

Nudging Parents to Improve Children's Oral Health: A Field Study

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About This Initiative

This research brief is part of a series by the Social Impact Nudgeathon initiative. This initiative incorporated insights from behavioral economics into the design and delivery of social welfare programs. Developed through a partnership between the Joint Distribution Committee (JDC) and the Social Policy Institute (SPI) at Washington University in St. Louis, this initiative is among the first of its kind to launch in Israel.

Working in close collaboration, research teams from the United States and Israel investigated whether using behavioral insights to make small changes in the delivery of social service programs in Israel and Russia would positively influence the outcomes of those programs.

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Key Findings

- This brief presents the results from a field experiment that tested strategies for improving parental participation in an oral health promotion workshop.
- In this study, daycare centers, in which a team of dental hygienists provided oral health workshops for parents, were randomly assigned to one of six experimental conditions.
- Specifically, daycare centers were randomly assigned to introduce the Teeth Brushing Board (TBB)—i.e., an interactive poster board to report whether parents brushed their child’s teeth the previous day—into daycare classrooms in the two weeks before the oral health workshop. Further, parents were randomly assigned to receive invitation letters to the workshop with different messages (neutral, negative accountability, or positive accountability).
- The evidence shows that 41.3% of parents attended the oral health workshop, with none of the interventions significantly changing parents’ attendance rates relative to the control condition (i.e., neutral letter, no interactive board).

Background

Dental caries, or tooth decay, is an infectious bacterial disease. Although dental caries is a preventable disease, it affects most of the population. Early childhood caries (ECC) is a severe version of the disease occurring during the earliest years of life when the primary teeth are extremely vulnerable. Worldwide, ECC is one of the most prevalent diseases among children and it affects approximately 15% of Israeli children (Livny & Sgan-Cohen, 2007; Natapov, Gordon, Pikovsky, Kushnir, Kooby, Khoury & Zusman, 2010). Onset of ECC can begin with the first tooth, and has the potential to affect children’s development, health, and quality of life by causing pain, psychological trauma, and physical health complications. In addition, treatment of ECC can cause indirect harm from procedures that require

general anesthesia (Alazmah, 2017; Anil & Anand, 2017; Petersen, 2008). Further, children with ECC can develop problems with eating and speaking as well as having increased risk for caries in their permanent teeth.

Prevention of ECC can be achieved through comprehensive programs that promote oral health including a thorough oral examination; caries risk assessment; preventive services; anticipatory guidance on diet, growth and development, and injury prevention; and review of oral health practices, including information on the various modes of fluoride use. Oral health programs implemented across the globe have been effective in preventing ECC, especially among children whose primary caregivers attended oral health programs emphasizing the critical role caregivers play in the adoption of protective health care behaviors (Harrison, 2003; Kay & Locker, 1998; Macpherson et al., 2013; McMahon, Blair, McCall, & Macpherson, 2011; Petersen, 2003; Rong, Bian, Wang & De Wang, 2003). Additionally, as compared with children who received preventive dental care at older ages (five years and older), young children who received preventive dental care at early ages (before three years) had lower overall costs for dental treatment (Macpherson et al., 2013). Prevention, health promotion, and dental care among children are foundational to good oral health (Fluoride Recommendations Work Group, 2001; Kanduti, Sterbenk & Artnik, 2016; Sgan-Cohen et al., 2013; Simmons, Smith & Gelbier, 1983; The World Oral Health Report 2003). Parents and caregivers play a crucial role in their children’s oral health, including the prevention of ECC. The parent/caregiver role is especially important for young children who are unable to care for themselves. Achieving optimal dental health for children requires collaboration between parents, educational professionals, and health care professionals (Arrow, Raheb, Miller, 2013; Lai, Tan & Lu, 2018).

The Smiles Program

Over the last several years, significant investments have been made to develop and implement models of community-based early childhood oral health programs to serve children from low socioeconomic status families in Israel. These model programs are

a collaborative effort of the JDC-Ashalim (which is part of Joint Distribution Committee-Israel) and the Department of Community Dentistry of Hadassah-Hebrew University, with the endorsements of the Division of Dental Health of the Ministry of Health, the Ministry of Education, and the Ministry of Labor, Social Affairs and Social Services. The work is supported by P.E.F. Israel Endowment Funds. The model programs launched in multiple sites, most of which are known as “peripheral communities.” These sites are geographically distant from the center of the country and typically have limited services and significant numbers of children at risk.

The first program—Smiles: Oral Health Promotion Program Among 3- to 5-Year-Old Children in Kindergartens in Israel—was implemented from 2013 to 2016. This program included 5,300 kindergarten-aged children (3–5 years old) from 180 kindergartens across Israel. As part of the national dental service for children in Israel, this pilot program was designed to incorporate daily supervised tooth brushing into the routine of the kindergarten classroom. The program is now embedded as an essential component of the National Health Service for children in Israel (Vered, Natapov, Goldberg, Zini, Sgan-Cohen & Mann, 2018; Vered, Goldberg & Natapov, 2018).

A second model program in Israel, targeting 1- to 3-year old toddlers in daycare centers, was implemented from 2016 to 2018. This program included 50 daycare centers across Israel (2,450 toddlers), and the educational staff of each center. The program targeted parents through a one-time, high-quality workshop for parents and children called the “Teeth Brushing Meeting” (TBM). During this 60-minute meeting, a dental hygienist first introduced guidelines for oral health and then instructed parents and children in good techniques for brushing their teeth. Notably, substantial efforts were made to make these workshop meetings attractive to families: the workshop is free, provided at times and locations convenient for most families, and participants received incentive gifts (i.e., a toothbrush, toothpaste, and a magnet with oral health guidelines). However, despite these efforts, the workshops had poor

attendance rates in 2016 and 2017.

To address this problem, in 2018 the Smiles project teamed with researchers from several universities in Israel to test strategies for improving parental participation in the 2018 cycle of this oral health promotion program. Specifically, Smiles and the research teams wanted to test the effectiveness of using insights from behavioral science to increase the number of parents participating in oral health workshops. This approach was informed by existing research in the health, financial, and education fields showing that incorporating principles from behavioral science is a cost-effective strategy to increase program uptake (Benartzi et al., 2017; Thaler, 2015). The present brief summarizes the methods and findings of this collaborative project.

Research Objective and Study Procedures

This field study tested the effect of two nudges aiming to encourage parents of toddlers to attend the TBM, a series of educational sessions on how to take care of their children’s oral health.

Based on research showing that reminders are effective in helping people adhere to their goals (Cadena & Schoar, 2011; Karlan, McConnell, Mullainathan & Zinman, 2010), the first nudge was a reminder issued in the weeks preceding the TBM to remind parents that they needed to take care of their children’s oral health. To provide a daily reminder in the two weeks before the oral health workshop, we introduced the Teeth Brushing Board (TBB) into daycare classrooms. The TBB is an interactive poster board on which parents report whether they brushed their child’s teeth the previous night. The TBB is posted by the classroom doorway and the parent (with the child) can mark off tooth-brushing activity while dropping off their child for daycare. In addition, the TBB displayed details about the upcoming TBM. We hypothesized that the use of the TBB would increase families’ attendance at the TBM (*Hypothesis 1*).

The aim of the second nudge was to remind parents of the potential gains (vs. losses) of good (vs. poor) oral hygiene habits. This nudge draws on a considerable

body of research showing that reminding individuals about the positive or negative outcomes of a given behavior can affect their likelihood of engaging in that behavior (e.g., Benartzi et al., 2017; Kahneman, 2011). Building on the research on behavioral reminders, we also added an element to this nudge to create a sense of accountability in parents. Preschoolers have not developed the level of responsibility to take care of their own teeth, and therefore, their oral health depends on the efforts and persistence of their primary caregivers. Accountability can give rise to two emotions: pride, when the outcome is positive, and guilt, when the outcome is negative. In this project, we tested the impact of priming parents for pride and guilt through the invitation letters for the TBM workshop. We designed three invitation letters that were sent to different groups of parents (each childcare was assigned to a single condition, meaning that all parents in the same childcare received the same type of letter).

One group received a neutral letter containing a brief description of the meeting with the date and location details. A second group received a positive accountability letter that aimed to elicit pride by emphasizing the gains to their child from good oral hygiene and pointing to the child's parents as responsible for this potential gain. Conversely, the third group received a negative accountability letter that aimed to elicit guilt by underscoring the losses their child might incur through poor oral hygiene habits and emphasizing the parents' responsibility in such loss. To increase the accountability impact, the positive and negative letters were worded as if written by the child ("Mommy, Daddy, why did you..." / "Mommy, Daddy, thank you for..."). With this nudge, we tested two hypotheses:

- **Hypothesis 2a:** The negative and the positive accountability letters will lead to higher attendance at the TBM workshop than the neutral (control) letter.
- **Hypothesis 2b:** The negative accountability letter will lead to higher attendance at the TBM workshop than the positive accountability letter.

Although we wanted to incorporate a condition

replicating the recruitment method of the previous years of the program, this was not possible due to the fact that in the previous years of the program, recruitment was done independently by each daycare at the discretion of the daycare staff.

Experimental Design

The intervention included six conditions in a 2 x 3 between-subject factorial design (TBB: with and without; Invitation letter framing: neutral, negative accountability, and positive accountability). Daycare centers were randomly assigned to one of the six conditions. All families with a child enrolled in a given daycare center were assigned to the same experimental condition. For example, all parents with a child in Daycare A received a neutral letter, all parents with a child in Daycare B received a positive accountability letter, and all parents of a child in Daycare C received a negative accountability letter; and each of three daycares included a TBB. This approach was used to limit cross-contamination between the intervention groups.

Research Method

Participants

Our study participants were parents to 2,450 children enrolled in 50 daycare centers with three types of classes: classes for younger children (ages 1–2 years), older children (ages 2–3 years), and "mixed" (with children ranging from 1 to 3 years). Some daycare centers had one class, while others had two. The daycare centers were located in various cities and towns in Israel and were representative of the diversity of the Israeli population (e.g., some daycare centers served the Arab community, others served the Ultra-Orthodox community, and the majority served the non-Ultra-Orthodox Jewish community). All study materials were translated to Arabic, and the meeting was conducted in Arabic for the daycare centers serving the Arabic-speaking community.

Due to technical reasons independent of our study, some daycare centers ended up not participating in the Smiles program. In addition, some data on meeting

attendance were stolen from the car of a hygienist in charge of several daycare centers. These daycare centers therefore had to be pulled from the study. The final sample used for the analysis included 41 daycare centers and 2,050 children. The number of children in each condition is summarized in Table 1. Overall, 765 children (37%) were in a class for younger children, 1,063 (52%) were in a class for older children, and 222 (11%) were in a mixed class. A total of 1,633 children (80%) were in a daycare that served predominantly Jewish communities.

Study Materials

Teeth Brushing Board (TBB). The daycare’s staff put the TBB at the entrance of the classroom each morning over the period of two weeks before the TBM workshop. The TBB invited parents to report whether they had brushed their child’s teeth the previous night. The TBB had two columns: “We brushed our teeth” and “We didn’t brush our teeth, but we will tonight!” (Figure 1). Each child had a tooth-shaped sticker that they could attach to the appropriate column to mark that day’s response. The center’s staff explained the TBB to parents and encouraged parents to use the TBB each day.

Invitation letters. The invitation letters were printed and delivered to the daycare centers by the Smiles program team. The daycare staff was in charge of delivering the letters to parents (5 to 7 days before the TBM). Most daycare center staff did so by putting the invitation into the toddlers’ backpacks. There were

three different versions of the letters.

1. *Neutral invitation letter (control):* Language used was informative and neutral. The letter invited parents to a 60-minute meeting to ‘learn about caring for their beloved one’s oral health’ and informed the parent of the time and location of the tooth brushing meeting. It also included a neutral picture (Figure 2).
2. *Negative accountability letter:* In addition to the details included in the control letter, this letter emphasized that it is the parents who are responsible for any damage their child might sustain to their oral health. The letter included a picture illustrating the damage that can result from poor oral hygiene (Figure 3).
3. *Positive accountability letter:* In addition to the details included in the control letter, this letter emphasized that children’s good oral health is the result of parents fulfilling their responsibility. This letter included a picture of a smiling child with a healthy mouth (Figure 4).

All parents in a given daycare were assigned to the same intervention condition and received the same letter. Parents and daycare center staff were unaware of the existence of three different versions of the letter.

Table 1: Number of Children in Each Condition

		Use of Teeth Brushing Board		
		No	Yes	Total
Letter Design	Neutral (control)	323 (7)	334 (7)	657 (14)
	Positive accountability	279 (6)	522 (9)	801 (15)
	Negative accountability	427 (9)	165 (3)	592 (12)
Total		1,029 (22)	1,021 (19)	2,050 (41)

Notes: Number of daycare centers in parentheses.

Figure 1: Tooth Brushing Board (TBB)



Figure 3: Negative Accountability Invitation Letter



Figure 2: Neutral Invitation Letter



Figure 4: Positive Accountability Invitation Letter



Teeth Brushing Meeting (TBM) and Data Collection

The TBM was a one-time meeting. It lasted 60 minutes and was led by an oral hygienist who also monitored attendance and reported the number of participating parents. At the end of the meeting, parents were asked to fill in a short anonymous questionnaire about their child (e.g., gender, age, number of siblings). The answers to this questionnaire are not presented here.

The intervention period in each daycare center spanned approximately two weeks (including the TBB display, the letter delivery, and the TBM). Meetings were scheduled for various dates to accommodate the schedules of both parents and hygienists. As a result, the overall study lasted for about eight months during the school year of 2018-2019.

Empirical Method

To test whether parents' attendance was influenced by our interventions, we ran a logistic regression model, clustering standard errors by daycare center. The unit of analysis is a child. The dependent variable is a dichotomous variable equal to one if child's parent attended the workshop, and zero otherwise. In the first regression, the independent variables of interest were (i) the type of letter sent to the parents (control, positive, negative) and (ii) the presence or absence of the TBB. In the second regression, we added an interaction between the letter type and the TBB presence. Each regression model also controlled for the following characteristics: the type of class a child attended (a class for younger children, older children, or a mixed group) and whether a daycare was predominantly Jewish.

Results

Table 2 presents the average probability of the TBM attendance by experimental conditions. The overall rate of attendance was 41.3%.

Table 3 presents the results of two regression models. Model 1 reports findings from a regression model without an interaction term between the letter type and the TBB presence, and Model 2 presents the results that

include this interaction term. As these two tables show, our interventions did not significantly change the rate of the TBM attendance among parents.

Discussion

Educating parents to take care of their children's teeth—especially those of young children who cannot take good care of their teeth themselves—can have critical and long-lasting effects on oral health. However, convincing parents to attend educational workshops on the topic has shown to be difficult.

The goal of the project was to nudge parents of toddlers in 50 daycare centers across Israel to attend a free, interactive, one-time workshop of oral hygiene organized by the Smiles program. To do so, we used two interventions. First, in the two weeks before the workshop, a half of the daycare centers placed an interactive board in their classrooms, encouraging parents to report whether they brushed their children's teeth the previous morning and night. Second, we modified content of the invitation letter to the Smiles program meeting. While a third of the parents received a neutral letter containing only a short description of the upcoming meeting, its time, and location, the rest of the parents received one of two modified letters. The modified letters described the good (bad) outcomes of good (bad) hygiene in addition to regular meeting details, with a strong emphasis on the accountability of the parents for their child's oral health and respective outcomes.

Overall, parents' attendance in the meeting was around 41%. None of the interventions showed a significant improvement in parents' attendance rates compared to the control condition (i.e., neutral letter and no TBB). This lack of an effect can be explained by several factors.

First, for our letter intervention to be effective, letters had to reach children's parents. However, we had very little control over the delivery process, as invitation letters were placed in children's bags by the daycare staff. In some cases, the teachers notified parents about the letters, while in other cases they did not. In addition, parents were not expecting to receive a letter,

Table 2: Average Probability of TBM Attendance, by Intervention

		Use of Teeth Brushing Board		
		No	Yes	Total
Letter Design	Neutral (control)	0.446	0.422	0.434
	Positive accountability	0.444	0.389	0.408
	Negative accountability	0.405	0.337	0.395
Total		0.429	0.397	0.413

Notes: N=2,050.

Table 3: Results of Regression Analysis for TBM Attendance

Variable	TBM Attendance					
	No interaction term (1)			With interaction term (2)		
	Odds Ratio	Std. Err.	<i>p</i> -value	Odds Ratio	Std. Err.	<i>p</i> -value
Letter design (ref.=neutral)						
Positive	0.970	(0.280)	0.916	1.033	(0.302)	0.910
Negative	0.823	(0.283)	0.571	0.855	(0.336)	0.689
Use of Teeth Brushing Board						
Yes	0.793	(0.202)	0.364	0.847	(0.350)	0.688
Interaction terms						
Positive letter * Board				0.894	(0.486)	0.836
Negative letter * Board				0.921	(0.673)	0.910
Jewish (ref.=non-Jewish)	1.260	(0.430)	0.499	1.258	(0.436)	0.508
Class type (ref.=older children)						
Young children	1.081	(0.175)	0.628	1.087	(0.179)	0.613
Mixed group	0.783	(0.283)	0.499	0.788	(0.294)	0.524
Constant	0.699	(0.239)	0.296	0.676	(0.201)	0.188

Notes: N=2,050. Robust standard errors clustered by daycare center in parentheses. Ref.=reference group

and thus might not have looked at it. It is thus unclear how many of these letters actually reached children's parents. In fact, some of the parents who attended the meeting reported they did not get an invitation letter. Text messages or WhatsApp messages might have been a simpler, more controllable solution to implement our intervention. While we considered this option in the beginning of this project, we could not implement this idea given that a significant fraction of our sample belongs to the Ultra-Orthodox community where the usage of smartphones and text messages is not common (and in some cases even forbidden). This clearly illustrates that understanding how to reach parents is the first critical step in any intervention aimed at recruiting parents. Further exploration of this topic is needed.

Second, in the previous years of the Smiles program, the main factor of success in recruiting parents was the involvement and enthusiasm of daycare center directors. Daycare center directors who value the mission of the Smiles program can strongly influence parents' attendance either directly (e.g. by talking to parents about the workshop, putting up a note on the daycare center's entrance door, or sending reminders) or indirectly (e.g., by motivating their staff who may, in turn, encourage parents' attendance). The influence of daycare center directors may have neutralized the potentially smaller effects of our nudges. In other words, our interventions may have been influenced by an array of different factors that are beyond our control, such as the influence of daycare center directors and staff. Future studies could specifically target daycare center directors and staff given their critical role in parents' recruitment.

Lastly, it is important to note that we have no direct comparison with the attendance rates in the previous years of the program, and that none of our interventions reproduce the recruitment method used previously by the Smiles program team. In the previous years, the recruitment method was widely heterogeneous. It is thus unclear whether our interventions affected parents' attendance relative to what would have happened in the absence of any intervention by the

research team.

Conclusions

While we did not find evidence to support our hypotheses and were not able to significantly increase parents' attendance in the TBM, this project has been successful in many other ways. Specifically, we have developed a successful collaboration with multiple partners. The partnership has allowed us to explore our research hypotheses using data from 50 daycare centers across Israel, reaching more than 2,000 children. Our work has allowed us to determine the obstacles and challenges that should be addressed during the planning and design stages prior to the study implementation with regards to recruitment and engagement of toddlers' parents. We are hopeful that these insights will serve us and other teams in future projects.

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