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To cite this article: Marina Reznik, Elana Greenberg, Agnieszka Cain, Jill S. Halterman & Maria Ivanna Avalos (2019): Improving teacher comfort and self-efficacy in asthma management, Journal of Asthma, DOI: [10.1080/02770903.2019.1640732](https://doi.org/10.1080/02770903.2019.1640732)

To link to this article: <https://doi.org/10.1080/02770903.2019.1640732>



Published online: 17 Jul 2019.



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Improving teacher comfort and self-efficacy in asthma management

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ABSTRACT

Background: Asthma is common among urban school-age children. Though teachers should be prepared to assist children during an asthma attack, studies show they lack self-efficacy in managing asthma.

Objective: To assess feasibility of implementing an asthma workshop for elementary school teachers, describe themes of questions raised, and determine workshop's impact on teachers' comfort and self-efficacy in asthma management.

Methods: We developed and implemented an asthma workshop for teachers from four Bronx elementary schools (2012–2014). Teachers completed a questionnaire evaluating their comfort and self-efficacy in asthma management before and after the workshop. Questions asked during the sessions were recorded and analyzed for themes. Paired t-test and McNemar tests compared before/after scores.

Results: 65 out of 70 teachers (92.9%) participated in the educational sessions. Teachers asked questions about school policy for inhalers, medication administration guidelines, and physical activity and asthma. 64/65 (98.5%) teachers completed pre/post surveys (mean age 39.7 years; mean years at the school 8.0). Post-intervention, more teachers reported knowing how to manage an asthma attack (93.8% vs. 64.1%, $p < .0001$); and felt comfortable assessing (50.8% vs. 30.8%, $p = 0.019$) and handling an asthma attack (52.3% vs. 33.8%, $p = .023$). The overall mean self-efficacy score increased post-intervention (43.0 vs. 38.1, $p < .0001$), as did 8/12 individual self-efficacy items. Post-workshop, 95.3% of teachers agreed that teacher in-service asthma education should be done annually.

Conclusions: An asthma workshop was successfully implemented in the school setting and improved teacher comfort and self-efficacy in managing asthma. Annual training may improve teachers' confidence in assisting students with asthma.

Abbreviations/Acronyms: NYC DOE: New York City Department of Education; NHLBI: The National Heart, Lung, and Blood Institute; SE: self-efficacy; AMAF: Asthma Medication Administration Form; MDI: Metered Dose Inhaler

ARTICLE HISTORY

Received 7 April 2019
Accepted 2 July 2019

KEYWORDS

Elementary schools;
workshop; asthma; inner
city; children

CLINICAL TRIAL REGISTRATION

NCT01873755,
clinicaltrials.gov

Introduction

Asthma is one of the most common chronic diseases in childhood. Published research, including our prior study, revealed that asthma prevalence in urban minority school-aged children residing in inner-cities such as the Bronx, New York is 20–25% (1,2). Exposure to triggers throughout the school day can exacerbate asthma symptoms and may even be fatal (3–5). Given that many United States' schools have limited or no access to a school nurse, the teachers have an increased responsibility to care for children with asthma (4,5).

The National Heart, Lung, and Blood Institute provide a guide for schools specifying classroom teachers'

role in asthma management (6). The guidelines recommend effective communication between the school staff, physicians, and families as well as involving school staff in development of a school asthma management plan. Appropriate staff members, including the teachers, should be educated about each student's individual asthma action plan. Teachers should be comfortable recognizing signs of uncontrolled asthma and should be active facilitators in ensuring child's wellbeing while in the classroom.

Unfortunately, research has shown that teachers lack the appropriate training and knowledge regarding asthma management (3–5,7,8), with fewer than 25%

of teachers reporting having received training on asthma at their current place of employment (8). Other studies have reported that many teachers lack confidence and feel uncomfortable with their limited ability to help students with asthma exacerbations (7, 9). Elementary school teachers indicated high anxiety and limited knowledge about dealing with a possible asthma-related medical emergency in school (10). In addition, fears about medication administration and liability issues prevent teachers from feeling comfortable with managing children's asthma (4).

A study conducted with 45 teachers at six New Mexico elementary schools showed participants' comfort with recognizing symptoms of asthma was significantly higher after educational intervention (9). Recognition of respiratory distress is critical and could be lifesaving, prompting an early activation of the Emergency Medical Services system by the teacher (9). While there is a demonstrated need for asthma education for teachers, little is known about the impact of asthma education on teachers' comfort and self-efficacy in asthma management in the classroom.

Self-efficacy has been defined as a mechanism of personal agency relating to one's belief in their capability over their level of functioning and environmental demands (11,12). Teacher self-efficacy has been associated with multiple positive outcomes for not only the teachers but also their students (13). Higher self-efficacy scores were found to be associated with better asthma control for patients with asthma (14). We postulated that asthma education workshop would result in an increase in teacher self-efficacy and comfort in managing students' asthma. The objectives of this study were to assess the feasibility of implementing an asthma education workshop for elementary school teachers in an underserved urban district, describe themes of questions raised by teachers during the educational sessions, and evaluate the impact of the workshop on teachers' comfort and self-efficacy in asthma management.

Methods

Participants and settings

We invited 70 teachers who taught 2nd–5th grades at four Bronx, NY elementary schools to participate in an intervention study during the 2012–2014 academic years. The principal investigator held meetings with school Principals and Assistant Principals to explain the intervention and encourage teachers' participation. To be eligible to participate, teachers must have worked at the school for at least one academic year;

all teachers meeting this criterion were invited to participate. Attendance was voluntary and all participating teachers signed an informed consent form.

This study was part of a larger school-based intervention trial. The study was approved by both the University's and the New York City Department of Education (NYC DOE) Institutional Review Boards.

Teacher asthma workshop

The 45-min asthma workshop was based on the National Heart, Lung, and Blood Institute (NHLBI) guidelines on asthma management in schools (6) and consisted of a didactic presentation followed by an interactive question and answer session. The workshop aimed to enhance the teachers' knowledge and their ability to manage students with asthma as well as address their lack of self-efficacy and comfort around asthma. The workshop was delivered by a Community Health Worker with previous training and experience in providing asthma education.

The workshops took place at schools (libraries, meeting rooms and classrooms) during teachers' preparation periods or during the school staff weekly meetings. A PowerPoint presentation was developed to aid the session, and a sample inhaler and spacer devices were used to demonstrate the asthma medication administration technique. Supplemental printed materials were also distributed to the participants. The core topics addressed during the training session are presented in Table 1. The teachers who completed the training received a certificate of attendance and were awarded incentives consisting of school supplies for their classrooms as part of participation in a larger trial.

Teacher questions

A question and answer session followed the didactic presentation, with encouragement and prompting for participation by the study staff as needed. Each

Table 1. Asthma workshop topics.

1.	Information about school asthma prevalence
2.	Pathophysiology of asthma
3.	Warning signs and symptoms of an asthma attack
4.	Common asthma triggers
5.	Actions to be taken during an acute asthma attack in the classroom
6.	Asthma and physical activity
7.	Differences between quick-reliever and preventive medications
8.	Demonstration of MDI-spacer technique
9.	Asthma medication administration form (AMAF)
10.	Asthma Action Plans
11.	The teachers' role in asthma management as per NHLBI guidelines

MDI: Metered Dose Inhaler; NHLBI: National Heart, Lung, and Blood Institute.

question that was raised was systematically recorded. We then compiled questions and performed iterative review to identify themes. Each author then reviewed the theme categorizations for consensus.

Questionnaire

We asked teachers to complete a 20-item written survey evaluating their self-perceived knowledge, comfort, and self-efficacy in classroom asthma management twice: 1–2 weeks prior to the workshop and then again 1–2 weeks after completion of the workshop.

Teachers were asked whether they knew what to do if one of their students developed an asthma attack (yes/no). Teachers also rated their comfort level in assessing and handling the situation if one of their students had an asthma attack in the classroom (1 = “not comfortable at all” to 5 = “completely comfortable”). These responses were dichotomized into “not comfortable” and “comfortable.”

The survey included a 12 item self-efficacy (SE) scale (Cronbach’s $\alpha = .88$), developed based on the NHLBI guidelines (15). We asked the teachers about their confidence managing students with asthma, including symptom recognition, trigger avoidance, assisting with medications, communicating with parents, encouraging participation in physical activity, and responding to asthma emergencies. Teachers rated their confidence from 1 = “not at all sure” to 5 = “completely sure.” Responses were summed to obtain SE scores (12 = lowest SE to 60 = highest SE). Responses to individual items on SE scale were dichotomized into “not sure” and “sure.”

Additionally, we collected demographic information such as teacher’s age, gender, race/ethnicity, years worked in the school and NYC DOE system, their own asthma status, and if they had a family member with asthma.

Statistical analysis

We used the McNemar test to compare teacher knowledge, comfort, and individual items on self-efficacy scale pre/post-workshop. Paired t-test was used to compare SE scores pre- and post-workshop. We used chi-square test to compare baseline teacher knowledge, comfort, and responses to individual items on SE scale between teachers with and without personal asthma diagnosis and/or having a family member with asthma. Independent samples t-test was used to compare pre-workshop and post-workshop SE scores between teachers with and without personal asthma diagnosis and/or having a family member with

Table 2. Sociodemographic characteristics of teachers.

Characteristics	N	(%)
Mean age, years (SD) ^a	39.7	(10.6)
Female Gender ^b	61	(95.3)
Ethnicity ^b		
Hispanic/Latino	16	(25.0)
Not Hispanic/Latino	48	(75.0)
Race ^c		
African American	23	(35.9)
Caucasian	33	(51.6)
Other	9	(14.1)
Grade Taught ^d		
2nd Grade	10	(15.4)
3rd Grade	16	(24.6)
4th Grade	19	(29.2)
5th Grade	11	(16.9)
Multiple grades	9	(13.8)
Work Experience ^d		
Years worked in NYC DOE System (SD)	11	(6.8)
Years worked in the school (SD)	8	(5.9)
Exposure to Asthma ^b		
Self	9	(14.1)
Family member	26	(40.6)
Student current school year	63	(98.4)

Data presented as N (%) unless otherwise specified.

^aData available on 52 participants.

^bData available on 64 participants.

^cData available on 62 participants.

^dData available on 65 participants.

asthma. A 2-sided p values < 0.05 were considered statistically significant. All analyses were completed using SPSS version 23.0 software (SPSS Inc, Chicago, IL).

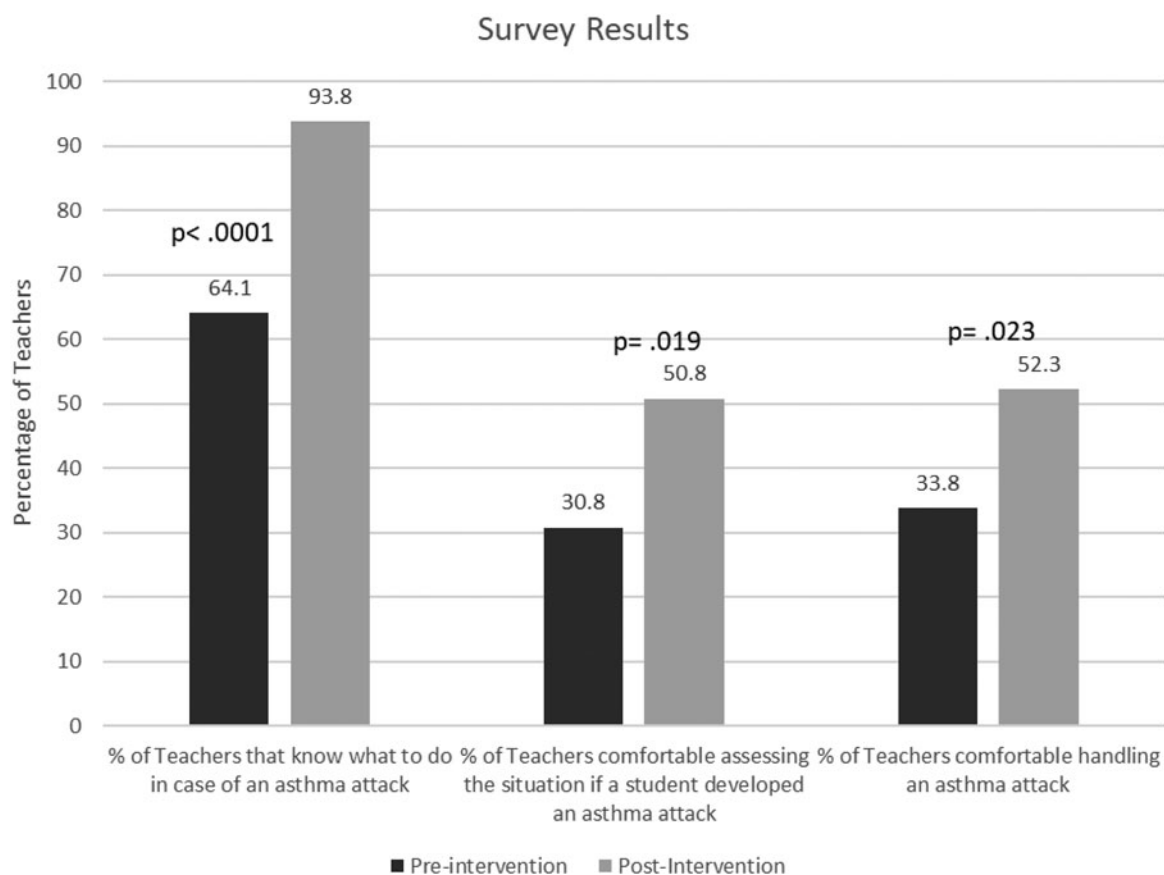
Results

Fourteen workshop sessions were held during the late spring of 2013 and 2014 with 1 to 18 teachers in attendance per session, successfully reaching 65 classroom teachers. A total of 28 teachers attended the workshop in year 1 of the study (2012–2013) and 37 in year 2 (2013–2014). Teachers were on average 39.7 years old; the majority were female (95%), and the mean years of teaching experience at the school was 8.0 yrs. Teachers were of diverse racial and ethnic backgrounds, with 35% reporting African American race, 51% Caucasian, and 25% Hispanic/Latino. A total of 40.6% of teachers reported having a family member with asthma (Table 2).

During the workshop sessions, teachers raised questions around several common themes (Table 3). These included questions about the school policy for asthma inhalers (e.g., “What to do on a field trip; should we tell students to bring the pump?”), medication administration and forms (e.g., “Can teachers administer medications?” “Who has the medication administration form?”), asthma treatment (“Does the pump hype kids up?”), and physical activity and asthma (“Do they all need to take the inhaler before gym?”). They also inquired about distinguishing “cold” symptoms from asthma and the contribution of allergies.

Table 3. Sample questions teachers asked during the asthma workshop.

Themes	Questions
1. Asthma Inhaler School Policy	"Can child carry medicine? What to do on a field trip? Should we tell students to bring the pump?" "What is the school policy around carrying the pump?"
2. Asthma Medication Administration	"How do we know if the child can self-administer medication?" "Can the child carrying the pump administer his/her own medication?" "Can teachers administer medication?"
3. Asthma Medication Administration Form (AMAF)	"Can the child carrying the pump administer his/her own medication?" "What should teachers do if the child is carrying the pump, but she/he does not have the AMAF? Should they confiscate the pump?"
4. Asthma Treatment	"Does the asthma pump hype the kids up?" "Are there any natural remedies?" "Do you need to get treatment right at the early warning signs before it gets bad?" "Is the spacer only for children?"
5. Physical Activity and Asthma	"Do they all need to take the inhaler before gym?" "Is a child always going to have an attack when he exercises?" "What to do if students do not have a pump and do not want to participate in gym?"
6. Other	"Does the attendance office know when kids are absent due to asthma?" "School nurse goes on lunch break- what do we do then?" "How can you tell the difference between a cold and asthma?" "Doesn't the Bronx have the highest prevalence of asthma?"

**Figure 1.** Survey results.

Out of the total of 65 teachers who attended the workshop, 64 completed pre/post surveys. We found that post-workshop, a greater proportion of teachers reported knowledge of what to do if a student developed an asthma attack and felt comfortable assessing and handling the situation if a student developed an asthma attack (See Figure 1). The overall mean SE score

increased post-intervention (43.0 vs 38.1, $p < .0001$), as did 8 out of 12 individual SE items (Table 4). SE scores did not significantly increase for four out of 12 items. These included items assessing the teachers' confidence in: (1) Ensuring immediate access to asthma pump in school; (2) Ensuring immediate access to asthma pump during trips; (3) Ensuring students file an Asthma

Table 4. Teachers' self-efficacy.

Self-efficacy item	Survey question	Pre-intervention, %	Post-intervention, %	<i>p</i> value
1. Ensuring recognition of asthma symptoms	How sure are you that can recognize symptoms of asthma in one of your students?	32.8	64.1	<.0001
2. Ensuring avoidance of asthma triggers in the classroom	How sure are you that you can avoid or reduce the asthma triggers in your classroom?	30.6	54.8	0.003
3. Assisting children with avoidance/exposure to triggers	How sure are you that you can assist children with asthma with avoiding exposure to known triggers?	29.7	57.8	0.001
4. Ensuring participation of students with asthma in physical activity	How sure are you that you can encourage students with asthma to participate fully in physical activity?	59.4	76.6	0.013
5. Assisting students with taking their asthma inhaler	In case of asthma attack, how sure are you that you can assist students with taking their asthma pump?	42.9	61.9	0.023
6. Ensuring immediate access to asthma inhaler in school	How sure are you that your students have immediate access to their asthma pump during regular school?	30.6	40.3	0.286
7. Ensuring immediate access to asthma inhaler during trips	How sure are you that your students have immediate access to their asthma pump during school trips?	34.4	39.1	0.664
8. Evaluating student's need to take asthma inhaler	How sure are you that you can determine if a student needs to take his/her asthma pump?	35.9	60.9	0.002
9. Ensuring students file a medication administration form	How sure are you that all of your students with asthma have a MAF on file in school?	18.8	25.0	0.388
10. Effective communication with parents about child's asthma	How sure are you that you can effectively communicate with parents about their children's asthma?	51.6	64.1	0.152
11. Getting immediate medical care for a student in severe distress	If the student is in severe distress such as unable to speak or has blue lips, how sure are you that you can stop the class and get immediate medical care for the student?	71.9	85.9	0.035
12. Effectively working with nurse and PE teacher to support students with asthma	How sure are you that you can effectively work with other school staff such as school nurse and Physical Education Teacher in providing extra support to students who have asthma?	65.6	79.7	0.022

MAF: Medication Administration Form; PE: physical education.

Medication Administration Form (AMAF) with the school nurse; (4) Ensuring effective communication with parents about child's asthma. Lastly, post-workshop, almost all teachers (95.3%) agreed that in-service asthma education should be implemented annually.

There was no statistically significant difference in baseline knowledge of what to do if a student developed an asthma attack and comfort in assessing and handling a situation if a student developed an asthma attack between teachers with and without a personal history of asthma and/or having a family member with asthma. There was also no statistically significant difference in pre-workshop and post-workshop SE scores between teachers with and without a personal history of asthma and/or having a family member with asthma (pre-workshop: 39.2 vs. 36.9, $p = 0.334$; post-workshop: 43.7 vs. 42.4, $p = .451$). Subgroup analyses of individual items on SE scale revealed that at baseline, teachers with a personal history of asthma and/or a family member with asthma reported being more sure to assist students in avoiding exposure to asthma triggers in a classroom than teachers without these characteristics (43.3% vs. 17.6%, $p = .025$).

Discussion

We successfully implemented a 45-min educational workshop for teachers in an underserved school district and

found improved asthma knowledge and an increase in self-efficacy and confidence in handling asthma exacerbations in the classroom. The teachers nearly uniformly agreed that they would benefit from the implementation of a similar educational workshop on an annual basis. The NHLBI Guidelines provide guidance on the development of an Asthma Management Program in schools (6). It promotes professional development for teachers and staff by endorsing their active role in asthma management and underlining their involvement in the development and maintenance of the school asthma management program (6). This has been supported by past research, including a study by Rodehorst et al. who in 2003 surveyed 212 rural elementary school teachers in Western Nebraska and Eastern Wyoming and found that they had very little knowledge about their students' asthma (16).

Our study suggests that many teachers would benefit from a 45-min educational workshop on the topic of asthma management. Similar studies have suggested that programs providing asthma education to non-medical staff at school have been successful at increasing knowledge and confidence among school staff members (9,10). Several means of educating school personnel have been used. Abdel et al. found that using asthma educational pamphlets as a resource for school staff increased the staff's asthma-related knowledge and improved the asthma-related attitudes, and management practices (17). Bell et al. found that an asthma training session by a pharmacist in Northern Ireland significantly improved

teacher's knowledge of asthma based on the Newcastle Asthma Knowledge questionnaire (18).

There is evidence to suggest that increased knowledge can lead to an increase in confidence and decreased anxiety so that teachers can react calmly in an emergency (10). A study in California and similar Australian research showed that the teachers' self-reported confidence with management of acute asthma episodes in the classroom increased significantly after attending asthma workshops (19,20). We found only one Australian study from 1994 that showed improved teacher confidence with the management of acute asthma at school after asthma education workshop (20). No study has evaluated effects of educational interventions on teachers' self-efficacy and competency in managing asthma.

The questions raised by teachers during the workshop sessions demonstrated their engagement in the topic as well as their desire to increase their capacity to help students with this all too common disease. The themes represented practical issues (e.g., asthma inhaler school policy, medication administration, what to do on field trips and when a school nurse is out of office, asthma attacks with exercise) that they likely face routinely. School-based workshops should ensure inclusion of these pertinent topics in their educational materials, and also leave room for additional questions as they arise.

Having a personal history of asthma and/or a family member with asthma did not affect baseline knowledge and comfort of teachers in assessing and handling a student's asthma attack. There was no statistically significant difference in pre- and post-workshop SE scores between teachers with and without a personal history of asthma and/or a family member with asthma. At baseline, only one out of twelve items on SE scale revealed statistically significant difference: teachers who had a personal history of asthma and/or a family member with asthma were more sure to assist students in avoiding exposure to asthma triggers in a classroom than teachers without such history. A cross-sectional survey of 2,779 teachers from Turkey found that teachers' knowledge of asthma was poor and teachers who stated that they had asthma or had first-degree relatives with asthma provided more significantly correct answers than those without these characteristics (21). Implementing education programs that target teachers and other school staff, regardless of their prior exposure to personal history of asthma or family members with asthma, may improve asthma management in schools.

There are several potential reasons for the lack of increase in four out of the twelve items on SE scale evaluated pre- and post-workshop. There was no significant

increase in the SE items relating to the access to asthma pumps in school and during trips. Many teachers may not be aware that students can be allowed to have their asthma inhalers with them during the school day or on a field trip if indicated on the child's AMAF as per New York State Guide for Asthma Management in Schools (15). Another reason for this may be the lack of clear school policy on asthma medication management or the teachers' lack of familiarity with such policy (22). The other two SE items that did not increase post-workshop were related to filing the AMAF with a school nurse and communication with the parents about the child's asthma. This may be due to teachers not seeing certain aspects of their student's asthma management as their responsibility; instead they may attribute the responsibility for these tasks to the school nurse. However, in many urban schools, lack of a school nurse and a low nurse to child ratio (23) has increased the responsibility of the schoolteacher in managing the child's asthma throughout the school day. Finally, another possible explanation for the lack of increase in three out of four items on SE scale (i.e., access to asthma pumps in school and school trips and filing of the AMAF with a school nurse) could be that these items touch on matters that may not be fully under the teacher's control.

Possible limitations of the study include the specific population in the study which may not be representative of the larger population. Further research should be done to see if this workshop held in the Bronx is generalizable to different communities with lower asthma prevalence. While this study suggests that a 45-min workshop for teachers can improve asthma self-efficacy and comfort, further research should be conducted to find the best educational approach for other school support staff. We did not code the responses by participant in the question and answer session to be able to connect to the teachers' quantitative data; future research could consider pairing such data. Additionally, it would be important to test the long-term effectiveness of the workshop by conducting follow-up surveys at various time intervals.

Conclusion

A brief asthma workshop incorporating NHLBI guidelines on school asthma management was successfully implemented in schools and improved teacher knowledge, comfort and self-efficacy in managing asthma. Developing a sustainable model of annual asthma workshop delivery for teachers and other school personnel may improve their comfort in assisting with asthma management for students.

Acknowledgements

We would like to acknowledge Florinda Islamovic for her assistance with data collection for this study.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Funding

This study was supported by the National Institutes of Health Eunice Kennedy Shriver National Institute of Child Health & Human Development (grant number 5K23HD065742).

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