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Major Article

Variation in surface decontamination practices among Michigan child care centers compared to state and national guidelines

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A B S T R A C T

Background: Environmental decontamination is one of the most effective methods to prevent transmission of infectious pathogens in child care centers (CCCs). Alongside state recommendations, national organizations—including the American Academy of Pediatrics (AAP)—offer best-practice policies. In Michigan, these sets of guidelines differ, and the extent to which CCC practices agree with either set of protocols is unknown.

Methods: A survey of environmental decontamination practices was administered at a professional meeting of CCC directors (N = 24) in a single Michigan county. CCC practices (eg, products, locations, frequencies) were compared to state and AAP guidelines. Bivariate analyses investigated CCC characteristics as predictors of decontamination policy agreement.

Results: CCC agreement with established policy was slightly higher for national AAP guidelines (66%) than Michigan standards (59%). The use of an outside child care health consultant was strongly associated with a significantly higher level of agreement with state decontamination policy ($P = .01$).

Conclusion: We noted substantial disagreement between county CCC practices and state/national guidelines, regardless of CCC size or director experience. Results highlight opportunities to improve CCC director familiarity with current state and nationally advised protocols, to consolidate state licensing and AAP guidelines, and to promote the use of child care health consultants.

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BACKGROUND

Out-of-home child care attendance is associated with an increased risk of infectious disease in children, particularly respiratory and gastrointestinal illnesses.^{1–3} Child care center (CCC) environments are especially prone to infectious disease outbreaks, due to the naïve immune systems of child attendees and their unique behavioral patterns (eg, frequent sharing of toys and other fomites). Outside of their impact on children and staff, evidence suggests that CCCs propagate infectious epidemics into the surrounding community, as well, thus affecting the health, work productivity, and quality of life in CCC-associated households.^{4–6} Past research into the transmission of

infectious pathogens has established that mitigation of CCC outbreaks can diminish wider community epidemics.⁷

Daily environmental decontamination is recommended in CCCs to prevent illness outbreaks and is defined as “the targeted removal or eradication of surface and fomite-associated pathogens.”⁸ Regional standards for CCC decontamination practice are established through state CCC licensing departments, whereas at the national level best-practice policies and consensus scientific advice are provided by expert organizations, including the American Academy of Pediatrics (AAP). State guidelines are often adopted from these national standards, which highlight particular classroom surfaces, decontamination frequencies, and appropriate materials required for effective environmental decontamination of CCC facilities.

The degree of CCC protocol agreement with either state or national policies remains unclear. A better understanding of CCC practices and their compatibility with advised policies is important for improved CCC decontamination and is particularly significant in states such as Michigan where state and national guidelines are not

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identical. In response, we surveyed a group of Michigan CCC directors from a single county regarding their facility decontamination practices. Based on director responses, we sought to determine the heterogeneity of environmental decontamination policies among local CCCs and compare these reported practices to existing state and national guidelines.

METHODS

To identify CCC directors, we partnered with the Washtenaw County Early Childhood Director’s Association, a professional network of facility directors, administrators, and leaders in early childhood care programs within this southeast Michigan county. During one of the group’s monthly meetings (January 25, 2017), we distributed a written survey to directors of all 27 CCCs present (Supplementary Appendix). This surveyed group accounts for approximately 15% of the 186 registered child care programs in Washtenaw County. Information requested by the survey included a demographic summary of enrolled children, the number of employed staff, private versus public facility status (state or federally subsidized), and several questions regarding the CCC’s particular decontamination protocols.

Our primary analysis focused on director-reported decontamination policies for 8 common facility surfaces: doors/cabinets, diaper tables, floors, kitchen/counters, mixed-use tables, tables/high chairs, toilets, and toys. Respondents were also asked to indicate the frequency with which a particular surface was decontaminated: before use, after use, end of day, or weekly. It is worth noting that the AAP defines 3 intensities of decontamination—cleaning, sanitation, and disinfection—which are further detailed in our Discussion section. Our survey questions, however, were written with simplicity in mind to encourage higher response rates; therefore, decontamination frequency questions did not distinguish between intensities used.

In order to assess the similarity between Washtenaw CCC policy and national or state guidelines, we identified the minimum decontamination frequency for each aforementioned surface recommended by both US and Michigan guidelines (Table 1). National guidelines were adopted from *Caring for Our Children*, 3rd edition (CFOC), a best-practices reference book jointly published by the AAP, the American Public Health Association, and the National Resource Center for Health and Safety in Child Care and Early Education.⁹ In Michigan, state CCC licensing guidelines (updated in 2014) are published by the Licensing and Regulatory Affairs (LARA) branch of the Michigan state government.¹⁰ Michigan and national decontamination recommendations are not identical, but sections within Michigan policy refer to the CFOC as a consultative resource.

We considered a CCC to be in agreement with a set of guidelines (either state or national) if the director indicated that a particular surface was cleaned at least as often as the corresponding guideline recommended. CCCs were also assigned individual scores based on the proportion of decontamination agreement across all surfaces (ie,

a CCC decontaminating 6 of 8 surfaces in concordance with a particular guideline was given a score of 75%). Because Michigan LARA guidance lacks explicit daily protocol for decontamination of toys, floors, and doors/cabinets, these surfaces were excluded from the overall calculation and the individual CCC score for state policy agreement.

Descriptive statistics and graphics were created using R-3.5.0. Bivariate analyses were used to compare agreement across strata of CCC characteristics; statistical significance ($\alpha \leq .05$) was assessed with *t*-tests and analysis of variance calculations.

RESULTS

The survey was fully completed by 24 of the 27 CCC directors present at the Washtenaw County Early Childhood Director’s Association meeting (Table 2). Representative CCCs had enrollments ranging from 15 to 170 children, with a mean child-to-staff ratio of 3.9 to 1. On average, CCC directors had over 10 years of cumulative director

Table 2
Demographic profile of 24 Washtenaw County child care centers

	Value*
CCC characteristics	
Number of children, mean (SD)	67.9 (39.7)
Number of staff, mean (SD)	17.5 (9.8)
Facility type, n (%)	
Public	2 (8%)
Private	22 (92%)
Director experience (y), mean (SD)	13.6 (12.6)
Experience at current CCC (y), mean (SD)	12.0 (8.4)
Director medical experience (yes), n (%)	1 (4%)
Use of healthcare consultant (yes), n (%)	7 (28%)
Cleaning methods and practices reported by CCCs	
Solution, n (%) [†]	
Bleach	20 (87%)
Soapy water	12 (52%)
Hydrogen peroxide	7 (30%)
Three-step process	6 (26%)
Materials, n (%)	
Paper towels	18 (75%)
Wash cloths	7 (29%)
Wipes	6 (25%)
Microfiber towels	5 (21%)
Sponges	0 (0%)
Information source, n (%) [‡]	
Licensing requirements	18 (75%)
Internet	8 (33%)
Local/state health departments	5 (21%)
Environmental health departments	4 (18%)

CCC, child care center.

*Similar to other multiple-option questions on the survey, although 1 response per question was requested directors often provided multiple answers; thus, the percentages may add to more than 100%.

[†]Only 23 CCCs provided responses.

[‡]Only the top 4 responses are shown.

Table 1
Decontamination frequencies recommended by national and state agencies

CCC surface	American Academy of Pediatrics recommendation ¹¹	Michigan Department of Licensing and Regulatory Affairs policy ^{*,12}
Diaper tables	After each use	After each use
Doors, cabinets	At the end of each day	<i>Should be kept in good repair</i>
Floors	At the end of each day	<i>Should be kept in good repair</i>
Kitchen, countertops	After each use and at the end of each day	After each use
Mixed-use tables	Before each use	Before and after each use
Tables, high chairs	Before and after each use	After each use
Toilets	At the end of each day	After each use
Toys	After each use and at the end of each day (plastic); at the end of each day (fabric)	<i>When used by an ill child or soiled</i>

CCC, child care center.

*Michigan policy, when not explicitly defined as a frequency, is summarized in italics

experience in child care settings; the majority of directors gained such experience in their respective facilities. Nearly a third of directors reported the use of an outside child care health consultant. Almost all completed surveys represented private CCCs (92%), rather than government-subsidized facilities (eg, Head Start).

Environmental decontamination methods and information sources varied among CCCs. Bleach, the most popular decontamination solution noted by the directors, was used in 87% of facilities. The next most common solution was soap and water, used by 52% of respondents. Paper towels, used by 75% of CCCs, were the most noted decontamination material, ahead of wash cloths, which were used by 29%. Bathrooms and toys were reported by 30% and 21% of the directors, respectively, as the most difficult areas or objects to clean.

Directors reported where they gathered information for decontamination requirements. Generally, primary sources of information originated from “licensing requirements” and “the internet” (75% and 33% of the centers, respectively). Other information sources included cleaning supply company representatives, consultants, and custodial services. When asked where their policy originated, 42% of CCC directors indicated that decontamination guidelines had been established by a regulatory agency other than themselves, 33% noted that guidelines were set independently by facility staff, and 25% indicated a mix of both of the former scenarios.

Overall, there was a substantial degree of disagreement between surface decontamination frequencies practiced by the CCCs and frequencies advised at either the state or national level (Fig 1). Agreement was slightly higher for national AAP guidelines (66%) than for Michigan LARA standards (59%). Generally, higher levels of agreement were associated with the less stringent policy (Table 1 and Fig 1). For example, director-reported decontamination protocols

were most aligned with Michigan guidelines for tables and high chairs; for AAP recommendations, policy agreement was highest for floor decontamination. On the other hand, discrepancies with Michigan policy were highest with regard to toilet decontamination frequency, for which no CCC practices agreed with state guidelines. According to AAP policy, the highest levels of disagreement were found in the decontamination frequency of kitchens and countertops.

For both Michigan and nationally recommended environmental decontamination frequencies, the use of a child care health consultant was associated with significantly higher mean policy agreement for any given CCC (Table 3). Higher agreement with Michigan policy was also observed among facilities with smaller child enrollment, those that noted licensing requirements as a primary information source, and those that were privately operated; none of these differences was statistically significant. Similar patterns were observed for agreement with AAP policy, although not to the same extent. Interestingly, the 50% of CCC directors with the most experience in child care were no more likely to have reported CCC decontamination policies that were in agreement with either state or national standards.

DISCUSSION

Because of CCC licensing expectations to comply with LARA mandates, public expectations for sanitary CCC conditions, and no study method to verify director reports, we initially anticipated higher levels of reported agreement with both Michigan and national guidelines in local CCCs. Survey responses, however, indicated a considerable degree of variation between local CCC practices and both state and nationally recommended protocols for environmental

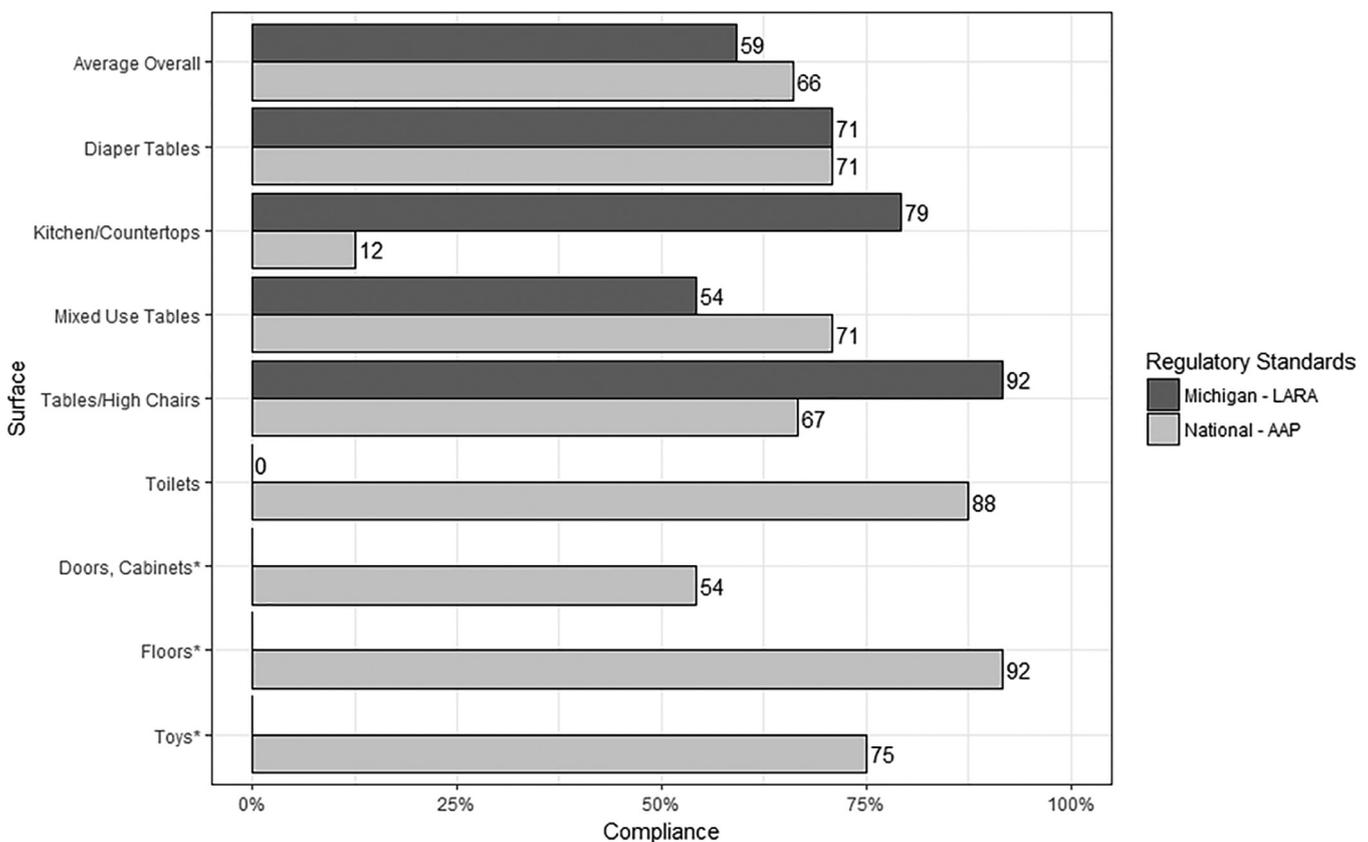


Fig 1. Environmental decontamination agreement with Michigan and national regulatory standards in 24 Michigan child care centers. *Michigan lacks recommended protocols for decontamination of toys, floors, and doors/cabinets; therefore, these surfaces were excluded from LARA compliance calculations. Refer to Table 1 for expectations of respective policies. AAP, American Academy of Pediatrics; LARA, Michigan Department of Licensing and Regulatory Affairs.

Table 3
Bivariate analysis of policy agreement and characteristics of Washtenaw County child care centers (N = 24)

CCC characteristic	n	Mean percent agreement with policy			
		LARA	P value*	AAP	P value*
Child enrollment size			0.74		0.97
1–49	9	64%		67%	
50–99	10	56%		65%	
≥100	5	56%		67%	
Facility type			0.47		0.08
Public	2	40%		44%	
Private	22	61%		68%	
Licensing agency as information source			0.4		0.85
Yes	18	62%		67%	
No	6	50%		65%	
Use of health care consultant			0.01		0.05
Yes	7	74%		77%	
No	17	53%		62%	
Director experience [†]			0.63		0.9
0 to 9.25 y	12	62%		66%	
Greater than 9.25 y	12	57%		67%	

AAP, American Academy of Pediatrics; CCC, child care centers; LARA, Michigan Department of Licensing and Regulatory Affairs.

*P values from *t*-tests and analysis of variance calculations as appropriate (with significance assessed at $\alpha = .05$).

[†]The median value of director experience was 9.25 years.

decontamination. CCC policy did not agree with at least a third of either national or state guidelines.

Given the social desirability bias often underlying survey responses, the fact that CCC directors reported disagreement at all likely underscores CCC unfamiliarity with both LARA and AAP standards.¹¹ Previous research has recognized that CCC staff are commonly unaware of child care recommendations from the AAP.¹² Our survey results provide 2 potential answers as to why this unfamiliarity persists.

For one, communication between Michigan LARA and local CCCs regarding environmental decontamination appears to be suboptimal. More than 25% of CCC directors did not mention licensing requirements when asked about the information sources used to set overall facility decontamination policy. These CCCs displayed significantly more disagreement with Michigan policy than CCCs that had listed licensing agencies as a source of information (Table 3). Although Michigan LARA provides decontamination advice online, our survey suggests that there remains an opportunity to improve educational messaging efforts toward CCC directors regarding advised decontamination protocols.¹³ Encouragingly, LARA child care policy was recently revamped in March 2018 and includes increased training and licensing requirements.¹⁴ Future work might consider longitudinal assessments of CCC and LARA agreement to gauge the effect of policy updates.

Second, current Michigan guidelines differ from nationally recommended AAP guidelines, and these inconsistencies may be another source of policy confusion among CCCs. Because neither guideline is predictably more strict or lax than the other (Table 1), it might be challenging for CCC directors to determine which facets of either protocol should be followed. A state's adoption or endorsement of national guidelines—such as the CFOC reference book, which is based on expert opinion and best-practice advice for CCC licensing—could help to consolidate conflicting advice and streamline decontamination practice. Indeed, the CFOC reference book is already referred to in LARA policy as a consultation source.¹⁰

Survey results offer a pertinent example of these state/national decontamination policy discrepancies; although toys are a common CCC high-touch fomite,¹⁵ Michigan has no daily decontamination

protocol for toys currently advised. This is a concern, considering that toys are one of the most contaminated fomites in CCCs and provide surfaces on which viruses can persist for extended periods of time.^{16,17} Enteropathogens, for example, cause serious infection in children and can persist for extended periods of time on both wet and dry surface fomites.^{18–21} Michigan does recommend decontaminating toys during norovirus outbreaks, but this alone is likely inadequate, as research indicates that asymptomatic CCC children are often infected and capable of shedding pathogens.^{22–25} Frequent environmental decontamination of toys may therefore be necessary to reduce the endemic disease burden and prevent outbreaks rather than simply contain them. Although our survey indicates that most CCCs are already decontaminating toys at frequencies recommended by the AAP, explicit state protocols for daily, year-round decontamination of toys (wooden, plastic, fabric) would be worthwhile.

As one solution to improve CCC familiarity with both LARA and AAP advisories, we advocate for the increased use of outside child care health consultants when CCCs create and set their environmental decontamination policies. The AAP strongly recommends that CCC facilities identify and partner with child care health consultants, who are typically licensed health professionals with education and expertise in both child and community health, as well as child care.⁹ Child care health consultants can help acquaint directors with national policy, implement compliant decontamination practices with attention to the needs of particular facilities, and provide assistance in interpreting LARA-advised policies and regulations. Past research in child care settings indicates that the use of child care health consultants improves CCC health outcomes, safety practices, and implementation of illness screenings.^{26,27} Our survey results agree, as the 7 centers using a consultant were associated with significantly higher policy agreement levels under state mandates (Table 3). CCC agreement with LARA policy improved more than agreement with AAP policy when consultants were employed, which perhaps reflects the state-specific knowledge and training possessed by Washtenaw area consultants. We propose that child care consultants help to reduce policy confusion, whether from conflicting guidelines or a lack of communication between CCCs and government agencies.

One limitation of our study is that survey responses did not indicate the intensity of decontamination methods practiced nor the concentration of solution used. The AAP defines 3 methods of environmental decontamination: cleaning, sanitizing, and disinfecting. Cleaning is the act of “physically removing all dirt and contamination,” sanitizing refers to “reducing germs on inanimate surfaces to levels considered safe by public health,” and disinfecting is intended “to destroy or inactivate most germs on any inanimate object.”⁹ The latter 2 methods are associated with particular bleach concentrations and contact times. Although cleaning requires no bleach, sanitizing uses a 1:250 dilution of bleach (200 ppm) for 2 minutes, and disinfection requires a 1:50 dilution of bleach (1000 ppm) for 5 minutes. AAP protocol recommends disinfection-level bleach for any CCC bathroom surfaces, diapering areas, and doors/cabinets throughout the facility. In Michigan, however, only sanitation-level concentrations are advised by LARA; disinfection-level bleach is advised to combat norovirus outbreaks but not for routine environmental decontamination.²² Although the majority of CCC directors in our survey reported using bleach (87%), the specific concentration of bleach used and on which surfaces it was applied remain unclear. Future decontamination studies and policy in CCCs must recognize intensity as a component of protocol equal in importance to frequency and location.

Our survey results also likely underestimate the true extent of disagreement between the decontamination policies of local CCCs and state/national protocols. For one, survey results are likely biased by the selection of respondents—directors who voluntarily attend professional meetings are more likely to follow recommended decontamination procedures than directors who do not. As a result, our

calculated levels of disagreement may be lower than CCCs from the rest of the county. Second, in the same way that the social desirability bias inherent to survey responses indicates a lack of familiarity with expected protocols, we also note that this issue likely biases CCC agreement levels artificially high. Research and a priori knowledge indicate that levels of true compliance in practice are often lower than reported. A 2013 study found that, although CCC staff self-reported hand washing compliance at 87%, compliance was actually closer to 42% when observed by study researchers.²⁸ Similar discrepancies are noted in hospital settings. Minnesota providers reported donning gowns and masks in 38% and 26% of necessary scenarios, respectively; however, when observed, staff practices were actually closer to 12% and 1%, respectively.²⁹ Still, assuming that director-reported levels of agreement are possibly best-case scenarios only reinforces the need for increased focus on supporting the improved implementation of recommended decontamination practices.

CONCLUSIONS

We observed substantial variability in environmental decontamination protocols among a group of Michigan CCCs—regardless of facility size, funding status, or director experience. A large proportion of CCCs reported decontamination policies that varied with either national consensus guidelines from the AAP or the Michigan CCC licensing department, LARA. With the ultimate goal of reducing illness burden in CCCs, our results suggest that efforts should be made to improve CCC director familiarity with current state and nationally advised protocols, to consolidate state licensing and AAP guidelines, and to promote CCC use of child care health consultants.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.ajic.2019.03.019.

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