

Washington State Licensed Child Care Facility Directors' Perspectives on Childhood Immunization

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Received May 31, 2012; accepted August 2, 2012.

Background. The study objective was to determine Washington State childcare facility directors' compliance with state immunization education and monitoring requirements and the role of directors' immunization attitudes and beliefs on compliance.

Methods. We mailed a self-administered survey to 2000 randomly selected childcare facility directors in Washington State. The primary outcome measures were reported compliance with state requirements to educate parents about the importance of immunizations and monitor the immunization status of enrolled children.

Results. Our response rate was 28%. The majority of respondents worked at facilities with a licensed capacity of <25 children, had ≥ 11 years of experience, and were parents themselves. Overall, 68% agreed that they educated enrolled parents about the importance of immunizations and 90% agreed that they monitored the immunization status of enrolled children. However, 60% were concerned that children might have a serious side effect from an immunization, 51% were concerned that any one of the childhood immunizations might not be safe, and 11% were distrustful of the immunization information they received. These beliefs were associated with a statistically significant decreased likelihood of educating parents about immunization (adjusted odds ratios [aORs]: 0.57, 0.46, 0.19, respectively) and monitoring immunization status of children (aORs: 0.32, 0.32, 0.19, respectively).

Conclusions. Most Washington State child care facility directors who responded to our survey are compliant with state requirements for immunization education and monitoring. A substantial number of directors are concerned about vaccine safety, however, and these concerns may decrease the likelihood of these requirements being followed.

Key words. Immunizations; Vaccines; Daycare

Nationally, more than 4.5 million children in the United States under 5 years of age were enrolled in an organized childcare facility in 2008 [1]. Many more children received childcare through more informal arrangements, such as from nonrelatives at the child's home or at the nonrelative's home. In Washington State, it is estimated that over 176 000 children

were enrolled in licensed childcare in the spring of 2010, representing roughly 1 in 7 of all children in the state [2].

Children who attend child care are at increased risk of contracting an infectious disease [3]. As such, there are standards for the prevention and control of infectious disease in childcare centers [4]. Among these

standards are immunization requirements for children in childcare. In Washington State, a child must present a signed certificate of immunization status (or a certificate of exemption) showing proof of full immunization or an initiation of a schedule of immunization to attend childcare or preschool [5]. Furthermore, the program director of a childcare facility in Washington State is responsible for “verifying and assessing immunization information of (enrolled) children for accuracy and completeness,” “keeping an up-to-date list of (enrolled) children who are not adequately immunized,” and “educating coworkers and (enrolled) parents about the importance of immunizations” [6]. The maintenance of immunization records of enrollees is also an explicit legal requirement in Washington State [7]. Given these responsibilities, child care facility directors in Washington State can influence the immunization status of children in child care.

However, no data exist regarding child care facility directors’ own immunization attitudes and beliefs or their compliance with immunization education and monitoring requirements. Given the current rise in vaccine hesitancy among parents nationally [8] as well as recent data that Washington State has the highest number of parents exempting their child from required school-entry immunizations [9], we sought to characterize the immunization attitudes, beliefs, and behaviors of directors of licensed childcare facilities in Washington State in order to understand potential targets for intervention to help reduce parental vaccine hesitancy and improve preschool immunization rates. We hypothesized that childcare facility directors would have similar concerns regarding childhood immunizations as do parents, and that these concerns would negatively affect their compliance with Washington State education and monitoring requirements.

METHODS

Study Sample

Our target population was program directors of licensed childcare facilities in Washington State who were included in the Washington State Department of Early Learning Licensed Child Care Provider List (n = 7446). This list includes both licensed childcare centers and family home childcare providers. Surveys were mailed to 2000 childcare providers chosen by simple random selection (Figure 1). From the respondents, we excluded those who indicated that they were

not the program director of a licensed childcare facility.

Survey Design

Our survey was based upon the Parent Attitudes about Childhood Vaccines (PACV) survey and contained 15 items pertaining to childcare facility directors’ general perspectives on childhood vaccines and their immunization education and monitoring behavior (Figure 2). The PACV’s development is described elsewhere [10], and its validity for identifying vaccine-hesitant parents has been previously demonstrated [11]. We also included 9 socio-demographic items, all of which used categorical response formats. The socio-demographic items included the director’s age, years in current position, level of education, whether they had prior medical or healthcare training, and items relevant to the director’s childcare facility, such as the Washington State county in which the facility resides categorized into Washington State Department of Social and Health Services (DSHS) Administrative Regions (1–6), the child ages accepted at the facility, the licensed capacity of the facility, the facility’s average attendance, and the number of staff employed at the facility.

Data Collection

Surveys were mailed in May 2010 along with a personalized and signed cover letter and a stamped reply envelope. No monetary incentive was used. One reminder postcard was sent to the entire target population approximately 1 week after the initial mailing, and 2 additional reminders were sent via e-mail approximately 6 and 13 weeks after the initial mailing to

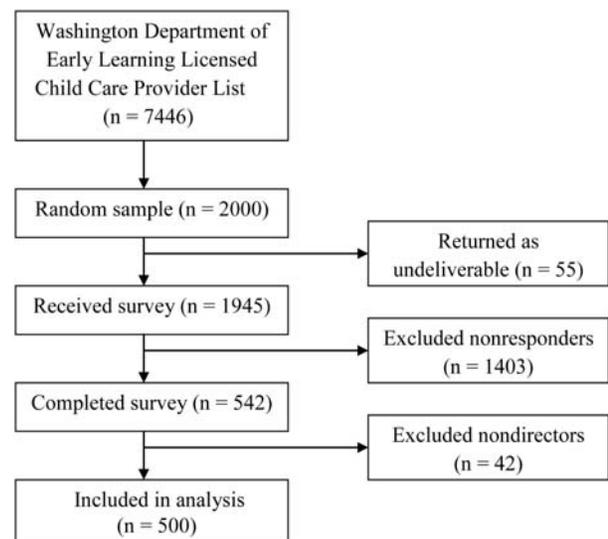


Figure 1. Survey population.

Items	Response Categories
How sure are you that following the recommended immunization schedule is a good idea for children?	0 (Not at all Sure) to 10 (Completely Sure)
Children get more immunizations than are good for them.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
I believe that many of the illnesses vaccines prevent are severe.	Strongly Agree/Agree/ Not sure/Disagree/Strongly Disagree
It is better for children to develop immunity by getting sick than to get an immunization.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
It is better for children to get fewer vaccines at the same time.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
How concerned are you that children might have a serious side effect from an immunization?	Not at all concerned/Not too concerned/Not sure/Somewhat concerned/Very concerned
How concerned are you that any one of the childhood immunizations might not be safe?	Not at all concerned/Not too concerned/Not sure/Somewhat concerned/Very concerned
How concerned are you that an immunization might not prevent the disease?	Not at all concerned/Not too concerned/Not sure/Somewhat concerned/Very concerned
Overall, how hesitant about childhood immunizations would you consider yourself to be?	Not at all hesitant/Not too hesitant/Not sure/Somewhat hesitant/Very hesitant
I trust the information I receive about immunizations.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
I educate parents of children enrolled in my program about the importance of immunizations.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
I monitor whether or not children enrolled in my program are up to date on their immunizations.	Strongly Agree/Agree/Not sure/Disagree/Strongly Disagree
For those respondents who indicated that they were also parents:	
Have you ever delayed having your child get an immunization for reasons other than illness or allergy?	Yes/No/Don't Know
Have you ever decided not to have your child get an immunization for reasons other than illness or allergy?	Yes/No/Don't Know
If you had another infant today, would you want him/her to get all the recommended immunizations?	Yes/No/Don't Know

Figure 2. Survey.

the portion of the target population with listed e-mail addresses ($n = 1549$). Survey postal mailings that were returned as undeliverable were re-mailed if an error in the mailing address was found.

Data Analysis

Responses to the survey items pertaining to childcare facility directors' general perspectives on childhood vaccines and their immunization education and monitoring behavior were first grouped into 3 categories (eg, strongly agree/agree, not sure, disagree/strongly disagree) and analyzed using descriptive statistics. Next, we used logistic regression to test the association of the primary outcome variables (childcare facility director agreement with the 2 statements in the survey regarding education of parents of children enrolled in

their program about the importance of immunizations and the monitoring of the up-to-date immunization status of enrolled children) with individual predictor variables (directors' immunization attitudes and beliefs). For this bivariate analysis, survey responses were dichotomized. We dichotomized the 2 primary outcome survey items into compliant (strongly agree/agree) and noncompliant (strongly disagree/disagree) and excluded the "not sure" response. The not sure response ($n = 39$ for the education item and $n = 4$ for the monitoring item) was excluded on these survey items relating to directors' behavior because it was felt to be more indicative of poor recall than a measurement of compliance. Responses to each of the individual items in the survey on beliefs regarding immunizations were dichotomized as hesitant or non-

hesitant. Hesitant responses for the 5-point Likert-scale items corresponded to the collapsed responses of “strongly agree/agree,” “somewhat or very concerned,” and “somewhat or very hesitant,” except for 2 items in which “strongly disagree/disagree” represented the hesitant response (given the valence of the question stem). The not sure response from all the belief survey items was collapsed into the non-hesitant response group. For the item with the 11-point scale (How sure are you that following the recommended immunization schedule is a good idea for children?), hesitant responses corresponded to the collapsed responses 0–5 and non-hesitant responses to 6–10.

We used multivariate logistic regression analysis to determine the independent association between our

Table 1. Characteristics of Study Participants (n = 500)^a

Facility Characteristics	N	%
DSHS administrative region ^b		
Region 1	80	16
Region 2	63	13
Region 3	67	14
Region 4	137	28
Region 5	66	13
Region 6	82	17
Child ages accepted (years) ^c		
<1	314	64
1–2	386	78
3–4	436	88
≥5	417	84
Licensed capacity (number of children)		
<25	326	65
25–48	74	15
49–72	46	9
73–96	19	4
>96	34	7
Average attendance (number of children)		
<25	333	68
25–48	79	16
49–72	38	8
73–96	17	3
>96	24	5
Employed staff (number)		
≤5	346	71
6–10	54	11
11–15	40	8
16–20	21	4
≥21	31	6
30 years old or older	462	94
Parent	410	84
Years in current position		

Continued

Table 1. *Continued*

Facility Characteristics	N	%
<1	24	5
1–5	132	27
6–10	79	16
≥11	263	53
Have prior medical or healthcare training	221	45
Education level		
8th grade or less	11	2
Some high school, but not a graduate	6	1
High school graduate or GED	55	11
Some college or 2 year degree	264	53
4-year college degree	73	15
More than 4-year college degree	89	18

Abbreviations: DSHS, Department of Social and Health Services; GED, General Education Development.

^aSome characteristics do not total 500 because of missing data.

^bRegion 1 counties include Adams, Asotin, Chelan, Douglas, Ferry, Garfield, Grant, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, and Whitman; Region 2 counties include Benton, Columbia, Franklin, Kittitas, Walla Walla, and Yakima; Region 3 counties include Island, San Juan, Skagit, Snohomish, and Whatcom; Region 4 includes King County; Region 5 counties include Kitsap and Pierce; and Region 6 counties include Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Klickitat, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum

^cCould choose all that apply.

primary outcome variables and significant predictors after controlling for socio-demographic characteristics that changed the predictor variable slope by >10%. For all tests, differences were considered significant when the 95% confidence interval (CI) around a point estimate did not include 1.0. This study was approved by the Institutional Review Board at Seattle Children’s Hospital.

RESULTS

Our response rate was 28%. Socio-demographic characteristics of licensed childcare facilities and their directors included in the analysis are summarized in Table 1. Most childcare facilities had an average attendance of <25 children (65%), employed staff numbering <5 (70%), and were located in DSHS Washington State Administrative Region 4 (28%), which comprises the State’s most populous county, King County.

Most respondents were 30 years old or older (94%), had 11 or more years of experience in their

Table 2. Vaccine Attitudes, Beliefs, and Behaviors of Study Participants (n = 500)

Item	Response	N ^a (%)
How sure are you that following the recommended immunization schedule is a good idea for children?	0 (not at all sure) – 5	98 (20)
	6–7	74 (15)
	8–10 (completely sure)	323 (65)
Children get more immunizations than are good for them.	Strongly Agree, Agree	126 (25)
	Not Sure	136 (28)
	Strongly Disagree, Disagree	236 (47)
I believe that many of the illnesses vaccines prevent are severe.	Strongly Disagree, Disagree	50 (10)
	Not Sure	58 (12)
	Strongly Agree, Agree	390 (78)
It is better for children to develop immunity by getting sick than to get an immunization.	Strongly Agree, Agree	72 (15)
	Not Sure	117 (23)
	Strongly Disagree, Disagree	309 (62)
It is better for children to get fewer vaccines at the same time.	Strongly Agree, Agree	246 (49)
	Not Sure	176 (35)
	Strongly Disagree, Disagree	78 (16)
How concerned are you that children might have a serious side effect from an immunization?	Very Concerned, Somewhat Concerned	298 (60)
	Not Sure	26 (5)
	Not at all Concerned, Not too Concerned	176 (35)
How concerned are you that any one of the childhood immunizations might not be safe?	Very Concerned, Somewhat Concerned	252 (51)
	Not Sure	55 (11)
	Not at all Concerned, Not too Concerned	191 (38)
How concerned are you that an immunization might not prevent the disease?	Very Concerned, Somewhat Concerned	189 (38)
	Not Sure	60 (12)
	Not at all Concerned, Not too Concerned	251 (50)
Overall, how hesitant about childhood immunizations would you consider yourself to be?	Very Hesitant, Somewhat Hesitant	144 (29)
	Not Sure	30 (6)
	Not at all Hesitant, Not too Hesitant	324 (65)
I trust the information I receive about immunizations.	Strongly Disagree, Disagree	56 (11)
	Not Sure	87 (18)
	Strongly Agree, Agree	356 (71)
I educate parents of children enrolled in my program about the importance of immunizations.	Strongly Disagree, Disagree	123 (25)
	Not Sure	37 (7)
	Strongly Agree, Agree	333 (68)
I monitor whether or not children enrolled in my program are up to date on their immunizations.	Strongly Disagree, Disagree	45 (9)
	Not Sure	4 (1)
	Strongly Agree, Agree	450 (90)

^aSome totals do not add up to 500 because of missing data.

position (53%), had at least some college education (86%), and were parents themselves (84%). Of the respondents who were parents (n = 410), 16% (n = 67) had delayed having their own child receive an immunization for reasons other than illness or allergy and 15% (n = 62) had decided not to have their child receive an immunization for reasons other than illness or allergy. Two-thirds of director parents who responded that they had delayed an immunization for their own child also responded that they had decided not to have their child get an immunization.

Most respondents agreed that they educated enrolled parents about the importance of immunizations (68%) and that they monitored their

immunization status (90%) (Table 2). Although most respondents were sure that following the recommended immunization schedule was a good idea for children (65%) and considered themselves to be not at all hesitant or not too hesitant about childhood immunizations (65%), the majority were also very or somewhat concerned that children might have a serious side effect from an immunization (60%) and that any one of the childhood immunizations might not be safe (51%). A substantial number also felt that it is better for children to get fewer vaccines at the same time (49%) and believed that children get more immunizations than are good for them (25%).

Table 3. Association of a Hesitant Response to Vaccine Belief Survey Items and Education of Parents Enrolled in Their Program about the Importance of Immunizations

Vaccine Belief Item	Hesitant Response	OR	95% CI	aOR ^a	95% CI
How sure are you that following the recommended immunization schedule is a good idea for children?	0–5	0.19	0.12, 0.32	0.17	0.10, 0.30
Children get more immunizations than are good for them.	Strongly Agree, Agree	0.57	0.36, 0.90	0.52	0.31, 0.86
I believe that many of the illnesses vaccines prevent are severe.	Strongly Disagree, Disagree	0.65	0.33, 1.27	0.42	0.20, 0.88
It is better for children to develop immunity by getting sick than to get an immunization.	Strongly Agree, Agree	0.41	0.24, 0.72	0.37	0.19, 0.69
It is better for children to get fewer vaccines at the same time.	Strongly Agree, Agree	0.69	0.45, 1.04	0.66	0.41, 1.05
How concerned are you that children might have a serious side effect from an immunization?	Very Concerned, Somewhat Concerned	0.64	0.41, 0.99	0.57	0.35, 0.94
How concerned are you that any one of the childhood immunizations might not be safe?	Very Concerned, Somewhat Concerned	0.53	0.34, 0.80	0.46	0.29, 0.74
How concerned are you that an immunization might not prevent the disease?	Very Concerned, Somewhat Concerned	0.79	0.52, 1.21	0.77	0.48, 1.23
Overall, how hesitant about childhood immunizations would you consider yourself to be?	Very Hesitant, Somewhat Hesitant	0.34	0.22, 0.53	0.36	0.22, 0.58
I trust the information I receive about immunizations.	Strongly Disagree, Disagree	0.21	0.12, 0.40	0.19	0.09, 0.40

^aAdjusted for director age, years in current position, director being a parent, and facility's average attendance and number of employed staff.

In bivariate analysis, directors who gave a hesitant response on one of several items pertaining to vaccine attitudes and beliefs were less likely to agree with the statement that they educate enrolled parents about the importance of immunizations compared with respondents who gave a non-hesitant response (Table 3). For instance, directors who were unsure that following the recommended immunization schedule was a good idea were less likely to educate parents than were directors who were sure (odds ratio [OR], 0.19 [95% CI, 0.12, 0.32]). Likewise, directors who were very or somewhat concerned that children might have a serious side effect from an immunization or that any one of the childhood immunizations might not be safe were less likely to educate parents than were directors who were not concerned (OR, 0.64 [95% CI, 0.41, 0.99] and OR, 0.53 [95% CI, 0.34, 0.80], respectively). Distrust in immunization information and overall hesitancy toward childhood immunizations were also associated with a significantly decreased likelihood to educate parents. In a multivariate model that controlled for socio-demographic variables that confounded the association between immunization education of parents and directors' vaccine attitudes (director age and years in current position, the director being a parent, facility's average attendance, and number of employed staff), all of these associations remained statistically significant (Table 3).

We found a similar association between several vaccine attitudes and directors' agreement with the statement that they monitor the up-to-date immunization status of enrolled children (Table 4). Directors who were very or somewhat concerned that children might have a serious side effect from an immunization or that any one of the childhood immunizations might not be safe were less likely to monitor the immunization status of enrolled children than were directors who were not concerned (OR, 0.32 [95% CI, 0.14, 0.76] and OR, 0.31 [95% CI, 0.14, 0.67], respectively). Directors who were very or somewhat hesitant about childhood immunizations overall or were distrustful of the immunization information they received were also significantly less likely to monitor the up-to-date immunization status of enrolled children. After adjusting for several variables that confounded the association between monitoring of immunization status and the childcare facility directors' vaccine attitudes, each of these associations remained statistically significant except for the relationship between directors' overall immunization hesitancy and monitoring of immunization status.

In a subgroup analysis of only those directors who were also parents, those who had ever delayed or refused an immunization for their own child were significantly less likely to educate enrolled parents about the importance of immunizations (OR, 0.44 [95% CI,

Table 4. Association of a Hesitant Response to Vaccine Belief Survey Items and Monitoring the Up-To-Date Immunization Status of Enrolled Children

Vaccine Belief Item	Hesitant Response	OR	95% CI	aOR ^a	95% CI
How sure are you that following the recommended immunization schedule is a good idea for children?	0–5	0.38	0.18, 0.79	0.42	0.17, 1.06
Children get more immunizations than are good for them.	Strongly Agree, Agree	0.54	0.26, 1.10	0.46	0.19, 1.12
I believe that many of the illnesses vaccines prevent are severe.	Strongly Disagree, Disagree	0.40	0.17, 0.98	0.31	0.09, 1.05
It is better for children to develop immunity by getting sick than to get an immunization.	Strongly Agree, Agree	1.89	0.56, 6.36	2.42	0.45, 12.94
It is better for children to get fewer vaccines at the same time.	Strongly Agree, Agree	0.55	0.28, 1.10	0.48	0.20, 1.14
How concerned are you that children might have a serious side effect from an immunization?	Very Concerned, Somewhat Concerned	0.32	0.14, 0.76	0.32	0.12, 0.89
How concerned are you that any one of the childhood immunizations might not be safe?	Very Concerned, Somewhat Concerned	0.31	0.14, 0.67	0.32	0.13, 0.80
How concerned are you that an immunization might not prevent the disease?	Very Concerned, Somewhat Concerned	0.78	0.40, 1.54	0.73	0.31, 1.73
Overall, how hesitant about childhood immunizations would you consider yourself to be?	Very Hesitant, Somewhat Hesitant	0.39	0.20, 0.78	0.55	0.23, 1.33
I trust the information I receive about immunizations.	Strongly Disagree, Disagree	0.18	0.08, 0.38	0.19	0.07, 0.53

^aAdjusted for child age accepted at facility, facility's licensed capacity and average attendance, number of employed staff at facility, director being a parent, years in current position, director's age and level of education, and prior medical training received by director

0.26, 0.74] for those who delayed and OR, 0.30 [95% CI, 0.17, 0.54] for those who refused an immunization, respectively). After adjusting for the same variables used in the multivariate model that included all directors (director age, years in current position, facility's average attendance, and number of employed staff), these associations remained statistically significant (adjusted OR [aOR], 0.46 [95% CI, 0.26, 0.83] and aOR, 0.35 [95% CI, 0.18, 0.67], respectively). No additional socio-demographic characteristics confounded the association between compliance with the education requirement and a director's own immunization behavior. In addition, a director parent who had ever delayed or refused an immunization for their own child was also significantly less likely to monitor the immunization status of enrolled children (OR, 0.42 [95% CI, 0.21, 0.85] and OR, 0.29 [95% CI, 0.13, 0.63], respectively). However, these associations did not remain statistically significant after adjusting for the variables used in the multivariate model that included all directors (OR, 0.48 [95% CI, 0.18, 1.27] and OR, 0.77 [95% CI, 0.23, 2.59], respectively).

DISCUSSION

To our knowledge, this is the first study to examine the immunization attitudes and beliefs of childcare facility directors and to determine the impact of these attitudes and beliefs on directors' compliance with state requirements for educating enrolled parents about the importance of immunizations and monitoring the up-to-date immunization status of enrolled children. We found that Washington State licensed childcare facility directors who responded to our survey generally view childhood immunizations positively and that most are compliant with state requirements for immunization education and monitoring. However, the majority of respondents are concerned about the safety of childhood immunizations, and there is a large minority who feel that children receive more immunizations than are good for them, are unsure that following the recommended immunization schedule is a good idea, and are distrustful of the immunization information they receive. Perhaps most importantly, many of these immunization attitudes and beliefs are associated with decreased director compliance with Washington

State's childcare immunization education or monitoring requirements.

The overwhelming majority of the childcare facility directors who responded to our survey were parents themselves, and, perhaps consequently, their immunization concerns largely mirror those in other studies sampling the general parent population. For instance, Freed et al [12] found that 54% of parents surveyed were concerned about serious adverse effects of vaccines in 2009, compared with 60% of childcare facility directors in our study who were concerned that children might have a serious side effect from an immunization. Likewise, in 2010, Kennedy et al [13] found that 34% of parents surveyed reported that children get too many vaccines during the first 2 years of life, compared with 25% of childcare center directors in our study who thought children get more immunizations than are good for them and 49% who thought it is better for children to get fewer vaccines at the same time. Furthermore, we found the immunization behavior of childcare facility directors who were also parents to be similar to the immunization behavior of the general parent population: the percentage of director parents who had delayed or refused a childhood immunization for their own child (16% and 15%, respectively) is similar to parental delay and refusal rates in other studies [11, 12, 14]. Our findings therefore suggest that the immunization attitudes, beliefs, and behaviors of childcare center directors might simply be representative of the parent population in which they belong.

The similarities between childcare facility directors in our survey sample and the general parent population with respect to immunization concerns, the prevalence of these concerns, and immunization delay and refusal rates has important implications. First, because the level of hesitancy we found among our sample of facility directors matches that of the broader parent population, it may be that our results are generalizable to the larger childcare facility director population, particularly those who are also parents. This similarity also suggests that the need to address immunization hesitancy among childcare facility directors should be one that mirrors the need among parents [15, 16]. As is the case for parents, improved vaccine communication with childcare facility directors may be needed to help correct misconceptions about childhood immunizations and alleviate safety concerns. Interventions that have been developed for parents and shown promise in accomplishing these goals, such as the information brochure entitled "Why Vaccinate Your

Child?" [17], might easily be adapted for childcare facility providers for the same purpose.

Second, although parents and childcare facility directors may have similar immunization attitudes and behaviors, the ramifications of these attitudes and behaviors are quite different. Unlike individual parents who have a responsibility only to their own children, childcare facility directors have a responsibility to protect the general safety and well-being of all children enrolled under their care at their childcare center. This responsibility includes complying with requirements to prevent and control infectious disease in their center. Our results indicate that personal immunization attitudes and behaviors of childcare facility directors' conflict with these managerial responsibilities and decrease the likelihood that they fulfill them. A recent national survey of licensed childcare facility directors regarding preparation for pandemic influenza found similar results regarding immunization beliefs and management of infectious disease in childcare settings: 32% of respondents were not concerned at all about pandemic influenza, and even after being presented with a hypothetical scenario in which "10 children in your state died last week because of this influenza," 18% were not likely to require that enrolled children in their center be immunized against the flu and an additional 16% were not sure or didn't know [18].

With Washington State currently in the midst of a pertussis epidemic [19], these findings seem particularly relevant. However, how our results might impact immunization outcomes is unclear for 2 reasons. First, there has been no study of the effect of directors' decreased compliance with immunization education and monitoring on a child's up-to-date immunization status. It may be that decreased education and monitoring by childcare facility directors is in fact inconsequential to a child's immunization status. Second, there is a paucity of evidence regarding the influence of a childcare facility provider on parental immunization decision-making. Salmon et al [20] studied the association of immunization knowledge, attitudes, and beliefs of elementary school personnel on nonmedical immunization exemptions, and found that a child in a school where personnel had concerns that children's immune systems would be weakened by too many immunizations was more likely to have a nonmedical immunization exemption. Although this suggests that the knowledge, attitudes, and beliefs of school personnel may be influential on parents of children at that school, this study was not designed to determine

causation and therefore cannot exclude the opposite from being true: parents with children at the school and who claim exemptions may be influential on school personnel's immunization attitude and beliefs. Other evidence suggests that parents commonly seek immunization information from non-health professional sources [21], but it is not clear how often parents seek such information from their childcare facility provider. Therefore, to fully gauge the significance of our study, further research is needed to answer these important questions.

One limitation of this study is that the modified version of the validated parent survey we used may have poor psychometric properties in our target population of childcare facility directors. This could lead to a misinterpretation of responses to particular survey items. However, because most respondent directors were also parents—and parents were the population in which the survey was originally validated—it is likely that the psychometric properties of our survey are similar to that of the original.

A second limitation is the potential for a social desirability bias in answering the 2 primary outcome survey items, especially the item on monitoring immunization status given its legal basis. However, this bias would suggest that our finding that 10% of respondents who indicated that they do not comply (or are not sure that they do) is an underestimate. If so, the importance of developing interventions aimed at improving childcare center director compliance is only enhanced.

Social desirability bias may have also contributed to a reluctance to complete the survey, and this modest response rate creates the possibility of nonresponse bias. However, our sample accurately represents the geographic distribution of childcare facilities in Washington State as described in the Washington State 2010 Child Care Survey, a telephone, web, and mail survey of childcare centers and family home providers conducted from May to June 2010 with response rates of 79% and 70%, respectively [2]. Furthermore, we found the majority of directors in our survey to have ≥ 11 years of experience, which was similar to the sample in the Washington State survey in which the average number of years of paid childcare experience among directors was 18 years. However, one notable difference between the 2 samples was with regards to the licensed capacity of participating childcare facility (65% had a licensed capacity of < 25 children in our sample compared with 17% in the Washington

State survey sample). We did not ask respondents whether they directed childcare centers or family home childcare facilities, so it may be that our sample contained a larger number of directors of smaller family home childcare facilities. It is not known how or whether this increased number of small childcare facilities participating in our survey influenced our results.

CONCLUSION

Most Washington State licensed childcare facility directors who responded to our survey are compliant with state requirements for educating enrolled parents about the importance of immunizations and monitoring the immunization status of enrolled children. However, there appear to be substantial concerns among childcare facility directors regarding vaccine safety. In addition, there is a large minority of respondents who feel that children get more immunizations than are good for them, are unsure that following the recommended immunization schedule is a good idea, and are distrustful of the immunization information they receive, and these concerns decrease the likelihood that directors follow state education or monitoring requirements. Further research is needed to understand the impact of childcare facility directors' beliefs about vaccines on the immunization status of the children in their care.

Acknowledgments

Financial support. This work was supported by the Office of Immunization and Child Profile, Washington State Department of Health.

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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