Pandemic Influenza Preparedness Among Child Care Center Directors in 2008 and 2016

Timothy R. Shope, MD, MPH, FAAP,[a] Benjamin H. Walker, MS,[b] Laura D. Aird, MS,[c] Linda Southward, PhD,[b] John S. McCown, MS,[b] Judith M. Martin, MD[a]

abstract

BACKGROUND: Children in child care centers represent an important population to consider in attempts to mitigate the spread of an influenza pandemic. This national survey, conducted in 2008 and 2016, assessed directors' reports of their child care centers' pandemic influenza preparation before and after the 2009 H1N1 novel influenza pandemic.

METHODS: This was a telephone-based survey of child care center directors randomly selected from a national database of licensed US child care centers who were queried about their preparedness for pandemic influenza. We grouped conceptually related items in 6 domains into indexes: general infection control, communication, seasonal influenza control, use of health consultants, quality of child care, and perceived barriers. These indexes, along with other center and director characteristics, were used to predict pandemic influenza preparedness.

RESULTS: Among 1500 and 518 child care center directors surveyed in 2008 and 2016, respectively, preparation for pandemic influenza was low and did not improve. Only 7% of directors had taken concrete actions to prepare their centers. Having served as a center director during the 2009 influenza pandemic did not influence preparedness. After adjusting for covariates, child care health consultation and years of director's experience were positively associated with pandemic influenza preparation, whereas experiencing perceived barriers such as lack of knowing what to do in the event of pandemic influenza, was negatively associated with pandemic influenza preparedness.

CONCLUSIONS: Pandemic influenza preparedness of child care center's directors needs to improve. Child care health consultants are likely to be important collaborators in addressing this problem.

[a]Division of General Academic Pediatrics, Department of Pediatrics, University of Pittsburgh School of Medicine, Children's Hospital of Pittsburgh of UPMC, Pittsburgh, Pennsylvania; [b]Social Science Research Center, Mississippi State University, Starkville, Mississippi; and [c]Department of Child Health and Wellness, American Academy of Pediatrics, Elk Grove Village, Illinois

Dr Shope participated in study concept and design, writing the questionnaire, acquisition and analysis of data, and drafting/revising the manuscript; Mr Walker participated in acquisition and analysis of data, and drafting/revising the manuscript; Ms Aird participated in study concept and design, writing the questionnaire, and revising the manuscript; Dr Southward and Mr McCown participated in acquisition and analysis of data and revising the manuscript; and Dr Martin participated in study concept and design and drafting/revising the manuscript; and all authors approved the final manuscript as submitted.

DOI: https://doi.org/10.1542/peds.2016-3690

Accepted for publication Mar 6, 2017

WHAT'S KNOWN ON THIS SUBJECT: This is the first report of child care center director preparedness for pandemic influenza. Addressing pandemic influenza in children in child care centers is important due to high morbidity and mortality, efficient droplet spread, and transmission to household contacts.

WHAT THIS STUDY ADDS: This study demonstrates a general lack of pandemic influenza preparedness among child care center directors driven in large part by gaps in knowledge. Use of Web-based training and child care health consultants are promising approaches to address this problem.

To cite: Shope T R , Walker B H , Aird L D , et al. Pandemic Influenza Preparedness Among Child Care Center Directors in 2008 and 2016. *Pediatrics.* 2017; 139(6):e20163690

About one-quarter of all children <5 years of age in the United States regularly attend organized group early education and child care in settings such as child care centers, preschools, and Head Start[1] and are at higher risk for influenza. An influenza pandemic occurs when a new strain of influenza, to which the majority of the population is not immune, gains the ability to spread from person to person, and then advances globally. The most recent influenza pandemic occurred in 2009 involving influenza A H1N1. Public health officials try to mitigate spread in early stages of a pandemic by using nonpharmaceutical interventions such as respiratory etiquette, hand hygiene, and social distancing. Because influenza is spread primarily through droplets, and children <5 years of age do not effectively practice these nonpharmaceutical interventions, the options for preventing spread in these settings are limited. Seasonal influenza vaccination would be ineffective early in a pandemic because the virus is novel, requiring time to engineer and distribute a new vaccine. In severe influenza epidemics or pandemics, school or child care program closures may be recommended.

Recognizing the potential for an influenza pandemic and the critical role that early education and child care centers play in the spread into communities, the Centers for Disease Control and Prevention (CDC) developed resource materials in 2006 to prepare these centers.[2] A random national sample of licensed child care center directors was queried in 2008 regarding their preparedness for pandemic influenza just before the influenza A H1N1 pandemic occurred in 2009 and a follow-up survey was conducted in 2016. We present the findings of these surveys and provide recommendations for enhancement of strategies aimed at reducing transmission of pandemic influenza in child care centers.

METHODS

Survey Development

We developed survey domains and content in 2008 with a multidisciplinary group that included an American Academy of Pediatrics (AAP) staff person (L.A.), a researcher (L.S.), a pediatrician (T.R.S.) with expertise working with infectious diseases in child care centers, and other child care national experts. We also used content from a pandemic influenza preparedness (PIP) checklist for child care providers developed by the CDC.[2] We piloted items with a small group of child care center directors and content was modified to improve face validity.

Data Source and Participants

The Wolfgang Frese Survey Laboratory at the Social Science Research Center at Mississippi State University conducted nationwide telephone-based surveys of directors of licensed child care centers (including preschools and Head Start programs) in 2008 and 2016. Before administering each survey, we compiled databases of all licensed child care centers in the United States by requesting contact information from individual state licensing agencies, if the information was not readily available via states' Web sites. Eligible centers were currently licensed by the state and had to be considered a child care center or child care program affiliated with a school. We excluded home-based family child care programs. We contacted centers by telephone and removed them from the database for the following: incorrect/disconnected numbers, poor connections, no longer in business, and not meeting screening criteria. Interviews were conducted with the center directors and were ~15 to 20 minutes in length. Samples sizes were determined by available funding. In 2008, to complete 1500 surveys, we drew a simple random sample of 8664 cases from a database of 97 000 child care centers. In 2016, to reach 518 completed surveys, we drew a simple random sample of 2500 cases from a database of 180 000 centers. A refusal was a respondent who initiated the questionnaire, then terminated the call at any point before completion. Cooperation rate was calculated as (No. completed surveys)/(No. completed surveys + No. refusals). This study was reviewed and approved by the institutional review boards of the following: the AAP, Naval Medical Center Portsmouth, Mississippi State University, and University of Pittsburgh.

Measures

We grouped conceptually related items in 6 domains into indexes that might be associated with preparedness for pandemic influenza: general infection control, communication, seasonal influenza control, use of health consultants, quality of child care, and perceived barriers. These domains are described below. We counted each item within an index as 1 point. The full list of items in each index can be found in Supplemental Table 6 along with the 2016 questionnaire in Supplemental Information.

General Infection Control

The General Infection Control Index assessed directors' level of competency with general infection control measures. We generated the index by summing positive responses to 8 items (7 in 2008) capturing disease surveillance and infection control such as documentation of illness in the center, use of daily health checks, use of written exclusion criteria, and training of staff members on infection control.

Communication

The Communication Index assessed directors' level of communication about illness or infections at their center. We computed the index

by summing positive responses to 3 items: whether directors share information with parents about illness, use social media for health-related issues, or use social media to communicate with families. Because the social media items were not included in the 2008 survey, the index used for the 2008 was a single-item index.

Seasonal Influenza Immunization

The Influenza Immunization Index gauged whether directors' required seasonal influenza immunization. We comprised the 2-item index by summing positive responses about whether the directors' center required immunizations for children and adult staff, respectively.

Use of Health Consultants

A child care health consultant is a licensed health professional with some training or experience in pediatrics who works with early childhood education programs to address health and safety issues. We captured the use of health consultants by centers by using a 5-item Consultant Index summing responses about the use of a health consultant, using written agreements, using paid consultants, frequency of telephone advice (at least monthly), and frequency of consultant visits to the center (at least monthly).

Quality of Child Care

The Quality Indicators Index consisted of a 2-item index assessing whether the program was, or was in the process of being, accredited by an organization like the National Association for the Education of Young Children (NAEYC) and whether the director met minimum qualifications on the basis of AAP guidelines contained in *Caring for Our Children* standard 1.3.1.1,[3] which combines minimum director education, minimum experience, and number of children at the center.

Barriers

We generated a Barriers Index from 7 items that might have prevented directors from being prepared for pandemic influenza: lack of knowledge, not knowing where to find information, not knowing what to do, not having the time, and lacking the resources, and any other barrier not listed (specified by respondent).

Other Potential Predictor Variables

Items collected but not included in the indexes were as follows: centers' racial composition, whether the center was a designated Head Start facility, average center attendance, and directors' years of experience. We determined racial composition by asking center directors to respond to the question, "Among the children in your center, what racial background is most common?" We also queried respondents whether they were working in their current center during the 2009 H1N1 influenza pandemic.

Outcome: PIP

We constructed the primary outcome, the directors' reported level of preparedness for pandemic influenza, from an index of positive responses to 4 items: concern about pandemic influenza, having been contacted about pandemic influenza, planning for pandemic influenza, and preparation for pandemic influenza.

Analytic Approach

We used Stata/SE 14 (StataCorp, College Station, TX) for statistical analyses. We used descriptive statistics to assess the characteristics of child care centers, directors' qualifications and backgrounds and their associations with PIP scores in 2008 and 2016. We used independent samples *t* tests to compare means of continuous variables and Pearson χ^2 tests to compare proportions across groups or time points. We used multiple variable regression analysis to assess the influence of general infection control, communication, seasonal influenza immunization, the use of health consultants, and the presence of barriers on PIP scores. We adjusted models for racial composition of the center (African American, Latino/Latina, other race, or those lacking a single most common race to predominantly white population, which we used as the reference category), Head Start status, directors' years of experience, and whether the director worked in the same center before the 2009 influenza pandemic. We developed separate regression models for the 2008 and 2016 samples. Missing data were handled by using listwise deletion. Due to the number of missing cases, we also analyzed data by using multiple imputation with no meaningful change in the results. The final analytic sample for the regression models included 910 cases for 2008 and 350 for 2016.

RESULTS

The cooperation rate for 2008 and 2016 was 44.4% and 59.0%, respectively ($P < .001$).

Child Care Center and Director Characteristics

Descriptive statistics of child care center directors and their centers are displayed in Table 1. The proportion of NAEYC accredited, or accreditation in-process, centers in the sample was significantly lower in 2016 than in 2008 (38% vs 44%, $P < .05$). The self-reported age distribution of centers was significantly different in 2016 with a higher proportion of children ages 0 to 6 weeks (11% vs 9%) and a higher percentage of children older than 25 months (21% vs 10%, $P < .001$). Directors were more likely to report having a degree in early childhood or child development in 2016 compared with 2008 (77% vs 72%, $P < .05$). Finally, directors had a mean of 1 additional year of

experience in 2016 than in 2008 (19 vs 18 years, $P < .05$).

Trends in PIP

Table 2 summarizes the individual items comprising the PIP index in 2008 and 2016. A positive response to any of the 4 items was assigned a point yielding a possible range of 0 to 4; higher scores represent greater PIP. Responses to individual items were similar in 2008 and 2016 with the exception of having been contacted about pandemic influenza, which was more likely in 2008 (11.5% vs 4.9%, $P < .001$). On average, respondents in each year received just over 1 point (1.16) on the PIP index.

Table 3 reveals the proportion of respondents who indicated engaging in 6 different activities related to pandemic influenza preparation. Overall, only 7% of directors reported engaging in any preparation for pandemic influenza each year. However, there was a small but significant increase in the proportion of respondents who reported using a checklist to prepare for pandemic influenza (3.6% vs 6.4%, $P < .01$).

Predictors of PIP

Table 4 reveals the mean PIP scores in 2008 and 2016 by select child care center and director characteristics. Directors from centers that were NAEYC accredited/in process of accreditation had significantly higher mean PIP scores in both 2008 ($P < .01$) and 2016 ($P < .01$). Directors from Head Start sites had significantly higher mean PIP scores only in 2008 ($P < .001$). Directors with higher education levels ($P < .05$) and degrees in early childhood education ($P < .01$) had significantly higher mean PIP scores in 2008 and nearly so in 2016. In 2008, directors with more years of experience had higher mean PIP scores ($P < .001$).

Table 5 reveals multiple regression analyses for 2008 and 2016 predicting PIP scores using indexes of general infection control, communication, seasonal influenza immunization, the use of health consultants, and the presence of barriers, as well as various director and center-level characteristics. Overall, the regression model accounted for 17% of the variation

TABLE 1 Child Care Center and Director Characteristics

Characteristics	2008, n = 1500[a]	2016, n = 518[a]	P[b]
NAEYC[c] accreditation, n (%)	643 (44)	186 (38)	<.05
Head Start, n (%)	209 (14)	76 (15)	.71
Youngest age, n (%)			<.001
0–6 wk	135 (9)	56 (11)	
7 wk–24 mo	1218 (81)	351 (68)	
≥25 mo	147 (10)	111 (21)	
Average daily attendance, M (SD)	61.7 (28.1)	61.6 (29.2)	.95
Most common racial background of attendees, n (%)			<.001
White	913 (63)	250 (50)	
African American	235 (16)	46 (9)	
Latino/Latina	101 (7)	57 (11)	
Other	32 (2)	8 (2)	
Mixed backgrounds without single most common race	169 (12)	142 (28)	
Director's highest level of education, n (%)			<.001
High school diploma or associates degree	621 (42)	166 (32)	
Bachelor's	623 (42)	236 (46)	
Master's or above	232 (16)	114 (22)	
Director degree in early childhood education or child development, n (%)	883 (72)	362 (77)	<.05
Director total years of experience, M (SD)	17.8 (9)	19 (10)	<.05
Director worked in same center in 2009, No. (%)	NA	282 (55)	NA

NA, not applicable.
[a] n reflects total sample. Totals for individual variables may vary due to missing data.
[b] P values determined by using χ^2 and independent samples t test.
[c] Programs accredited, or in the process of accreditation, by a program like the NAEYC.

TABLE 2 PIP Index (% Positive Response)

Item	2008	2016	P[a]
Before today, how concerned were you about pandemic influenza?	63.04	65.24	.38
Before today, has anyone contacted you about pandemic influenza?	11.52	4.86	<.001
Before today, have you or someone else from your center been involved in any planning for pandemic influenza?	8.61	8.66	.97
How prepared do you think your center is for pandemic influenza?	33.52	37.98	.07
Mean index score (SD)	1.16 (0.96)	1.16 (0.91)	.10

Range 0–4 points (1 point for each positive response).
[a] P values determined by using χ^2 and independent samples t test.

TABLE 3 Pandemic Influenza Preparation Activities (% Responding Yes)

Activity	2008	2016	P[a]
Used a checklist	3.6	6.4	<.01
Developed a written plan	3.7	5.0	.20
Participated in community discussions or planning efforts	3.9	3.1	.39
Participated in workshops or received technical assistance from a child care resource and referral agency	4.5	4.5	.94
Held staff trainings	3.9	5.8	.07
Held parent meetings	1.6	2.5	.18
Any activity	7.2	7.6	.77

[a] P values determined by χ^2.

TABLE 4 Mean PIP Scores, 2008–2016, by Child Care Center and Director Characteristics

Characteristics	2008 (n = 910) M (SD)	P[a]	2016, n = 350, M (SD)	P[a]
Total PIP[b]	1.16 (0.98)	NA	1.19 (0.91)	NA
NAEYC[c] accreditation		<.01		<.01
Yes	1.27 (1.01)		1.36 (0.94)	
No	1.07 (0.94)		1.08 (0.88)	
Head start		<.001		.11
Yes	1.53 (1.14)		1.40 (0.99)	
No	1.10 (0.94)		1.16 (0.90)	
Youngest age		<.001		.39
0–6 wk	1.55 (1.14)		1.15 (0.87)	
7 wk–24 mo	1.08 (0.92)		1.23 (0.91)	
>25 mo	1.47 (1.14)		1.06 (0.96)	
Average daily attendance		.12		<.05
1–25	1.29 (1.07)		0.89 (0.78)	
26–59	1.08 (0.96)		1.13 (0.91)	
>60	1.90 (0.97)		1.30 (0.93)	
Most common racial background of attendees		<.01		.45
White	1.12 (0.98)		1.17 (0.88)	
African American	1.30 (1.00)		1.10 (0.94)	
Latino/Latina	1.06 (0.92)		1.45 (1.06)	
Other	0.72 (1.02)		1.00 (0.63)	
Mixed backgrounds without single most common race	1.42 (0.88)		1.17 (0.92)	
Director's highest level of education		<.05		.08
High school diploma or associates degree	1.13 (0.92)		1.05 (0.98)	
Bachelor's or	1.12 (0.97)		1.18 (0.84)	
Master's or above	1.33 (1.07)		1.37 (0.98)	
Director degree in early childhood education or child development		<.05		.05
Yes	1.22 (1.00)		1.24 (0.06)	
No	1.03 (0.92)		1.00 (0.09)	
Director years of experience		<.001		.07
0–10	0.91 (0.87)		0.97 (0.85)	
11–17	0.96 (0.89)		1.14 (0.93)	
18–24	1.27 (0.93)		1.28 (0.88)	
>25	1.50 (1.07)		1.31 (1.01)	

[a] P values determined by using independent samples t test and 1-way ANOVA.
[b] PIP range = 0–4 points.
[c] Programs accredited, or in the process of accreditation, by a program like the NAEYC.

in PIP scores in 2008 and 15% of the variation in 2016. Of the indexes, the Consultant and Barriers Indexes were significantly associated with PIP. Higher Consultants Index was significantly associated with higher PIP in 2008 (P < .001) and 2016 (P < .01). In contrast, higher Barriers Index was significantly associated with lower PIP in 2008 (P < .001) and 2016 (P < .01). In 2008, identifying as a Head Start program was significantly associated with higher PIP (P < .01). In 2016, centers with higher average attendance were significantly associated with higher PIP (P < .05). Finally, in both 2008 and 2016, directors' years of experience was significantly associated with higher PIP (P < .001 and P < .01, respectively). Based on the standardized coefficients (β), use of health consultants and having barriers were the strongest predictors of PIP in the models.

DISCUSSION

We found that PIP was low and changed very little from 2008 to 2016 in a national sample of US licensed child care center directors, despite the 2009 pandemic. Directors' previous experience with pandemic influenza did not influence their PIP. Few directors had undertaken any definitive action related to preparedness for pandemic influenza. Center and director characteristics commonly associated with higher quality child care, such as NAEYC accreditation, Head Start status, directors' higher education levels, and degree in early education or child development, were associated with higher PIP in univariate analysis. However, after adjusting for covariates, the most important and only independent predictors of PIP in both survey years were use of a child care health consultant, directors' years of experience, and perceived barriers.

Because barriers such as not knowing what to do and lacking resources were negatively associated with PIP, it is important to evaluate what PIP training/materials were available to directors at the time of these surveys. The CDC developed a checklist for

TABLE 5 Summary of Multiple Regression Analysis Predicting Child Care Center Directors' Scores on PIP Index

Variable	2008 (n = 910)			2016 (n = 350)		
	B	SE B	β	*B*	SE B	β
General infection control index	−.02	.04	−.01	.03	.05	.04
Communication index	.20	.41	.02	.06	.07	.04
Consultant index	.13***	.02	.21	.08**	.03	.16
Influenza immunization index	.06	.05	.04	.07	.08	.04
Quality indicators index	.06	.04	.04	.13†	.07	.10
Barriers index	−.16***	.03	−.18	−.12**	.04	−.16
Most common race (reference = white)						
African American	.06	.09	.02	−.18	.17	−.06
Latino/Latina	−.07	.12	−.02	.10	.16	.03
Other	−.41*	.18	−.07	−.23	.36	−.03
No most common race	.22*	.10	.07	−.09	.11	−.04
Head Start vs non-Head Start	.23**	.09	.08	.02	.16	.01
No. children	.00	.00	.01	.00*	.00	.11
Years of experience	.02***	.00	.20	.01**	.01	.16
Worked in same center during 2009 FLU	NA	NA	NA	−.08	.10	−.04

B, unstandardized β; β, standardized β; NA, not applicable; SE B, SE of β. 2008 R^2 = 0.17; 2016 R^2 = 0.15.
† $P < .10$.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

pandemic influenza planning for child care centers in 2006.[2] Updates and more recommendations were refined by the CDC and AAP in February 2009 and 2010, after the influenza pandemic.[4–6] These recommendations were available on the Internet and disseminated through various electronic distribution lists. Despite this effort, most directors apparently were not aware of and/or did not implement them. Our study did not evaluate whether the messaging reached the intended audience, and if it did, whether it was not implemented due to complexity, conflicting health beliefs and priorities, or other reasons. It will be important to further explore the barriers directors report because they are potentially modifiable.

Given the low pandemic influenza knowledge and preparedness of child care center directors, in a future pandemic (as occurred in the 2009 pandemic) pediatric health care providers will likely be consulted by concerned parents who have questions about how to avoid pandemic influenza, exclusion policies, and possible center closures. Pediatric health care providers should be aware that there are CDC recommendations for pandemic influenza mitigation in child care settings.

To our knowledge, there are no previous reports of PIP in child care centers. It is well-established that children in group child care spread infectious diseases, including seasonal and pandemic influenza, at higher rates than children in other settings because of their interactive play and unlikeliness to practice social distancing, hand hygiene, and respiratory etiquette.[7] Young children experience high morbidity and mortality from seasonal influenza, and this was also seen in the 2009 pandemic influenza.[8–10] Influenza viral shedding lasts significantly longer in younger children than adults, over one-half of children are still shedding influenza at 8 days after onset of illness, posing important questions about the appropriate length of time for exclusion.[11,12] Young children spread influenza to families and the community at significant rates and child care attendance independently increases this risk.[10,13] Unfortunately, infection control interventions to reduce the spread of respiratory and influenzalike illness in center-based child care have a relatively small impact.[14–17] Finally, the inability to attend child care due to exclusion or closure of the center results in the need for alternative care arrangements or missed parental work, which has a large societal economic impact.[18,19] For these reasons, it is both important and difficult to address PIP for children in child care centers.

The findings of this study suggest that efforts to increase PIP among US child care center directors should focus on increasing awareness and knowledge of pandemic influenza by developing more effective ways of distributing information and conducting training. Child care health consultants, used by over 40% of centers in both survey years, are effective at increasing and implementing health promotion policies and practices[20,21] and should be used for this purpose. Encouragingly, directors became more interested in receiving training about pandemic influenza between 2008 and 2016. Although paper-based and in-person training remain popular choices, receiving Internet-based self-directed or webinar-based

training were the preferred methods in 2016 and represent an efficient way to deliver training.

The strengths of this study are the use of national sampling of licensed US child care centers and adjusting for covariates to identify independent predictors of PIP. This study is based on director self-report, rather than direct observation of practices, and could be influenced by social desirability bias although preparedness levels were so low that this is unlikely to be a large issue. The sample populations differed significantly in that the source databases grew significantly from 2008 to 2016. This likely represents better accounting by states of active centers over this time period because the number of children using child care centers changed very little according to the most recent US Census Bureau reports.[1,22] There were significant demographic and center director differences (Table 1) in the 2 survey years; however, this was adjusted for in multivariable analyses. Finally, the cooperation rate was higher in 2016 than 2008, possibly due to greater knowledge of pandemic influenza (respondents with at least some knowledge of pandemic influenza: 63.3% vs 46.9%, respectively). This could have introduced selection bias; however, if such a bias existed, one might have expected higher PIP in 2016.

CONCLUSIONS

Pandemic influenza is a potentially devastating global health event, and young children in child care centers are a vulnerable group that can augment the spread of pandemic influenza into the community. Therefore, it is important to have strategies in place for mitigating pandemic influenza in these settings. Based on our findings, we recommend addressing child care center director knowledge gaps about PIP by developing Internet-based webinars and self-paced trainings and by using child care health consultants to promote them. Because ongoing educational efforts have not been successful, policymakers may consider requiring PIP training for licensure or accreditation. Pediatric health care providers should be aware of child care center directors' lack of PIP and steer parents and center directors toward CDC resources to help mitigate the spread.

ABBREVIATIONS

AAP: American Academy of Pediatrics
CDC: Centers for Disease Control and Prevention
NAEYC: National Association for the Education of Young Children
PIP: pandemic influenza preparedness

Address correspondence to Timothy R. Shope, MD, MPH, FAAP, Children's Hospital of Pittsburgh of UPMC, One Children's Hospital Dr, 4401 Penn Ave, Pittsburgh, PA 15224. E-mail: timothy.shope@chp.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Funded by the Centers for Disease Control and Prevention, under grants 1U01DD000233 and 5U38OT000167-03.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

REFERENCES

1. US Census Bureau. Who's minding the kids? Child care arrangements: spring, 2011. Available at: https://www.census.gov/prod/2013pubs/p70-135.pdf. Accessed January 24, 2017
2. Centers for Disease Control and Prevention. Child care and preschool pandemic influenza planning checklist. Available at: https://www.acf.hhs.gov/sites/default/files/occ/cdc_pandemic_checklist.pdf. Accessed January 24, 2017
3. American Academy of Pediatrics. *Caring for Our Children National Health and Safety Performance Standards for Out-Of-Home Child Care and Early Education Programs*. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2011
4. American Academy of Pediatrics. Preparing child care programs for pandemic influenza. Available at: https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Pages/Preparing-Child-Care-Programs-for-Pandemic-Influenza.aspx. Accessed January 24, 2017
5. Centers for Disease Control and Prevention. Action steps for child care and early childhood program providers to prevent the spread of flu. Available at: https://www.cdc.gov/H1N1flu/childcare/toolkit/pdf/actionsteps_preventflu032410.pdf. Accessed January 24, 2017
6. Centers for Disease Control and Prevention. CDC guidance on helping child care and early childhood programs respond to influenza during the 2009-2010 influenza season. Available at: https://www.cdc.gov/h1n1flu/childcare/guidance.htm. Accessed January 24, 2017
7. National Institute of Child Health and Human Development Early Child Care Research Network. Child care and common communicable illnesses: results from the National Institute of Child Health and Human Development

Study of Early Child Care. *Arch Pediatr Adolesc Med*. 2001;155(4):481–488

8. Reed C, Katz JM, Hancock K, Balish A, Fry AM; H1N1 Serosurvey Working Group. Prevalence of seropositivity to pandemic influenza A/H1N1 virus in the United States following the 2009 pandemic. *PLoS One*. 2012;7(10):e48187
9. Ruf BR, Knuf M. The burden of seasonal and pandemic influenza in infants and children. *Eur J Pediatr*. 2014;173(3):265–276
10. Mughini-Gras L, Pijnacker R, Enserink R, Heusinkveld M, van der Hoek W, van Pelt W. Influenza-like illness in households with children of preschool age. *Pediatr Infect Dis J*. 2016;35(3):242–248
11. Esposito S, Daleno C, Baldanti F, et al. Viral shedding in children infected by pandemic A/H1N1/2009 influenza virus. *Virol J*. 2011;8:349
12. De Serres G, Rouleau I, Hamelin ME, et al. Contagious period for pandemic (H1N1) 2009. *Emerg Infect Dis*. 2010;16(5):783–788
13. Glatman-Freedman A, Portelli I, Jacobs SK, et al. Attack rates assessment of the 2009 pandemic H1N1 influenza A in children and their contacts: a systematic review and meta-analysis. *PLoS One*. 2012;7(11):e50228
14. Huskins WC. Transmission and control of infections in out-of-home child care. *Pediatr Infect Dis J*. 2000;19(suppl 10):S106–S110
15. Roberts L, Jorm L, Patel M, Smith W, Douglas RM, McGilchrist C. Effect of infection control measures on the frequency of diarrheal episodes in child care: a randomized, controlled trial. *Pediatrics*. 2000;105(4 pt 1):743–746
16. Pandejpong D, Danchaivijitr S, Vanprapa N, Pandejpong T, Cook EF. Appropriate time-interval application of alcohol hand gel on reducing influenza-like illness among preschool children: a randomized, controlled trial. *Am J Infect Control*. 2012;40(6):507–511
17. Uhari M, Möttönen M. An open randomized controlled trial of infection prevention in child day-care centers. *Pediatr Infect Dis J*. 1999;18(8):672–677
18. Rashid H, Ridda I, King C, et al. Evidence compendium and advice on social distancing and other related measures for response to an influenza pandemic. *Paediatr Respir Rev*. 2015;16(2):119–126
19. Yin JK, Salkeld G, Lambert SB, et al. Estimates and determinants of economic impacts from influenza-like illnesses caused by respiratory viruses in Australian children attending childcare: a cohort study. *Influenza Other Respi Viruses*. 2013;7(6):1103–1112
20. Hanna H, Mathews R, Southward LH, et al. Use of paid child care health care consultants in early care and education settings: results of a national study comparing provision of health screening services among Head Start and non-Head Start centers. *J Pediatr Health Care*. 2012;26(6):427–435
21. Alkon A, Bernzweig J, To K, Wolff M, Mackie JF. Child care health consultation improves health and safety policies and practices. *Acad Pediatr*. 2009;9(5):366–370
22. US Census Bureau. Who's minding the kid's? Child care arrangements: spring 2005/summer 2006. Available at: www.census.gov/content/dam/Census/library/publications/2010/demo/p70-121.pdf. Accessed January 24, 2017

Pandemic Influenza Preparedness Among Child Care Center Directors in 2008 and 2016

Timothy R. Shope, Benjamin H. Walker, Laura D. Aird, Linda Southward, John S. McCown and Judith M. Martin

Pediatrics 2017;139;
DOI: 10.1542/peds.2016-3690 originally published online May 15, 2017;

Pandemic Influenza Preparedness Among Child Care Center Directors in 2008 and 2016

Timothy R. Shope, Benjamin H. Walker, Laura D. Aird, Linda Southward, John S. McCown and Judith M. Martin

Pediatrics 2017;139;
DOI: 10.1542/peds.2016-3690 originally published online May 15, 2017;