Evaluation of the Children's Environmental Health Network's Environmental Stewardship Checklist Responses

Robyn Gilden, PhD, RN
Office of Environmental Health
University of Maryland School of Nursing

Katie McElroy, MS, RN
University of Maryland School of Nursing

Erika Friedmann, PhD
Organizational Systems and Adult Health
University of Maryland School of Nursing

Nsedu Obot Witherspoon, MPH
Children's Environmental Health Network

Hester Paul, MS
Eco-Healthy Child Care Program®
Children's Environmental Health Network

Abstract **Children are subject to multiple hazards on a daily basis, including in child care facilities. Research has shown that children in the child care setting may be exposed to lead, radon, pesticides, and multiple chemicals that are associated with known or suspected adverse health effects. The authors' study used an existing environmental health endorsement program to describe current practices of child care facilities as related to environmental health and safety. The facilities varied greatly in size and were located mainly in the U.S. with a few from Canada and Australia. A few checklist items had nearly a 100% positive response rate; however, some of the items had more than 10% of the facilities answer "false" or "don't know." Although many areas exist in which these sampled child care facilities are being environmentally responsible, further education is needed, particularly as related to the use of wall-to-wall carpeting, radon testing, aerosols, and air fresheners.**

Introduction

Childhood is a time of rapid physical and developmental growth. Chemical exposures during this time period can disrupt normal growth and development, causing damage that may last a lifetime and could even affect future generations (Bearer, 1995; Landrigan, Kimmel, Correa, & Eskenazi, 2004). According to the National Association of Child Care Resources and Referral Agencies (NACCRRA), "Nearly 11 million children under age five in the U.S. are in some type of child care setting every week. On average, the children of working mothers spend 35 hours a week in such care. About one-third of these children are in multiple child care arrangements so that parents can meet the need for child care during traditional and nontraditional working hours (NACCRRA, 2013)." In order to decrease childhood exposures to harmful substances, efforts must be made at home, in school, and in child care centers, which was the focus of our study.

Multiple harmful exposures have been detected in child care facilities. Studies of exposures in these facilities have found elevated levels of pesticides, which are associated with adverse neurodevelopmental and reproductive effects, as well as childhood cancers and cancers that develop later in life (Cohen, 2007; Cohen Hubal, Egeghy, Leovic, & Akland, 2006; Morgan et al., 2011; Tulve et al., 2006). Lead exposure is also a problem in child care facilities (Greenway & Gerstenberger, 2010). Lead may cause irreversible damage to the liver, kidneys, cardiovascular system and has been found to affect neurologic development in children, even at low levels of exposure (Bellinger, 2008; Greenway & Gerstenberger, 2010). Other chemicals, including brominated flame retardants and polychlorinated biphenyls, have been detected in child care facilities (Harrad et al., 2010). These chemical exposures have been associated with cancer and neurodevelopmental problems and may adversely affect reproduction in the form of decreased spermatogenesis (Harrad et al., 2010). Radon, one of the leading causes of lung cancer, can also be found in child care facilities (Laquatra, Maxwell, & Pierce, 2005). Finally, children in child care facilities are exposed to various asthmagens, including volatile organic compounds (Zuraimi & Tham, 2008), mold (Laquatra et al., 2005), and other triggers (Salo, Sever, & Zeldin, 2009).

Despite the research being done to identify exposures in the child care setting, little is known about the current practices of child care facilities to decrease harmful exposures. This information is necessary to guide the development of education programs aimed at management and staff in the child care field and to inform policy changes at the center, state, and federal levels. The purpose of our study was to describe current levels of envi-

FIGURE **1**

EcoHealthy Child Care Checklist

Eco-Healthy Child Care® Checklist

30 easy-to-follow steps that will immediately benefit the health and well-being of the children in your care.

Follow these instructions to get started on creating a healthier environment!

1. Answer all 30 questions on the checklist.

2. Comply with at least 24 of 30 items, including #1, #6 and #11, which are required.

3. If you can't answer "true" to 24 items, take steps to make improvements. Visit **www.cehn.org/ehcc** for tips and tools.

4. Fill out all parts of the Endorsement Form, and obtain both required signatures.

5. Send the completed checklist and $25 payment to the address indicated.

All EHCC checklist items comply with *Caring for Our Children: National Health and Safety Performance Standards, 3rd Edition.*

TRUE FALSE ?

Pesticides and Pest Prevention

❍ ❍ ❍ **1.** We use non-toxic techniques both inside and outside the facility to prevent and control pests (both insects and weeds). If a serious threat remains and pesticide application is the only viable option, parents and staff are notified in advance and a licensed professional applies the least toxic, effective product at a time when children will have the least exposure to the application area for at least 12 hours (see manufacturer's instructions to ensure 12 hours is enough time). **REQUIRED**

❍ ❍ ❍ **2.** We thoroughly wash all fruits and vegetables to avoid possible exposure to pesticides, and we take the opportunity to educate children about the importance of doing so.

Air Quality

❍ ❍ ❍ **3.** We avoid conditions that lead to excess moisture, because moisture contributes to the growth of mold and mildew. We maintain adequate ventilation (suitable fans or open screened windows). We repair water leaks and keep humidity within a desirable range (30-50%).

❍ ❍ ❍ **4.** We do not allow cars or other vehicles to idle in our designated parking areas.

❍ ❍ ❍ **5.** We do not use scented or unscented candles or man-made air fresheners.

❍ ❍ ❍ **6.** During operating hours, we do not permit smoking anywhere on the premises or in sight of children. (Note: For the healthiest environment for children and staff, smoking should not be allowed on the premises at any time). **REQUIRED**

Household Chemicals

❍ ❍ ❍ **7.** We use unscented, biodegradable, non-toxic cleaning products and least-toxic disinfecting and sanitizing products. When disinfectants and sanitizers are required, they are used only for their intended purpose and in strict accordance with all label instructions.

❍ ❍ ❍ **8.** We use chlorine bleach only when and where it is required or recommended by state and local authorities. We use it prudently and never use more than necessary.

❍ ❍ ❍ **9.** We do not use aerosol sprays of any kind.

❍ ❍ ❍ **10.** We use only low-VOC (Volatile Organic Compounds) household paints and do not paint when children are present.

Lead

❍ ❍ ❍ **11.** To avoid possible lead exposure from water lines, we have our water tested. We use only cold water for drinking, cooking and making baby formula. We run the water for 10-30 seconds or until it feels noticeably colder. **REQUIRED**

OVER

continued on page 24

ronmental stewardship practices by child care facilities and to identify areas for which additional education or technical assistance may be warranted.

Methods

A secondary data analysis was conducted using data provided by the Children's Environmental Health Network (CEHN). CEHN is a national nonprofit organization that focuses on education, research, and policy to protect the developing child from environmental hazards and promote a healthy environment. CEHN provides an Eco-Healthy Child Care® (EHCC) checklist to help child care facilities assess their level of environmental stewardship.

The EHCC checklist (Figure 1) is a self-report checklist focusing on stewardship areas of pesticides, air quality, household chemicals, lead, mercury, furniture and carpets, art supplies, plastics and plastic toys, treated playground equipment, radon, recycling/garbage storage, and education and awareness. Each item consists of a statement that describes an environmentally safe practice; if the facility currently adheres to the practice then the respondent will answer "true." Otherwise the respondent will choose "false" or "?" (don't know). The current version of the checklist lists 30 items; the original version of the checklist, used until October 2010, included 25 items.

The checklist was originally developed by the Oregon Environmental Council (OEC) in 2005 and was based on best practices of school and home assessment tools and research supported by the U.S. Environmental Protection Agency (U.S. EPA), the Centers for Disease Control and Prevention (CDC), and the Indiana Five Star Environmental Recognition program. In 2010, the entire EHCC program, including the checklist, was transferred to CEHN for management and leadership. The EHCC program was also modified to incorporate aspects of CEHN's earlier program, Healthy Environments for Child Care and Preschool. The checklist has been peer-reviewed by CEHN's science committee, the EHCC national advisory committee, the EHCC science task force, and four regional pediatric environmental health specialty units (an academically based regional network of experts in children's environmental health issues).

Child care facilities can use the checklist in two ways: as an internal tool to determine their level of environmental stewardship or to gain endorsement from EHCC in recognition of their commitment to environmental health. Facilities will obtain endorsement if they submit the nominal fee of $25 to cover processing costs and materials, have gathered the two required validation signatures, and at least 20 out of 25 or 24 of the 30 checklist items (80%) are met with positive responses. Additionally, positive responses on certain mandatory questions are required to receive the endorsement. On the original 25-item checklist, the questions on pesticides and no smoking were mandatory. On the 30-item checklist, running tap water before use to reduce lead exposure was added to the other two mandatory items. Facilities would not receive an endorsement without a "true" to these items.

The sample for our study consisted of child care facilities that submitted checklists to either OEC or CEHN from August 2008 through November 2011, which means that some of the facilities submitted 25-item checklists. The data were provided to independent researchers in January 2012 for analysis. SPSS v. 19 was used to analyze the data. The data were screened for missing or out-of-range values and were analyzed for general descriptive information, including frequencies and measures of central tendency.

Results

A total of 398 checklists were submitted from child care facilities but since two did not contain any checklist data they were not included in the final analysis, leaving 396 for analysis. Less than 3% were missing data. The child care facilities came from a diverse range of locations. Forty states plus one territory in the U.S., three Canadian territories, and two locations in Australia were represented in the data (Table 1). Oregon had the highest percentage of facilities (n = 74, 18.7%). The smallest child care facilities served three children, while the largest served 391 children. The median quartile served 8–29 children (n = 105, 26.5%). Fifty-one (13%) facilities submitted the older 25-item checklist.

Table 2 shows the number of positive checklist responses by checklist type. The positive responses ranged from 17 to 22 for the 25-question checklist and 17–27 for the 30-question checklist. Less than two-thirds (60%) of the facilities that completed the 25-item checklist achieved a score of at least 80% positive responses, the score required by EHCC to gain endorsement. Seventy percent of the facilities that completed the 30-item checklist scored at least 80% positive responses. This difference was not significant, χ^2 (1) = 2.069, p = .150. The maximum percentage of positive responses was nearly identical, with 88% being the maximum for the 25-item checklist and 90% for the 30-item checklist. The average number and percentage of positive responses for the 25-question checklist was 19.94 (79.8%); for the 30-question checklist, it was 24.57 (81.9%).

Data were analyzed to determine items that were frequently checked "false" or "don't know." More than 10% of the facilities chose "false" or "don't know" for 10 of the checklist items (Table 3). Table 4 contains a complete list of items with corresponding answers. Three items had 100% completion from all child care facilities. Those items were no pesticides, no smoking, and the use of furniture in good condition (items 1, 6, and 18, respectively). The rest of the items, except for the items listed in Table 3, had at least 90% of the facilities answer "true."

FIGURE **1** *continued from page 23*

EcoHealthy Child Care Checklist

TRUE	FALSE	?	
❍	❍	❍	**12.** Our facility was built after 1978 — OR — our facility was built before 1978, and we have tested our paint (indoors and outdoors) for lead. We keep the building free of flaking or peeling paint and regularly wash all areas around doors and windows. We use lead safe practices when painting or renovating our facility, and we have visited **www.epa.gov/lead** to learn more.
❍	❍	❍	**13.** To avoid possible lead exposure, we do not use imported, old or handmade pottery to cook, store or serve food or drinks.
❍	❍	❍	**14.** To reduce possible exposure to lead-contaminated dirt, we supply a rough mat at the entrance of our facility and encourage the wiping of shoes before entering — or — we are a shoe-free facility.
❍	❍	❍	**15.** We screen our toys for lead by searching **www.cpsc.gov** or **www.healthystuff.org/departments/toys/** or by purchasing lead testing kits at a local home improvement store.
			Mercury
❍	❍	❍	**16.** We do not use any mercury-containing thermometers or thermostats. Instead we use digital options.
❍	❍	❍	**17.** We securely store and recycle all used batteries and fluorescent and compact fluorescent light bulbs.
			Furniture and Carpets
❍	❍	❍	**18.** To avoid possible exposure to flame retardants, we ensure furniture is in good condition without foam or inside stuffing exposed. Stuffed animals, matting, pillows and other foam items are also intact.
❍	❍	❍	**19.** Furniture is made of solid wood or low-VOC (Volatile Organic Compounds) products, with few items made of particleboard. When purchasing furniture or renovating, we choose either solid wood (new or used) or products that have low VOCs.
❍	❍	❍	**20.** We do not have wall-to-wall carpeting where children are present.
❍	❍	❍	**21.** Area rugs are vacuumed daily and cleaned at least twice a year and as needed using biodegradable cleaners.
			Art Supplies
❍	❍	❍	**22.** We use only non-toxic art supplies approved by the Art and Creative Materials Institute (ACMI). Look for ACMI non-toxic seal 'AP' at at **www.acminet.org**.
			Plastics and Plastic Toys
❍	❍	❍	**23.** We avoid toys made out of soft plastic vinyl (such as vinyl dolls, beach balls, and "rubber ducky" chew toys). We buy only those labeled "PVC-free" and "phthalate-free".
❍	❍	❍	**24.** When using a microwave, we never heat children's food in plastic containers, plastic wrap or plastic bags.
❍	❍	❍	**25.** We never use baby bottles or sippy cups made with BPA (Bisphenol A). Instead, we use bottles made of glass, or plastic that is labeled 'BPA free'.
			Treated Playground Equipment
❍	❍	❍	**26.** We do not have playground equipment made of CCA treated wood (pre-2006) — or — if we do, we apply 2 coats of waterproof stain or sealant at least once a year. When building new playground equipment, we only use CCA treated wood if necessary – and only for the wood touching the ground.
			Radon
❍	❍	❍	**27.** We have tested our facility for radon. If elevated levels of radon are found, we take action to mitigate. We have visited **www.epa.gov/radon** for resources, and have researched state requirements and guidelines to learn more.
			Recycling and Garbage Storage
❍	❍	❍	**28.** We recycle all paper, cardboard, glass, aluminum and plastic bottles.
❍	❍	❍	**29.** We keep our garbage covered at all times to avoid attracting pests and to minimize odors.
			Education and Awareness
❍	❍	❍	**30.** We create opportunities to educate the families we serve on eco-healthy practices.

For more information on any checklist items, visit **www.cehn.org/ehcc/resources**

Discussion

The purpose of our study was to describe environmentally healthy actions that are currently being taken by child care facilities. Although many facilities in this sample reported adequate levels of environmental stewardship and obtained the EHCC program endorsement, the analysis uncovered subject areas for which further education aimed at child care facilities may be necessary. For

TABLE **1**

Number and Percentage of U.S. States, Territories, and Other Countries in the Checklist Data, *N* = 396

State/Territory	# of Facilities	% of All Facilities	State/Territory	# of Facilities	% of All Facilities
Alaska	5	1.3	Nevada	2	0.5
Alberta, Canada	1	0.3	New Hampshire	1	0.3
Arkansas	1	0.3	New Jersey	10	2.5
California	42	10.6	New Mexico	1	0.3
Colorado	14	3.5	New South Wales, Australia	1	0.3
Connecticut	1	0.3	New York	38	9.6
Florida	11	2.8	North Carolina	4	1.0
Georgia	8	2.0	Ohio	7	1.8
Hawaii	1	0.3	Ontario, Canada	5	1.3
Illinois	6	1.5	Oregon	74	18.7
Indiana	7	1.8	Pennsylvania	10	2.5
Iowa	2	0.5	Puerto Rico	1	0.3
Kansas	2	0.5	Quebec, Canada	1	0.3
Kentucky	4	1.0	South Australia	1	0.3
Louisiana	1	0.3	South Carolina	2	0.5
Maine	11	2.8	Tennessee	2	0.5
Maryland	16	4.0	Texas	24	6.1
Massachusetts	12	3.0	Vermont	5	1.3
Michigan	5	1.3	Virginia	5	1.3
Minnesota	12	3.0	Washington	17	4.3
Mississippi	1	0.3	Washington, DC	16	4.0
Missouri	3	0.8	West Virginia	1	0.3
Nebraska	1	0.3	Wisconsin	1	0.3

example, almost 30% of facilities reported having wall-to-wall carpeting. The presence of dust and dirt trapped in wall-to-wall carpeting can instigate wheezing in young children (Herr et al., 2012). If facilities are unable to remove the carpeting, they could be educated on the importance of frequent cleaning using a vacuum with a high efficiency particulate air filter. The analysis also showed that over 25% of the facilities may not have been appropriately tested for elevated radon levels. Do-it-yourself radon tests are easy and inexpensive to do, or a qualified radon contractor could be hired. Radon mitigation in child care centers should cost about the same as normal home repair procedures and may be required in some states.

Changes in daily actions could also prove beneficial. Almost 10% of the facilities answered "false" regarding the use of baby bottles without bisphenol A (BPA), but with education and suggested alternatives and parent involvement (asking parents to supply BPA-free bottles and sippy cups), this percentage could be easily decreased. Additionally, almost 10% also answered "false" to having a recycling program. The incorporation of recycling into a child care setting would not be difficult to implement given the cooperation and coordination of the jurisdiction and could be cost-effective as well. The most challenging task might be getting staff and teachers to commit to the practice and retraining them on safe places to store recyclables. Staff could then pass on the knowledge by encouraging families to utilize reusable items, such as Thermoses and lunch containers instead of plastic sandwich bags and drink boxes. Eliminating the use of air fresheners or aerosols (at least 16.7% and 14.9% of facilities use these types of products, respectively) is easily attainable by the facilities, given further education on why this change is important. All education aimed at changing behaviors should be accompanied by suggestions that include safer alternatives. Finally, child care facilities should be congratulated on the things that they are doing well, and should be encouraged to continue with those eco-healthy actions. These are all actions reinforced in the 4.5-hour EHCC trainings and easily accessible online via the fact sheets on CEHN's Web site.

Our study was limited by the voluntary nature of the checklist. Only facilities that were aware of the program and felt they could meet the criteria were likely to apply. Additionally, most facilities have not applied

for reendorsement since the certification lasts for two years, so sustainability of the practices has not been measured. It is also not known if the reported environmental stewardship practices have an effect on the overall exposures and health of the staff and children at the facility or if parents and guardians seek out facilities with the endorsement. Additional research is needed to determine if these practices result in lower levels of exposure in child care facilities.

Conclusion

Environmental exposures in the child care setting have profound effects on the health of children. Programs to improve the daily and long-term behaviors of child care workers and modifications at the facilities could lead to safer and healthier child care environments, but first an understanding of current practices must be obtained.

This data analysis was the first step in evaluating the environmental stewardship practices of child care facilities. We found multiple topics that should be addressed through outreach and education. For example, education is needed around removal of wall-to-wall carpeting; obtaining radon testing; eliminating soft plastic toys, scented candles, air fresheners, and aerosols; testing toys for lead; increasing the use of solid wood furniture, safer baby bottles, and safer play equipment; and recycling. Further research is needed to determine the long-term impact of increasing environmental stewardship practices on health and satisfaction of staff and parents/guardians.

Acknowledgements: Funding for this study came from the University of Maryland School of Nursing Designated Research Initiative Fund. Funding for the Eco-Healthy Child Care® Program has come from U.S. EPA, Cedar Tree Foundation, W.K. Kellogg Foundation, Kresge Foundation, CDC, and Children's Creative Learning Centers.

Corresponding Author: Robyn Gilden, Assistant Professor, Director, Environmental Health Certificate, Office of Environmental Health, University of Maryland School of Nursing, 655 W. Lombard St., Rm. 665, Baltimore, MD 21201. E-mail: rgilden@son.umaryland.edu.

TABLE **2**

Number and Percentage of Facilities by Total Number of Positive Responses[a] and by Checklist Type, *N* = 396

Total # of Positive Responses	Facilities Completing 25-Item Checklist (*n* = 51)		Facilities Completing 30-Item Checklist (*n* = 345)	
	#	%	#	%
17	3	5.9	1	0.3
18	6	11.8	0	
19	11	21.6	1	0.3
20	12	23.5	0	
21	9	17.6	20	5.8
22	10	19.6	35	10.1
23	–	–	44	12.8
24	–	–	57	16.5
25	–	–	64	18.6
26	–	–	50	14.5
27	–	–	73	21.2
80% or higher	31	60.7	244	70.8
79% or lower	20	39.3	101	29.3
	Min	**Max**	**Min**	**Max**
% of positive responses	68	88	57	90
	Mean	***SD***	**Mean**	***SD***
# of positive responses	19.94	1.49	24.57	1.90
% of positive responses	79.76	5.955	81.90	6.345

[a]Positive response for a checklist item indicates adherence to an environmentally safe practice.

TABLE **3**

Number and Percentage of Facilities That Participate in Most Common Environmentally Unsafe Practices, *N* = 396

Item	Facilities	
	#	%
20: Have wall-to-wall carpet	116	29.3
27: Do not do radon tests	64	18.6
23: Have soft plastic toys	60	15.2
5: Use scented candles or air fresheners	66	16.7
9: Use aerosols	59	14.9
15: Do not test for lead toys	45	13.0
19: Furniture is not solid wood	42	10.6
28: Do not have a recycling program	39	9.8
25: Baby bottles are not guaranteed safe	32	9.3
26: Play equipment not guaranteed safe materials	32	8.1

TABLE **4**

Complete Checklist With Frequency Data

Item	False		True		Don't Know		Missing	
	#	%	#	%	#	%	#	%
1: Less toxic pesticides	0		396	100.0	0		0	
2: Wash fruits/vegetables*	1	0.3	340	98.6	2	0.6	2	0.6
3: No excess moisture	2	0.5	388	98.0	6	1.5	0	
4: No idling vehicles	12	3.0	379	95.7	4	1.0	1	0.3
5: No air fresheners	66	16.7	318	80.3	9	2.3	3	0.8
6: No smoking	0		396	100.0	0		0	
7: Nontoxic cleaning products	9	2.3	378	95.5	8	2.0	1	0.3
8: No bleach	1	0.3	395	99.7	0		0	
9: No aerosols	59	14.9	321	81.1	11	2.8	5	1.3
10: Use of safe indoor paint	7	1.8	381	96.2	5	1.3	3	0.8
11: Use cold water	1	0.3	394	99.5	1	0.3	0	
12: No lead paint	1	0.3	391	98.7	2	0.5	2	0.5
13: No old pottery	1	0.3	393	99.2	0		2	0.5
14: Wipe feet	8	2.0	385	97.2	1	0.3	2	0.5
15: No lead toys*	45	13.0	278	80.6	14	4.1	8	2.3
16: Use digital thermometers	12	3.0	384	97.0	0		0	
17: Safe batteries and light bulbs	18	4.5	370	93.4	6	1.5	2	0.5
18: Good furniture	0		396	100.0	0		0	
19: Wood furniture	42	10.6	339	85.6	12	3.0	3	0.8
20: No carpet	116	29.3	272	68.7	6	1.5	2	0.5
21: Frequent vacuuming	11	2.8	377	95.2	5	1.3	3	0.8
22: Nontoxic art supplies	10	2.5	374	94.4	7	1.8	5	1.3
23: No soft plastic	60	15.2	310	78.3	23	5.8	3	0.8
24: No plastic in microwave	21	5.3	367	92.7	6	1.5	2	0.5
25: Safe baby bottles*	32	9.3	295	85.5	14	4.1	4	1.2
26: Safe play equipment	32	8.1	350	88.4	13	3.3	1	0.3
27: Had radon checked*	64	18.6	240	69.6	31	9.0	10	2.9
28: Recycle	39	9.8	351	88.6	6	1.5	0	
29: Cover trash	5	1.3	389	98.2	2	0.5	0	
30: Educate families*	6	1.7	333	96.5	2	0.6	4	1.2

*n = 345 for these items because they were not included in the 25-item checklist.

References

Bearer, C.F. (1995). How are children different from adults? *Environmental Health Perspectives, 103*(Suppl. 6), 7–12.

Bellinger, D.C. (2008). Neurological and behavioral consequences of childhood lead exposure. *PLoS Medicine, 5*(5), 690–692.

Cohen Hubal, E.A., Egeghy, P.P., Leovic, K.W., & Akland, G.G. (2006). Measuring potential dermal transfer of a pesticide to children in a child care center. *Environmental Health Perspectives, 114*(2), 264–269.

Cohen, M. (2007). Environmental toxins and health—the health impact of pesticides. *Australian Family Physician, 36*(12), 1002–1004.

Greenway, J.A., & Gerstenberger, S. (2010). An evaluation of lead contamination in plastic toys collected from day care centers in the Las Vegas Valley, Nevada, USA. *Bulletin of Environmental Contamination and Toxicology, 85*(4), 363–366.

continued on page 28

References *continued from page 27*

Harrad, S., Goosey, E., Desborough, J., Abdallah, M.A., Roosens, L., & Covaci, A. (2010). Dust from U.K. primary school classrooms and daycare centers: The significance of dust as a pathway of exposure of young U.K. children to brominated flame retardants and polychlorinated biphenyls. *Environmental Science & Technology, 44*(11), 4198–4202.

Herr, M., Just, J., Nikasinovic, L., Foucault, C., Le Marec, A.M., Giordanella, J.P., & Momas, J.I. (2012). Influence of host and environmental factors on wheezing severity in infants: Findings from the PARIS birth cohort. *Clinical & Experimental Allergy, 42*(2), 275–283.

Landrigan, P.J., Kimmel, C.A., Correa, A., & Eskenazi, B. (2004). Children's health and the environment: Public health issues and challenges for risk assessment. *Environmental Health Perspectives, 112*(2), 257–265.

Laquatra, J., Maxwell, L.E., & Pierce, M. (2005). Indoor air pollutants: Limited-resource households and child care facilities. *Journal of Environmental Health, 67*(7), 39–43, 61.

Morgan, M.K., Jones, P.A., Calafat, A.M., Ye, X., Croghan, C.W., Chuang, J.C., Wilson, N.K., Clifton, M.S., Figueroa, Z., & Sheldon, L.S. (2011). Assessing the quantitative relationships between preschool children's exposures to bisphenol A by route and urinary biomonitoring. *Environmental Science & Technology, 45*(12), 5309–5316.

National Association of Child Care Resources and Referral Agencies. (2013). *About child care.* Retrieved from http://www.naccrra.org/about-child-care

Salo, P.M., Sever, M.L., & Zeldin, D.C. (2009). Indoor allergens in school and day care environments. *Journal of Allergy and Clinical Immunology, 124*(2), 185–192.

Tulve, N.S., Jones, P.A., Nishioka, M.G., Fortmann, R.C., Croghan, C.W., Zhou, J.Y., Fraser, A., Cavel, C., & Friedman, W. (2006). Pesticide measurements from the first national environmental health survey of child care centers using a multi-residue GC/MS analysis method. *Environmental Science & Technology, 40*(20), 6269–6274.

Zuraimi, M.S., & Tham, K.W. (2008). Effects of child care center ventilation strategies on volatile organic compounds of indoor and outdoor origins. *Environmental Science & Technology, 42*(6), 2054–2059.