

**NYU College of Dentistry & Henry Schein Cares Global Student Outreach Program
Granada, Nicaragua Outreach Program Report**



Figure 1 From Left to Right- Kathy Davis (Students of Granada), Tamarinda Barry Godin, Eddie Rosenbaum, Rachel Laureyns, Marissa Swanson, Jenny Park, Magdalena Concha

October 21-26, 2019

Introduction:

A small delegation of the NYU Dentistry Henry Schein Cares Global Student Outreach Program completed a week-long, school-based, preventive outreach to Granada, Nicaragua, after a one-year absence due to the political climate of the country. At the time of travel, the U.S. State Department's travel advisory was "Level 3: Reconsider Travel." As a result, NYU Dentistry Global Outreach leadership elected not to bring students for a full clinical outreach, instead returning to Granada with a small group of seven people to continue a limited program in partnership with Students of Granada. The team was comprised of three pediatric dentists and four administrators, including Dr. Aura Caldera, an NYU Dentistry alumna who initiated the original Nicaragua outreach 12 years ago.

Overview:

With Students of Granada's insight and guidance, NYU Dentistry modified its approach this year to accomplish the following goals:

1. Support the ongoing oral health efforts of its partner organization, Students of Granada, and the four public schools in which activity was initiated in 2017, and in doing so demonstrate NYU Dentistry's commitment to the success of this initiative.

2. Examine oral health outcomes for children in select age groups and apply topical fluoride for caries arrest and prevention, while referring children in need of urgent care to local providers.
3. Maintain the support for and momentum of the daily toothbrushing programs in the four partner schools by replenishing supplies, continuing children's oral health education, and reinforcing school leadership's commitment.
4. Assess the situation on the ground in regard to safety and possible logistical challenges to determine the feasibility of continuing outreach programs in Granada in the future.

Program Background:

There is a large unmet need for dental care in Nicaragua due to multi-factorial access to care issues, including affordability and lack of providers. Similar to what NYU Dentistry has seen in other sites, people do not seek care until they experience pain, when it is often too late to save the affected tooth. In addition, preventive care for children is rare, while sugar consumption is common, highlighting the importance and need for sustainable preventive programs targeting children.

NYU Dentistry started planning for the outreach in July 2019. Kathy Davis from Students of Granada provided invaluable assistance in securing the necessary government approvals for the preventive programming in the schools. This included approvals from SILIAS, MINSA, and MINREX. Kathy also helped to organize the schedule of visits to the schools and obtained toothpaste for the outreach before the team's arrival. As the team arrived in Managua, for the first time ever MINREX greeted and escorted the group to a VIP waiting area while Customs agents gathered and inspected the supply luggage. It was an easy and efficient entry process. Kathy met the team at the airport with the original approval documentation.

The oral hygiene instruction (OHI) team was comprised of Mario Mendez Mercado, the School Plan Promoter for Colgate in Nicaragua, and Vilma Susana Rodríguez Valenzuela, a fifth-year dental student from UNICA, a dental school in Managua. NYU Dentistry did not bring a dental hygienist for this role because it was unable to recruit a Spanish-speaking faculty. Instead, Kathy helped to recruit Susana by reaching out to UNICA. Susana's and Mario's daily presence and willingness to integrate into the classrooms demonstrated strong local leadership that has the capacity to support a sustainable program when NYU Dentistry is not present. Mario fulfilled his promise to bring toothbrush kits, which he distributed to every child, along with Colgate's "Bright Smiles, Bright Futures" program activities. He is committed to supporting the four target schools throughout the year. Susana was a wonderful addition to the team, fluent in English and energetic with the classroom-based OHI activities. She would be a welcome local asset for future programs.

The school-based preventive intervention was based on the World Health Organization's basic package of oral health. Repeating its methodology from 2017, NYU Dentistry obtained caries prevalence and severity data among children in select age groups (6, 7-8, 9, 12 years old), noted

and referred any urgent treatment needs (i.e. abscess, pain), and systematically implemented preventive measures in the schools (tooth-brushing, oral hygiene instruction, topical fluoride application). Simple visual dental examinations and topical fluoride applications (silver diamine fluoride and fluoride varnish) were the only clinical activities that occurred within the schools; any children requiring additional dental treatment were noted and a list of names were provided to the schools' respective principals.

Daily Summary:

Monday, October 21st: The NYU Dentistry Global Outreach team arrived in Nicaragua. The group met Kathy Davis of Students of Granada in Managua to have lunch and then traveled to Granada to unpack and reorganize supplies.

Tuesday, October 22nd: Escuela Carlos Bravo was the first and largest of the schools visited, located on La Calzada just a short walk from Casa Blanca. Milena Ruiz, the principal, was helpful to provide the school's auditorium for the dental activities and provided a map of where each grade/ classroom was located. The research administrator calibrated the examiners for inter-rater reliability. Thirty-two classrooms received OHI for a total of approximately 809 children, with 150 who received examinations and fluoride.

Wednesday, October 23rd: According to Mario, Centro Escuela de Zamberg has had the best compliance with the toothbrushing program. Yenny, the principal, combined two classes together for the day to provide an empty classroom for the dental activities. Yenny had also organized a "health day" in conjunction with the dental program, so children were participating in activities relating to nutrition and oral health, and some parents were present. She seemed supportive of the program and helped to keep the students at her school organized. Thirteen classrooms received OHI for a total of approximately 413 children, with 155 who received examinations and fluoride.

Thursday, October 24th: Escuela Margarita Urbina was the smallest of the schools visited. The team set up in a small, defunct classroom in the back of the school, which was the only enclosed space available. The principal showed her appreciation of the dental program's visit with a demonstration of typical dance and a certificate ceremony. Eight classrooms received OHI for a total of approximately 308 children with 70 who received examinations and fluoride.

Friday, October 25th: Unbeknownst to the team before arriving, public schools are closed for teacher training every last Friday of every month, so no activities could be conducted on Friday. As a result, NYU could not visit the fourth school, Escuela Padre Misieri. Instead, Mario and Kathy offered to visit the following week ensure the success of the tooth-brushing program. School closings will need to be taken into consideration for future outreach planning.

Data Summary:

Methods

Standard oral examinations were conducted by three dentists, Dr. Tamarinda Barry Godín, Dr. Aura Caldera, and Dr. Magdalena Concha in order to determine caries status. Caries status was established using a modified International Caries Detection and Assessment System (ICDAS) scale to diagnose each tooth surface as intact, arrested, filled, decayed, missing age-appropriate, or missing age-inappropriate (presumably due to caries). All examiners were trained on diagnosis criteria and calibrated to a gold standard (Dr. Tamarinda Barry Godín). NYU administrators recorded data on electronic tablets chair-side. During the examinations, the dentists applied SDF to active carious lesions for caries management and to pits and fissures of permanent molars for caries prevention. All examined children received fluoride varnish application after the examination and a toothbrush during the classroom OHI. NYU administrators provided the school principals with names of children who were diagnosed with an abscess and/or complained of pain in order for them to facilitate a referral process for treatment.

The examiners conducted 401 dental examinations in the three schools, 26 of which were excluded from analysis due to missing information (i.e. age or gender). The sample included four age groups (6, 7-8, 9, 12-year-old children) based on dentition in order to gather caries data representative of the four participating schools. DMFT/S and dmft/s were calculated as measures of caries experience (DMFT/S is the average number of permanent teeth/surfaces per child affected by caries, while dmft/s is the average number of primary teeth/surfaces per child affected by caries). Descriptive and analytical statistics were performed using SPSS with level of statistical significance set at $p \leq 0.05$.

Findings

The final sample consisted of the results from 375 dental examinations. Of the 375 children, 201 (54%) had caries. There was no significant difference in caries experience among the three schools (See Table 1). A total of 14 children (4%) required emergency dental treatment and were referred to school principals for treatment (1 at Escuela Carlos Bravo, 9 at Centro Escuela de Zamberg, 4 at Escuela Margarita Urbina). It is worth mentioning that although Centro Escuela de Zamberg had the highest number of children needing urgent dental treatment, the overall caries prevalence and experience was not notably different from other schools; in fact, it had the lowest DMFT and DMFS. Overall, the children from the three schools had an average number of 3.61 (± 6.13 SD) untreated decayed surfaces and average dmfs of 4.54 (± 7.21 SD).

Table 1. Caries experience, Granada, Nicaragua, 2019.														
School	Caries prevalence		Age		Decayed surfaces		DMFT		DMFS		dmft		dmfs	
	N	%	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Carlos Bravo	81/150	54	9.48	2.06	3.23	4.70	0.30	0.74	0.48	1.27	1.30	1.88	3.75	5.82
DeZandberg	83/155	54	8.75	1.99	3.47	6.69	0.25	0.63	0.48	1.43	1.44	2.02	4.74	7.73
Margarita Urbina	37/70	53	8.71	1.86	4.70	7.38	0.40	0.98	1.00	3.02	1.74	2.37	5.76	8.51
Overall	201/375	54	9.03	2.02	3.61	6.13	0.30	0.75	0.58	1.79	1.44	2.04	4.54	7.21

*p<0.05

Compared to the findings from NYU's 2017 visit to Granada, caries experience has not significantly changed in the two years (See Table 2). The figures from 2017, however, do include the findings from Padre Misieri as its children did not exhibit any significant differences compared to the children from the three other schools that year.

Table 2. Comparison of caries experience, Granada, Nicaragua, 2017 and 2019.														
Year	Caries prevalence		Age		Decayed surfaces		DMFT		DMFS		dmft		dmfs	
	Number of students	%	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2017	295/620	48	8.74	2.18	3.85	6.39	0.21	0.61	0.45	1.54	1.49	2.31	4.40	7.52
2019	201/375	54	9.03	2.02	3.61	6.13	0.30	0.75	0.58	1.79	1.44	2.04	4.54	7.21

*p<0.05

Caries experience differed significantly across the four age groups ($\chi^2=12.32$, $p<0.01$). Children aged 6 years old were 1.6 times more likely to be diagnosed with decay compared to children aged 12 years old ($\beta=0.46$, $p<0.01$). In addition, children aged 6-9 years old had significantly more untreated decayed surfaces than those aged 12 years old ($MU=9822.5$, $p<0.001$). With every year increase in age from twelve to six years old, children had on average 0.83 fewer decayed surfaces ($t=-5.48$, $p<0.001$). Sixty-seven children (18%) exhibited arrested decay that would have otherwise worsened without the application of SDF for caries management. Those aged 7-8 years old had more arrested surfaces than those aged 12 years old ($KW=30.45$, $p<0.01$). This is possibly due to exfoliation of the teeth and the transition from mixed dentition to full permanent dentition.

Variables	Caries prevalence		Decayed surfaces		Arrested surfaces	
	Number of students	%	Mean	SD	Mean	SD
<i>Gender</i>						
Male	92/168	55	3.98	7.16	0.49	1.42
Female	109/207	53	3.30	5.15	0.44	1.17
<i>Age group (years)</i>						
6	19/26	73*	5.69*	7.25	0.54	2.16
7-8	84/143	59	5.35*	7.99	0.67*	1.40
9	56/103	54	2.97*	4.29	0.39	1.09
12	42/103	41	1.29	2.57	0.22	0.95
Overall	201/375	54	3.61	6.13	0.46	1.29

*p<0.05

Discussion

While NYU Dentistry was not able to conduct its outreach in Granada in 2018, the data from 2019 show that despite the interruption to school resulting from the social and political situation, the caries prevalence among children at three of the participating schools was not significantly affected. This means there was neither a notable improvement nor a worsening of oral health status; the hiatus in the school-based toothbrushing program seemed to have little, if any, oral health effect. The average number of arrested surfaces indicates that SDF was beneficial in managing the high caries in this population. Although it is encouraging that the extended school absence did not exacerbate caries for this group, the goal is to reduce caries prevalence. While topical fluoride application is protective against caries, daily tooth-brushing with fluoridated toothpaste remains the number one preventive measure of tooth decay. Students of Granada and the four participating schools should be commended for their commitment to continuing the tooth-brushing program despite their community's recent challenges.

Younger children in Granada were at higher risk of experiencing caries than their older peers. While this is a common trend worldwide, this finding emphasizes the importance of practicing good oral hygiene from the earliest age and systematic preventive programs such as this one. The pervasive myth that “baby teeth do not matter” further complicates attempts to convince parents and teachers to assist young children in maintaining good oral hygiene; indeed, healthy primary teeth are essential for the healthy growth and spacing of health permanent teeth.

Table 4 shows a comparison of the oral health outcomes in Granada against the goals of international health organizations. The high prevalence of untreated caries indicates that a majority of children in Granada do not have access to a dental home. NYU Dentistry and Students of Granada experienced notable challenges in identifying a dental office to which children with urgent needs could be referred. There are no public health dental services available in Granada, and many families cannot afford private dentistry. Kathy called and visited

several of the private dentists in an attempt to create a network of referral dentists in order to get the needs of the 14 urgent care cases addressed. One seemed willing to work with a limited number pro-bono or at reduced rates. While Students of Granada can help facilitate access to care for select cases, the long-term solutions and families' uptake of dental care for their children remain unknown.

Table 4. Outreach site scorecard		
Target or comparison	Granada	
	2017	2019
Institution: CDC		
Prevalence of untreated dental caries in children aged 6-11 years was 15% (2015-2016).	55%	61%
Institution: U.S. Department of Health and Human Services		
Healthy People 2020: Reduce the proportion of children aged 6-9 years with dental caries experience in their primary or permanent teeth to 49%.	58%	46%
Healthy People 2020: Reduce proportion of children 6-9 years with untreated dental decay in at least in their primary or permanent teeth to 25.9%.	54%	58%
Institution: WHO (2020)		
To increase the proportion of caries free 6-year-olds by X%	47%	27%
DMFT=3 for 12-year-olds	0.48	0.55

Finances

The total cost of this program was approximately \$13,968.28. This includes airfare and clinic supplies, activities and meals while in Nicaragua. Airfare totaled \$4,241.03, meals and miscellaneous expenses totaled \$3,416.09, and supply costs totaled \$6,311.16. Accommodations at Casa Blanca were graciously provided to us and NYU Dentistry only had to cover the cost of the cleaning services and drinking water. The majority of supplies were provided by Henry Schein Cares as part of its gift-in-kind, which reduces NYU Dentistry's actual expenses to \$9,727.25.

Recommendations

The team observed an abundance and ready availability of high sugar snacks in the schools. Removing these cariogenic foods and beverages and replacing them with healthy alternatives would benefit the children's oral and overall health.

There were 14 children who needed follow-up treatment. Many children from De Zandberg School needed urgent dental care. Unfortunately, there was no public health dental services where children could be referred in Granada. Students of Granada is exploring relationships with local private dentists in an attempt to create a network that may provide urgent care for these children at reduced fees.

Next steps:

If the U.S. State Department's travel advisory for Nicaragua is not lowered to a Level 2, the team cannot return with students to conduct a full clinical outreach in Nicaragua, regardless of how safe participants felt during this outreach. However, there is still a high need to address the oral health of Granada's citizens, and the NYU Dentistry Global Outreach team remains committed to investigating routes to address this disparity.

Should a full clinical outreach be feasible, the team should consider sending a school-based team one week early to begin assessments for children who need follow up to care to be sent to the outreach clinic.