files/Comparative%20Study%20FSN%20Frameworks.pdf> [Accessed 17 March 2020].

technology in the fields of agriculture and food production in addition to the fact that there are the resources to feed the entire world's population.² Analyzing the effectiveness of Crececos' programs can provide a model of a sustainable framework for alleviating hunger-related diseases, especially malnutrition, in communities around the world.

Crececos and the Sustainable Development Goals

While many of the United Nations' Sustainable Development Goals (SDGs) correlate with the outcomes of Crececos' programs, perhaps the most obvious would be its achievement of SDG #2, which is to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture." Crececos' direct work with children who have or are at-risk of various malnutrition diagnoses provides a clear example of a comprehensive program that can achieve this goal. Childhood malnutrition is a global phenomenon to be addressed and there are many theories and ideas of how to combat it. Crececos' programs and their cohesiveness should absolutely be used as model for other programs because of their excellence in cooperative practices which achieve positive nutritional results. It is especially timely to analyze such a project during the United Nations' own Decade on Action on Nutrition when there is still so much work to be done on alleviating malnutrition. Simply providing food and products has shown to be incomplete in solving the issue of childhood malnutrition, and specialized programs (such as those at Crececos) exemplify an alternative, cohesive way to alleviate childhood malnutrition.

Eating at the Crececos cafeteria also serves the purpose of educating the children on the importance of proper hygiene, in accordance with the Water, Sanitation, and Hygiene (WASH) guidelines outlined in the United Nations' Sustainable Development Goal (SDG) #6.³ Numerous studies prove that access to and understanding of how to use proper water and sanitation systems is relevant for achieving nutritional goals. At Crececos, children learn in a hands-on way how to maintain their hygiene. The children are taught on their first day eating in the cafeteria about the procedures for keeping both themselves and the center's property clean and hygienic. Upon their arrival, the children go to check in with the welcome staff member, and then they proceed to the handwashing station where their handwashing is supervised by a staff member and a parent volunteer to ensure proper cleanliness and orderliness. Afterwards, the child enters the cafeteria and joins the queue of other children as they wait for their plate. One of the nutritionists, or another trained staff member, distributes the plates to the children based on the portioning directives outlined in the child's nutritional plan. The child then has a seat amongst either their peers or siblings. They use the proper metal utensils necessary for the meal, and the meals are served on sturdy and reusable plates. After being dismissed, the child then uses their

² Ibid.

³ Sustainable Development Goal number 6 is to "Ensure availability and sustainable management of water and sanitation for all."

napkin to sweep any crumbs or spills into their plate and they go to the dishwashing cart. On this cart there are separate areas for utensils, plates, bowls, cups, organic waste, and other trash. The children learn how that to put away everything in its proper location. This teaches children to respect the items that they use and the value of maintaining cleanliness. The children then go back to the handwashing station before proceeding to the dental hygiene station. The children all have a toothbrush at the dental hygiene station, and they have access to oral health products, such as toothpaste. Once the child has brushed their teeth, they are free to move on to either their other programs at Crececos or to school. Teaching the children proper handwashing techniques, how to properly brush their teeth, and how to maintain cleanliness is directly in line with the hygiene aspect of SDG #6, and exemplifies a case of how this SDG is being fulfilled on a small scale in Monte Alban. Some of mothers who were interviewed referenced that they also learned hygiene skills from their children who arrived home with this new knowledge. The mothers, and then the whole family, improved their habits by performing the same actions at home.

Research Questions and Design

Many factors and considerations were taken into account in the design process of this research. The children and adolescents who were interviewed for this study were chosen because of their age, length of participation in the programs, and availability and willingness to be interviewed during July and August 2019. A pre-teen and teenage demographic were chosen as the targeted group for analysis. This is due to the fact that many have participated in Crececos' programs since their early childhood, and because they are at a perceptive age where they are still children with developing capacities but also nearing adulthood. In the coming years they will have more control over decisions about their health and wellbeing. A total of 41 children (21 males and 20 females) were interviewed over the course of three weeks in addition to twenty parents. 20 females and 21 males. The personal identity of each child remained anonymous throughout the data analysis, and each child's name was replaced with a number. The interviews were conducted on a one-on-one basis, and the children were free to opt out of answering any questions or to ask for further clarification. All of the children are residents of Oaxaca and participate in the programs offered at the Crececos center in the Monte Alban neighborhood of Oaxaca City. The ethnic demographic of the group, shown in Figure 1, consisted mostly of those with Zapotec origins, followed by those who are Mixtec. A fourth of the participants were unsure of their ethnic demographic or simply referred to themselves as Oaxacan or Mexican.

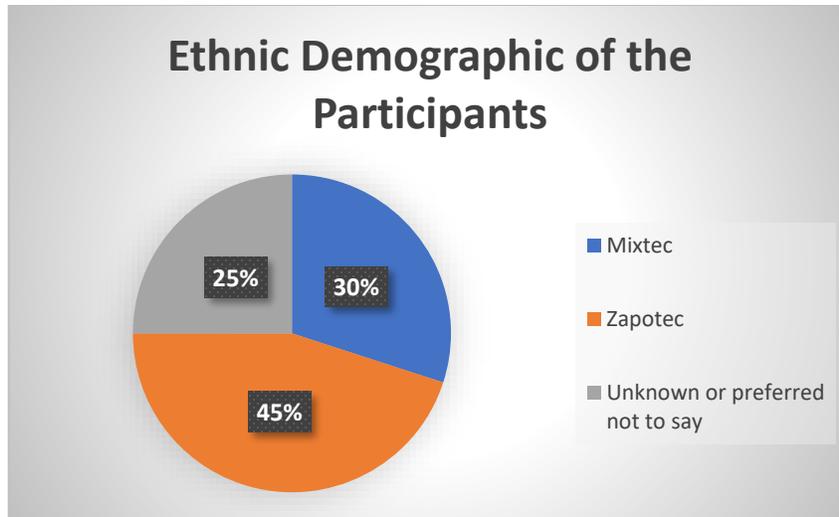


Figure 1

The research sought to address these primary research questions:

- Are the nutrition interventions effective long-term over the course of 5-years?
- What varies between males and females in terms of nutritional outcomes? What factors contribute to this?
- What influence do food preferences, beverage choices, and sports participation have on the analyzed group?
- Does the systems approach, especially the consideration of the family system, influence the outcomes?
- How do mothers (or maternal figures) view their role in alleviating malnutrition?

As will be seen later in the datasets, some of the participants may have entered the program without a diagnosis of malnutrition. These children usually were in a situation where they were at-risk of malnutrition, so the interventions were meant to maintain the child's nutritional status by ensuring that the child was always nourished through participation in the breakfast program, sports programs, and in regular checkups.

Results and Analysis: Nutritional Status

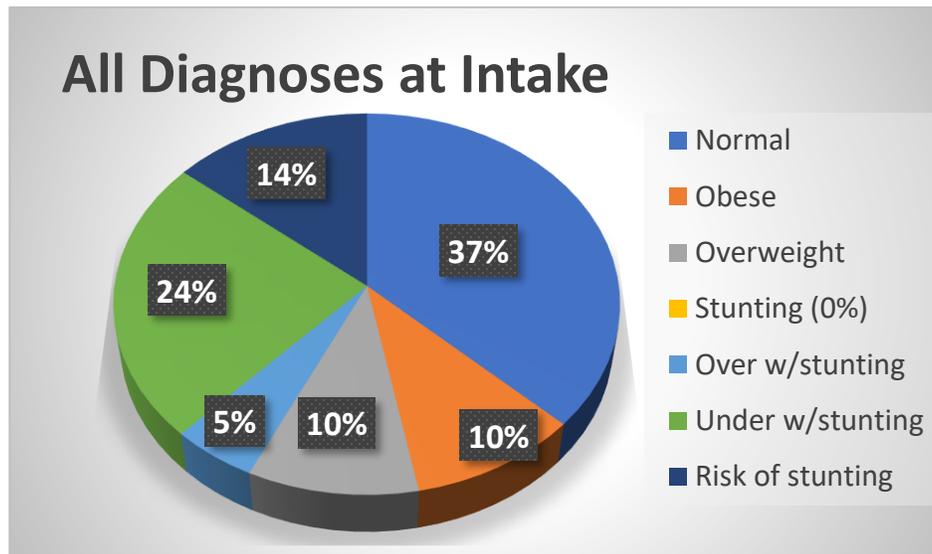


Figure 2

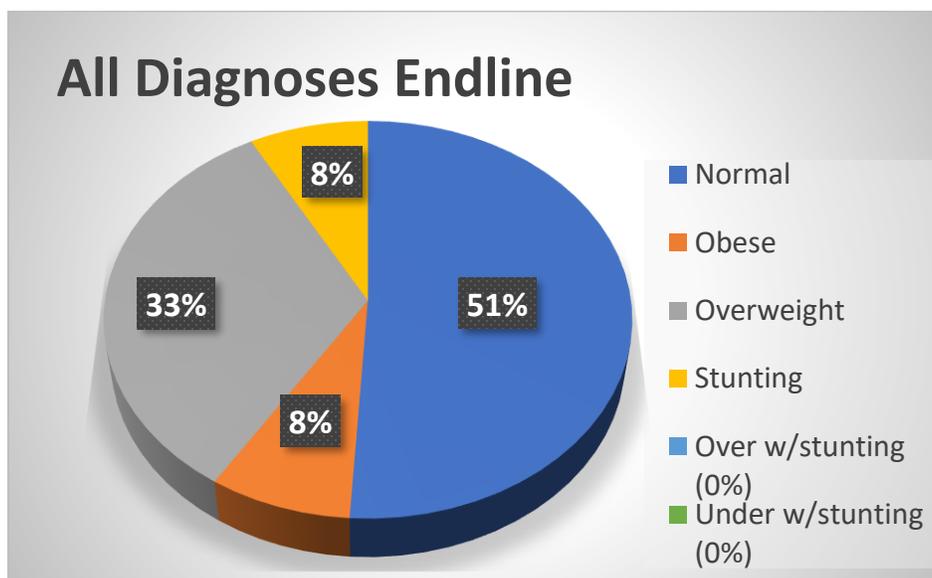


Figure 3

As indicated in Figures 2 and 3, the majority of children from both gender observation groups were at a normal nutritional diagnosis at the end line of the data. This is an improvement of 14% from the moment of the experiment's onset (intake), when 37% of the children had a normal diagnosis. The category in the intake dataset regarding chronic acute malnutrition has been entirely eliminated because there were no children in the observation group who had this diagnosis by the end line of the data. This is a very positive outcome found in the results, and it

is one that certainly proves the legitimacy and effectiveness of Creceemos' programs. During this time, 8% of the total number of children in the observation group were diagnosed with stunting, which is down 35% from the 43% who were stunting or at risk of stunting at the onset of the dataset. The category "overweight and stunting" was also eliminated from the end line dataset because no children in the observation group no longer had this diagnosis. As was seen in the data analyses of both the male and female observation groups, the number of children who were considered overweight or obese increased by a 16% by the end line. The cases of obesity actually decreased by 2% whereas the cases of overweight children increased by 18%. After comparing the data of the diagnoses from the onset of the dataset with the data from the end line, it can be concluded that the majority of the children in the observation group's health improved because the majority of the observation group was at a healthy weight. The finding that the second largest sum of the observation group were obese or overweight at the end line was an unexpected and alarming discovery. It was hypothesized that more of observation group would have a normal diagnosis in end line, although still the majority of participants did. The statistical data alone cannot offer reasons as to why so many children were diagnosed as obese or overweight. Only speculation can come from previous explanations on Mexican nutrition policies, and health statistics from Mexico show that the country already has high rates of obesity. Since the children in the observation group are between the ages of ten and fifteen years old, it is paramount to address these issues with them now so that they can be at a healthy weight as they enter adulthood.

Girls' Nutritional Status Analysis

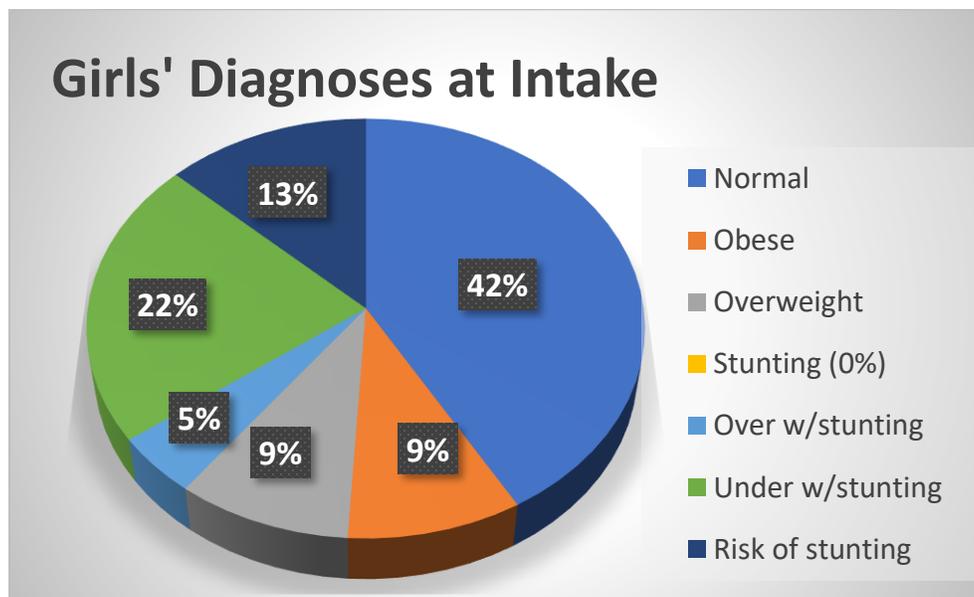


Figure 4

When analyzing the data on the basis of gender, it was seen that at the end line of data, the female group reported higher rates of having diagnoses of being overweight or obese. As seen in Figure 4, 45% of the female observation group were classified as being at a normal weight, height, and nutritional status during their intake in the program. As previously mentioned, their participation in Creceemos is therefore more a matter of prevention and education, and a way to ensure that they are able to live a life that is food secure. However, the majority of the girls in the program (the other 55%) were diagnosed with some form of malnutrition. The second largest amount of the girl observation group were diagnosed with being both underweight and stunted, also known as chronic acute malnutrition. This shows that the issue of stunting affects both genders in childhood. The other four diagnoses groups all were comprised of 10% of the participants who were diagnosed with being (1) overweight and stunting, (2) at-risk of stunting, (3) overweight, and (4) obese. This indicates that stunting is also a common issue among the females because 35% of the female observation group was diagnosed with stunting (25% officially diagnosed) and 10% were at risk of stunting. Obesity and being overweight was also common among the female group and a total of 30% of the girls were either obese or overweight. The overweight and obese group can be broken down into 10% who were obese, 10% who were overweight, and 10% who were overweight and stunting. The data from the female observation group accords with the 2013 statement by UNICEF which reports that women are more likely to be overweight in Mexico. The disproportionate risk of females who are diagnosed with obesity can have detrimental or risky effects on the female later in life, especially if that female chooses to birth children. Maternal obesity increases the risk for pregnancy related complications, including gestational diabetes mellitus (GDM),⁴ and since Mexico already has high rates of diabetes, this pregnancy related complication seems likely among women. Additionally, women who are obese while pregnant are more likely to have children who will either be born at a high birthweight or will become overweight or obese in their childhood.⁵ The issue of obesity and being overweight should not only be addressed in female children because they could one day bear children, but also because it is beneficial for the health of the female herself regardless of her future reproductive choices. Creceemos actively works to fight against childhood obesity through the nutritional interventions related to food, supplements, and education, but also through promoting exercise. There are both girls' soccer and basketball teams, in addition to other forms of exercise and physical education that the children can participate in. Exercise alone may not reverse the effects of obesity and being overweight, but physical activity in combination with improved eating habits with calorically appropriate portions is a method for success.

⁴ Kampmann, U., Madsen, L. R., Skajaa, G. O., Iversen, D. S., Moeller, N., & Ovesen, P. (2015). Gestational diabetes: A clinical update. *World journal of diabetes*, 6(8), 1065–1072. <https://doi.org/10.4239/wjd.v6.i8.1065>.

⁵ Taveras EM, Rifas-Shiman SL, Belfort MB, et al. (2009) Weight status in the first 6 months of life and obesity at 3 years of age. *Pediatrics*.123(4):1177–1183.

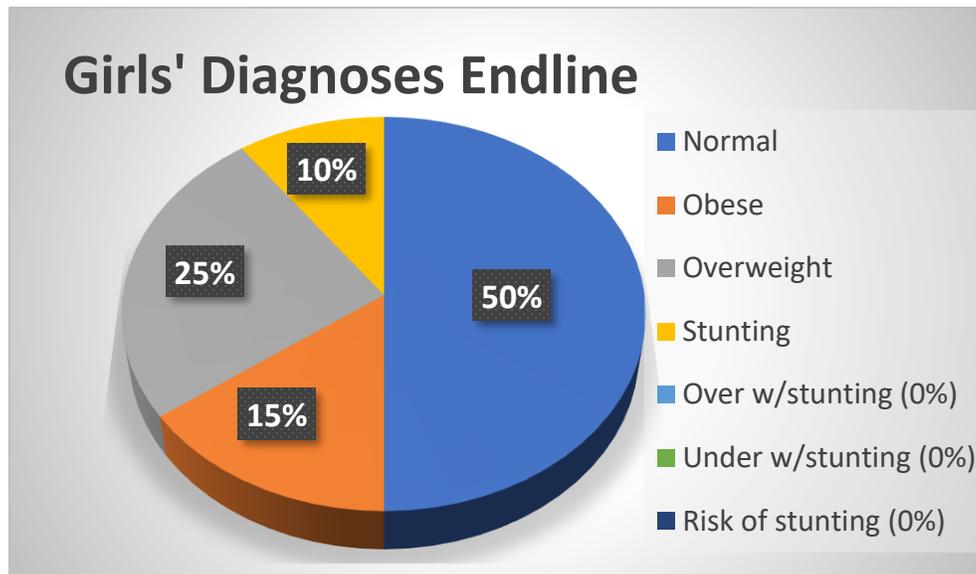


Figure 5

Figure 5 indicates that at the end line of data collection exactly 50% of those in the female observation group were diagnosed with a normal nutritional status and that the other 50% were divided between being overweight, obese, or chronically malnourished (stunting). The number of girls with normal diagnoses increased by 5% from the time of intake to the end line. This may seem like a relatively low percentage of improvement, but any improvement is worthy even if it remains on the lower range. The rates of girls with either the issues of stunting or who were at risk of stunting at intake (25% and 10% respectively, totally 35%) was reduced to a total of 10% who were still stunting and chronically malnourished. This is an improvement of 15% from those who were diagnosed with stunting, and an improvement of 25% from those girls who were both diagnosed and at-risk. Interestingly, both the number of girls who were overweight and obese (20% and 10% respectively) increased from the amount who were at intake by 5% total. Although the diagnosis of the combination of being overweight and stunting was no longer given to any of the females in the observation group, a higher number of girls were overweight or obese overall, with girls who were overweight being the majority of the 50% with abnormal diagnoses. The number of cases of obesity increased by 5%, while the number of cases of being overweight increased by 10%. After analyzing the data of specific children who began the program as overweight or obese, it is a noticeable trend that those with either diagnosis fluctuate between the two diagnoses. Among the females, it was also the case that one participant shifted from being underweight to being overweight over the course of the time of intake to the end line, and at one point this female was at a normal weight. This indicates that there are perhaps other factors that lead to a child remaining or becoming overweight or obese besides those related to nutrition interventions. It is paramount to consider the roles of personal choice and accessibility

in determining a child’s nutritional status. In some cases, the child may choose what they will consume, but it could also be the case that the child is eating what they are given in their home or at school, which further highlights the need for cooperation across the child’s systems and communities.

In order to better understand some indicators of why the data set shifted to a high number of children who are overweight or obese, it is important to factor in other aspects of quantitative data that includes the food, beverage, and sports habits of the group. Further, the qualitative data from the interviews will be considered in order to gain deeper insight in the habits of those in the observation group.

Food and Beverage Habits Analysis

The first dataset to be analyzed will be the specific food and beverage interests of the children. The children were asked about their favorite foods and beverages and the frequency with which they consume them. It is important to note that the children were not given a list of foods to choose from, and they were not informed about how other children responded to the question. The responses acquired in Table 8 were all given directly from the participants.

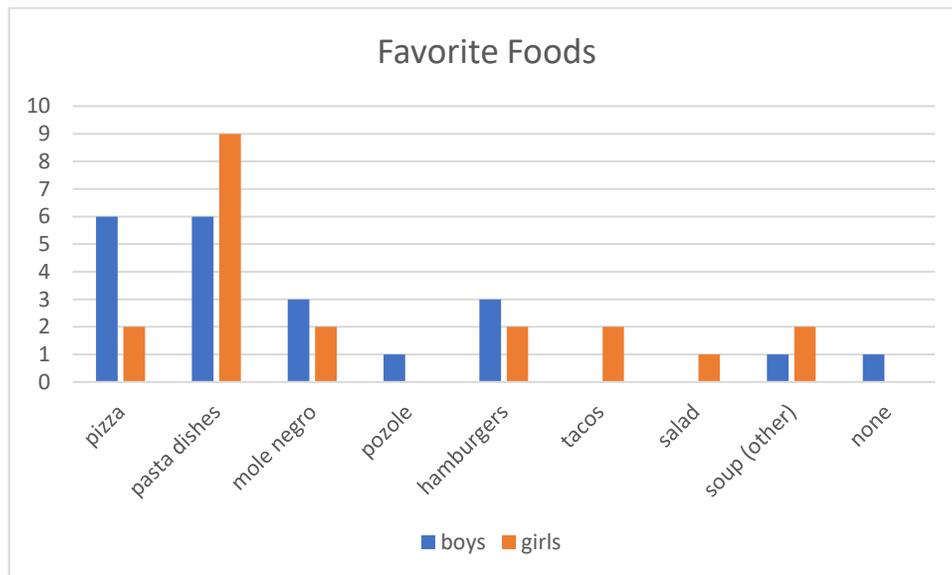


Figure 6

Figure 6 shows the observation group’s responses to the question about what their favorite foods are, and the graph is separated in two in order to analyze this on the basis of gender. While it cannot be the only factor in determining why the number of children who were overweight or obese increased, it can give insight into the choices that the observation group either makes or would if able to choose. Frequently, whenever this question was asked to the participant, they

would respond by asking, “My favorite food ever? It can be anything at all?” or “It can be any food I want to choose? Does it have to be a food that is served at Crecemos? Can it be something I eat out?” The participants were ensured that it could be any food that they would like to choose. After responding to the question, the children were then asked about the frequency with which they consume this food ordinarily. Every one of the children responded that they eat these foods at least once per week, and that if they had the choice, they would consume them several times per week. Pizza and pasta dishes were the foods that were chosen with the highest rate; the boys had an equal number of participants with an affinity for both pizza and pasta (6 for each dish), and the majority of the girls (9 girls) preferred pasta dishes. Although the pasta dishes were grouped together, but the top two responses for specific pasta dishes were spaghetti Bolognese and lasagna. While neither of these dishes are inherently unhealthy, it is a moment to remember the importance of portion control, which is a topic taught to some of the participants in this study in their nutrition classes at Crecemos. Another factor to consider is that the top two favorite foods, depending on their preparation, do not contain an adequate portion of vegetables. If the lasagna is prepared in the traditional manner with a bechamel sauce, layers of cheese, and meat that is not necessarily a lean cut, it is also possible that the dish has a very high fat content and is highly caloric. In addition, when asked to specify what kind of pizza they preferred, all of the participants who selected pizza as their favorite food said that their favorite kind is either (1) pepperoni pizza, or (2) Hawaiian pizza.⁶ Apart from the tomato sauce, which is typically high in sugar, neither of these pizzas contain any vegetables and can be highly caloric if one does not practice portion control. The third favorite food of the male observation group was tied between mole negro, or black mole, and hamburgers. Mole is a traditional Oaxacan dish that has seven different varieties and is made with a number of vegetables and fruits, cacao, spices, and chilies. It is served in a variety of ways, but is often served with rice, tamales, or tortillas in a dish called *enmoladas*, which means “in the mole [sauce].” Mole sauce is a delicious culinary masterpiece, but because of the many ingredients it can be also be very caloric. Therefore, it is another dish that should be consumed with portion control in mind. Hamburgers were the other third preferred food amongst the male observation group, and again, depending on the preparation, can also be highly caloric with few vegetables. Although the majority of the girls preferred pasta dishes, the girls had a wider variety of responses to question and the other half of their answers was well dispersed. There was a 5-way tie for second place with pizza, mole, hamburgers, tacos, and soup all receiving the same amount of responses.

⁶ Pizza with ham, cheese, tomato sauce, and pineapple.

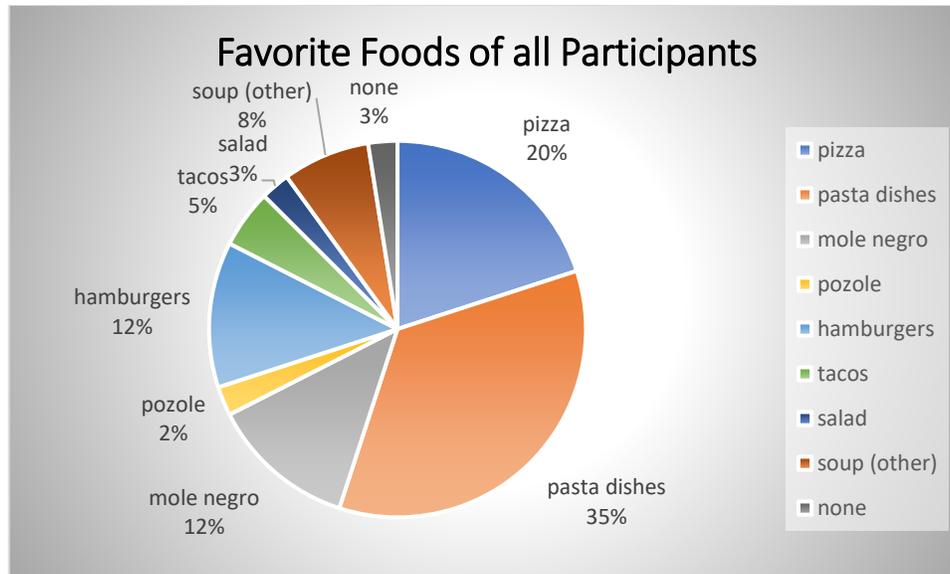


Figure 7

Figure 7 shows the favorite foods of the entire observation group, both male and female. It can be seen that pasta dishes are the favorite food of the majority of those in the observation group with a rating of 35%. Pizza is the second favorite food, with a rating of 20% which is 15% lesser than that of pasta dishes. The third favorite foods are tacos and hamburgers, both of which received 12% interest. Less popular foods include soups, tacos, salad, and posole. In theory, all of the foods listed as favorites of the children can be prepared in a healthful way. Totally eliminating these foods from the child's diet is likely impossible and unnecessary. It is more effective and sustainable to teach children portion control and moderation, healthier ways of preparing foods that they like, and to introduce them to a wider variety of foods and flavors. It can be assumed that if the children would have been told to state their favorite foods that are served in the cafeteria at Crecemos that the answers would have been quite different. The meals at Crecemos are appropriately portioned and contain adequate amounts of vegetables, proteins, fruits, carbs, and fats. The large number of children who were overweight or obese does not mean that the efforts of Crecemos have been futile, but rather that their work is still very relevant. It is valuable for a child who is overweight or obese to have a nutritionist reviewing their case and helping them to reach a normal weight. Additionally, the nutrition classes that the participants attend help them to gain a deeper understanding of the choices that they make, and they learn about healthy portions choosing healthy ingredients whenever cooking for themselves. Since these are children, oftentimes the parents have a vital role in determining the foods that the child will consume. If the family is having a meal that is highly caloric with soda, the child who likes this food and needs to eat will in turn consume these foods. Clearly eating something is better than having no food, but the purpose of eating is to nourish the body and not merely to satiate it. Every child has the right to a healthy life, and food choices are an

important determinant in actualizing a healthy life. Interestingly, while some traditional Mexican foods were accounted for by some of the children, the majority of the observation group preferred foreign foods. A total of 67% of the group preferred the foreign foods of pasta dishes, pizza, and hamburgers, while 30% preferred the traditionally Mexican foods of tacos, mole, and posole. Those who responded to liking salads and soups clarified when asked that the types that they like are also traditionally Mexican soups and salads. This preference for foreign foods, some of which are fast foods, coincides with data that indicates that worldwide fast food consumption among young people is on the rise.⁷

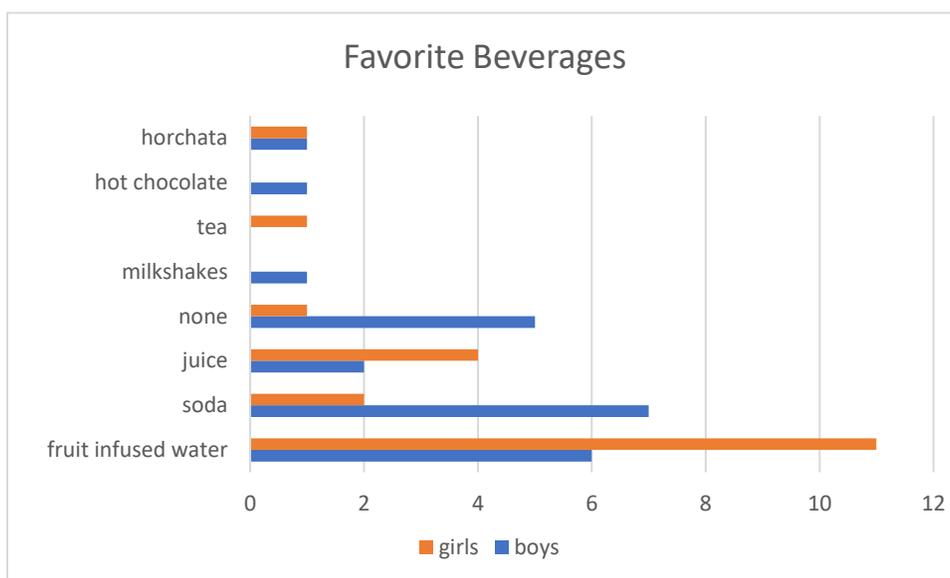


Figure 8

Figure 8 showcases the favorite beverages of the observation group and each line on the graph refers to the response of the gender of the participant. While the responses varied between the two genders, the most popular beverage choices were fruit-infused water, soda, and juice. Approximately 24% of the male observation group responded that they did not have a favorite beverage, despite being asked the question in a couple of different ways. With those who responded with none, it is difficult to determine whether or not their beverage choices could play a role on their nutritional profile, but this is the reality of the qualitative data. The majority of the girls (55%) indicated that their favorite beverage is fruit infused water (agua fresca). Fruit infused water is popular in Mexico, and it can be prepared in a healthy, low-calorie way or in a less-healthy way with a lot of added sugar. Most of the girls responded that they prefer that the fruit-

⁷ De Vogli, Roberto, Anne Kouvonen, and David Gimeno. (2014). The influence of market regulation on fast food consumption and body mass index: a cross-national time series analysis. *Bulletin of the World Health Organization*. Vol. 92. Available online: <https://doi.org/10.2471/BLT.13.120287>. [Accessed 10 May 2020].

infused water does have some added sugar. The majority of the boys in the observation group's favorite beverage was soda, which is quite popular in Mexico.⁸ Among the participants who responded that soda was their favorite beverage, some named specific brands such as Coca-Cola or Jarritos. The second most popular beverage among the female observation group was juice (20%), and when asked to clarify, all of the respondents stated that they prefer processed, store-bought juices to freshly made juices. Juices that are store-bought can vary in both calorie and sugar contents, but studies on sugar sweetened beverages in Mexico states that typical store-bought juices contain an average of 20 grams of sugar per serving.⁹

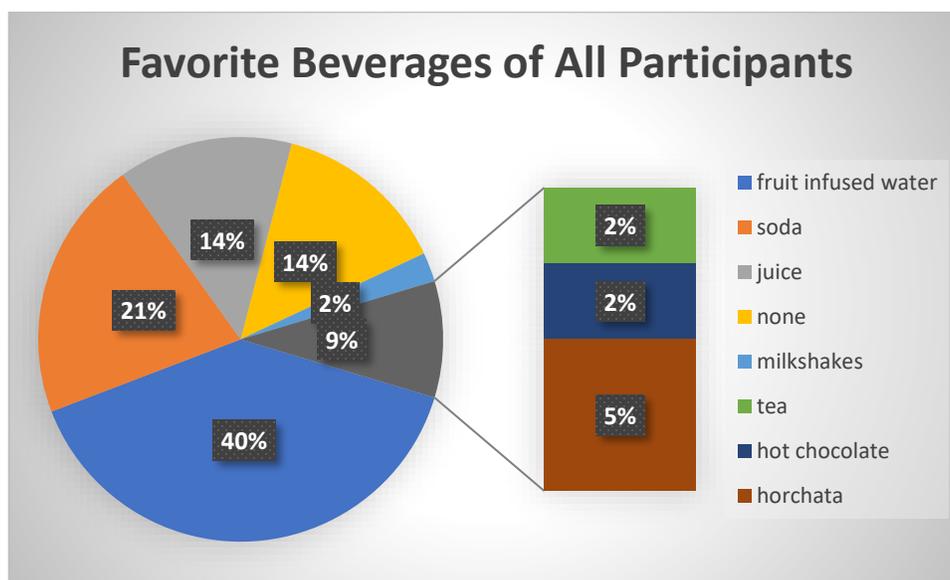


Figure 9

Figure 9 shows the favorite beverages of all of the participants in the observation group combined by gender. It can be seen that fruit infused water gained the majority of support from the observation group at 40%. Having such a beverage receive 40% of the votes offers a promising outlook on beverage consumption since fruit infused waters can easily be prepared in a healthy way. Their preference opens them opportunity to possibly learning to like it with gradually less amounts of sugar. The Crecemos cafeteria already serves the fruit infused waters with little to no-added sugars, so the observation group has already been introduced to a healthier way of

⁸Centro de Estudios de las Finanzas Publicas. (2015) "Medidas fiscales y extra fiscales para contrarrestar el consume de bebidas saborizadas en Mexico. In English: Center for Public Financial Studies. (2015) "Fiscal and extra fiscal measures to counteract the consumption of flavored drinks in Mexico." <http://www.cefp.gob.mx/publicaciones/nota/2015/abril/notacefp0142015.pdf> [Accessed 10 March 2020].

⁹ Sanchez, Mariela. (2014, February 14). "Refrsca tus gastos." Gobierno de Mexico Comision Nacional para la Proteccion y Defensa de los Usuarios de Servicios Financieros. (CONDUSEF). In English: "Refresh your expenses." Government of Mexico National Commission for the Protection and Defense of Users of Financial Services. <https://www.condufef.gob.mx/Revista/PDF-s/2013/165/gasto.pdf> [Accessed 11 March 2020].

drinking these beverages. Nearly all of the remaining beverages listed contain high amounts of sugar. Tea is another exception since the sugar content depends greatly on the preparation of the beverage. The second most popular beverage is soda which received 21% preference among the whole group, and soda contains a lot of sugar and is high in calories while being low in nutritional value. The same number of participants chose juice or said that they had no favorite beverage. A less popular beverage was horchata, which received 5% of the votes. Horchata is a traditional Mexican drink that is made from homemade rice milk, spices such as cinnamon and vanilla, and with fruit such as a cantaloupe. It is tasty without any added sugar, but it is typically prepared with added sugar and averages 9 grams of sugar per serving. Less popular beverages which received 2% of the vote each were hot chocolate, tea, and milkshakes. The major Mexican hot chocolate company, Mayordomo, actually originated in Oaxaca because Oaxaca has a large production of cacao. It was surprising that it received such a small number of votes because it was hypothesized that it would be one of the larger categories. Milkshakes and tea also vary in their nutritional values depending on the particular ingredients and added sugars. As it was with the observation group's favorite foods, the majority of the beverages listed can be prepared in a healthier way that is less caloric and has less added sugar. The majority of beverages that can be prepared in a healthier way make up 65% of beverage preferences and include fruit infused water, juice, horchata, tea, milkshakes, and hot chocolate. Soda (21%) in and of itself cannot be prepared in a healthier way since it is a beverage that is typically bought and not prepared at home. This is the main difference between the 65% majority of beverages that can be prepared healthily and soda which comprises 21% of beverage preferences. While there are some alternatives such as sparkling, fruit infused waters that are on the market now which can be considered alternatives to soda, these are not widely available or preferred among the children in the observation group. As with the food preferences, the best way to improve the children's beverage choices is to teach them about portions and serving sizes and to teach them alternative ways to still drink the flavors that they like but with less sugar. While it cannot be verified entirely if the beverages that the children consume directly influence the large number of children in the observation group who were overweight or obese at the end line of the data, it can be assumed that this is one of many factors in those statistics. Both the foods and beverages consumed by the observation group play a vital role in determining the nutritional status and diagnoses of the children.

Other factors to consider when comparing the food and beverage habits with the diagnoses of the children at the end line of the data include analyzing their responses to the question of whether or not they consider eating healthy to be an important part of life and if it will help them to achieve more both educationally and in their future careers. All of the children responded positively to the question with a resounding yes. One of the girls in the observation group responded, "I see the connection between eating healthy and my future career because I hope

to become a doctor, so nutrition is important for my future job. Also, if I don't learn to eat healthily, I will not be able to complete my studies because I will not feel well." One of the boys from the observation group stated that, "I see the connection because I need to eat healthily so that I will have enough vitamins. If I don't have enough vitamins or a good diet, I will not have the energy to study now or to work one day." Another boy responded, "Yes, I believe that eating healthy influences my capacity to learn new things," and another similarly stated, "Yes, it helps because if eat healthy and well I always have more energy, and I'm not so tired. I am motivated to eat healthy so that I can do better in school, because I hope to be able to go to university one day to study astronomy." The majority of the participants stated that their educational and career goals involve going on to pursue university studies if it is possible. Many of the group stated that they would be the first person in their families to do so.

Sports Participation

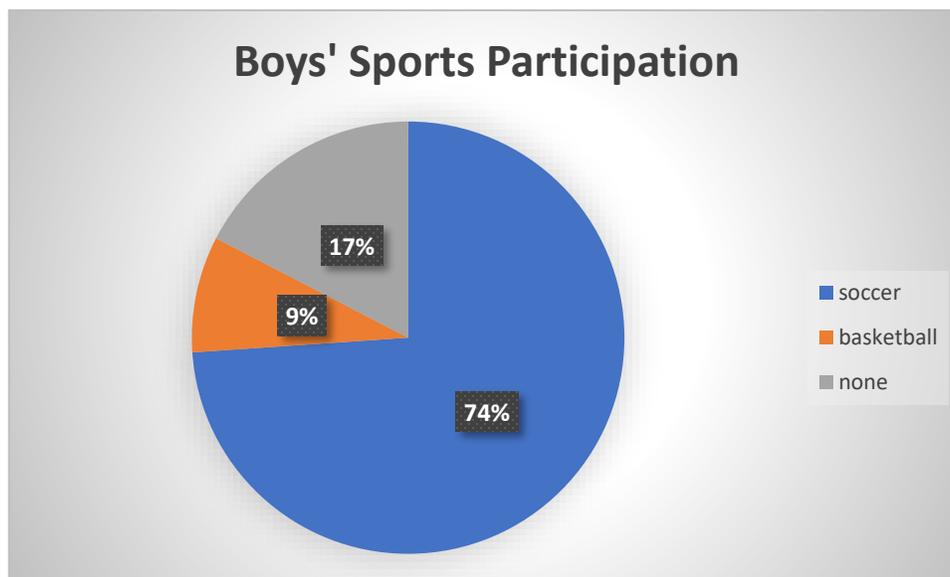


Figure 10

Figure 10 outlines the participation of the male observation group in sports activities. The majority of the observation group participates in either soccer or basketball with a total of 83% participation. Soccer was by far the most popular sport among the observation group with 74% participation. Many stated that it is their dream to become professional soccer players in the future, which they listed as a motivation to eating healthy so that they have adequate energy to play. Interestingly, 71% of the male observation group was at a normal weight in May 2019 and 83% of the male observation group is involved in a sports activity. It can be assumed that the amount the boys who are involved in sports coincides positively with the fact that many of them are at a normal weight. Even though the boys reported majorly that they prefer drinking sodas, it suggests that they are able to balance out their consumption through their participation in a

sport. Being part of a sports team gives the observation group and all youth an excellent opportunity to build friendships, learn social skills and teamwork, and to maximize on the benefits of physical exercise. It is important that the observation group is taught the vitality of continuing the habits of exercise for their whole lives, even after they may age out of school sports or the sports teams at Crecemos. Building healthy habits early on can influence young people to continue to make healthy choices in the future. Those who did not participate in any sports, 17% of the male observation group, stated that they did not do so because of lack of interest in the sports teams offered, and that they preferred to focus on other activities, such as art or music.

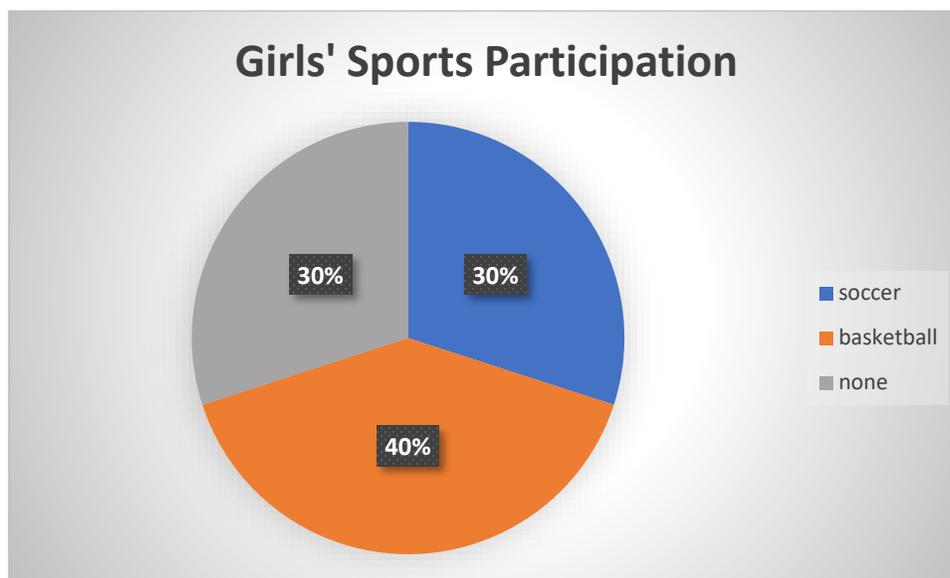


Figure 11

The majority of the girls in the observation group, 70%, stated that they actively participate in a sport through Crecemos, as shown in Figure 11. Many of the girls in the observation group also stated that they actively participate in a sport through their school. Basketball was the most popular sport among the girls in the group with 40% participation. Soccer was close behind with 30% participation, but soccer was also tied with 30% of girls who do not participate in any sports. When asked why they do not participate in any of the sports, the many girls stated that they either weren't interested in the sports that were offered or that they did not have time to participate because of other obligations. These other obligations included doing schoolwork, helping to care for their home, and helping to care for younger siblings or cousins. On average, the girls participated 13% less in sports activities than the boys did. This is perhaps one of the reasons in which the female observation group reported higher rates of diagnoses of obesity and overweight in May 2019. However, it should not be concluded that this is the only reason in which the girls had lower rates of participation. Other factors that could be evaluated including the hormones changes and physical developments that occur during puberty. These can be

considered alongside their food and beverage choices, and their lack of time for physical activity because of different responsibilities at home.

Maternal Participation

Parental or maternal involvement plays a fundamental role in any childhood nutrition intervention process because the child's primary community exists where they live: at home. Children often learn habits from their parents and discover their way of living primarily through their home life. Although children have other places like school where they participate in activities such as those at Crecemos, one of the primary systems to target for sustainable positive nutrition interventions is the family. Parents are always present during the initial diagnosis and intake of their child, and the staff stays in regular contact with the parents about the child's case, even if the child typically attends Crecemos on their own. Parents are therefore included in the fundamental aspect of the nutrition intervention. There are other activities in which parents can participate in at Crecemos, and involvement in those activities can further enrich the experience of the child and can have positive benefits on the nutrition intervention because the parent will also have learned various nutrition skills. In addition, parents are offered classes such as computation, finance, and tutoring to complete their studies if they have not done so. Gaining these extra skills is useful for the whole family because it means that the parent is able to perhaps find a better job, or that they will better be able to help their child with their schoolwork. Although it is not mandatory for a parent to participate in these extra classes, many of the parents who were interviewed viewed the classes as opportunities that they otherwise would not have to learn new skills and expressed gratitude for them.

The majority (65%) of those in the observation group have a parent or parent figure who participates in the programs at Crecemos. The majority of those who said that their parent participates stated that it was their mother who primarily participated. Others said that both parents participated, and some stated that their grandparents also participated in some programs. While not asked directly whether or not they like having their parents participate in Crecemos, some children stated on their own accord that they like that their parents are also involved as one female participant expressed, "I like when my mom is present because she can see what I am achieving here and she is proud of me." Additionally, 95% of the children stated that the primary factor that motivates them to become healthy and to be successful in their studies is their parents. The other 5% stated that it was their grandparents, their siblings, or some also stated that it was money that motivated them.

Of the mothers who were interviewed, 100% stated that they believe that they have adequate access to healthy foods. The outdoor fresh market is a long walk from the neighborhood, but some mothers stated that they split the cost of a taxi with other mothers from the neighborhood

that they befriended at Creceemos. Several stated that they wish that they had a closer market in their own neighborhood because it would make eating healthier at home easier for them. Many of the mothers expressed that they were not always going to the market prior to their involvement in Creceemos, but that they have realized the vitality of eating fresh ingredients. Some mothers said that it is because of getting recipes from Creceemos that they began to prepare healthier foods. The new meals that they prepare are the result of their child(ren) asking their moms to learn to prepare a meal that they ate in the Creceemos cafeteria. The biggest takeaway from their cooking classes at Creceemos is that they learned to use a wider variety of vegetables and ingredients in tasty meals. Many stated that it was not a matter of not liking vegetables, but that prior to their participation they did not have the habit of cooking them or the knowledge of how to prepare them in a way that their whole family would eat.

One mother stated that, “My child’s participation in Creceemos has not only helped my child, but it has helped my whole family. My son joined the program because he was overweight, and I was very worried about his health. Here the nutritionist helped me learn how to feed him better and he was able to participate in sports, make friends, and he lost a lot of weight. The food served here opened my eyes to new ways of preparing Mexican ingredients in healthy ways.” Another mother who began participating at Creceemos as a volunteer and then later was offered a job on the maintenance team stated that, “Participating in Creceemos has changed my family’s life. I have two daughters, and they are my motivation for working here because I see the good that this center does for the children in our neighborhood. I want for my girls to graduate from high school, go to college, and have a chance to have a career.”

Making healthier food decisions for their families also motivates many of the mothers to seek advice from the cooks and nutritionists at Creceemos. One mother shared her journey of transforming how she cooked for her family as a way to show her care and love for her children. She said, “If my children could choose what they could eat each day, they would only want to eat fries, pizza, hamburgers, and cake. Those are the kinds of foods they like because of the taste and because their friends eat these foods. But I have growing confidence in the fact that I am their mother, so it is my responsibility to do better at feeding them properly. I have learned how important it is to eat vegetables thanks to Creceemos.” Another mother stated that she is thankful not only for the nutrition interventions at Creceemos, but also the opportunities her children have to learn new skills. “My kids are both learning to play musical instruments. As much as I would want to, I would not be able to offer them that same opportunity otherwise because I cannot afford to buy an instrument or the lessons. I never thought I would have a child who plays the violin or another child who plays the upright bass. I am so proud of them,” she said through tears.

Conclusion

The fact that the observation group no longer being diagnosed with chronic acute malnutrition is the result of various interventions in different systems occurring simultaneously. This demonstrates the effectiveness of systems and communities working together in order to achieve sustainable results. Additionally, in order for the intervention to be sustainable long term and into adulthood, it is important that children not only have access to functioning systems, but that also they use their autonomy to make healthy choices throughout their lives. Within the observation group during the case study, it was seen that many of the participants were overweight or obese at the end line of the data. While it is very good that they no longer have acute chronic malnutrition, it poses a new obstacle that need different solutions. While many factors can contribute to someone becoming overweight or obese, oftentimes it occurs due to food choices of either a person or those that they rely on for food. While alleviating childhood malnutrition is paramount, it is best done in tandem with other reforms to incentivize people to continue to eat nutritious foods throughout their lives.

One research question asked whether the role of parents, especially mothers, influences childhood nutritional levels. It was further questioned whether or not maternal nutritional education and care impacts the results of malnutrition levels in children. Based on the findings during the interviews with the mothers of participants in Creceemos' programs, the role of mothers was found to be very significant in promoting the efficacy of nutrition interventions. If the child has nutritional support not only at a nutritional center, but also in their home from those who make the decisions about meals, the child has more opportunities to stay at a healthy nutritional level. Parents, especially mothers, can be included in all of the systems and their knowledge about nutrition is vital in ensuring that the first one-thousand days of a child's life are healthy.

Another research question pondered whether or not nutrition intervention programs are effective over the course of 5-years, and whether or not the systems approach can be considered sufficient. Creceemos' nutrition intervention program was absolutely effective over the course of 5-years at getting most of the participants to a normal weight or nutritional diagnosis. It would be interesting to see how the same observation group will develop over the course of the coming years as the issues of being overweight or obese are addressed. The systems approach relates to the case study because those who were in the observation group did not only receive food and nutritional assistance, but a wide range of social services assistance. If the program was merely covering nutrition, it is possible that there would still be positive results. What is essential to remember is that by using the systems approach to the intervention, the child has many skills and opportunities that can be pursued as a result of being healthy. In conclusion, the programs

at Crececos are highly effective and should be used as models to emulate in other areas around the world trying to address childhood malnutrition on localized levels.

[AVSI-USA](#) works with individuals and communities in developing countries to restore dignity and build resilience in the face of poverty and marginalization. [Crececos](#) is a community-based organization serving nutritional, academic, and social needs in vulnerable areas of Oaxaca, Mexico. Both are members of the global [AVSI Foundation](#) which supports development projects in over 30 countries. Jessica Anderson earned her MA from the Jagiellonian University in Krakow, Poland, in International Security and Development. This case study is based on research she conducted on-site in 2019-2020.