

Health and Safety of Child Care Centers: An Analysis of Licensing Specialists' Reports of Routine, Unannounced Inspections

Angela A. Crowley, APRN, PhD, Sangchoon Jeon, PhD, and Marjorie S. Rosenthal, MD, MPH

Attendance in out-of-home child care is a necessity for many children and poses both risks and benefits. Approximately 60% of children younger than 6 years both in Connecticut and nationally have mothers in the workforce.^{1,2} In Connecticut, about 85 000 young children are cared for in approximately 1600 licensed child care centers and group homes.³ When the quality of child care or early care and education (ECE) is suboptimal, children are at greater risk for infectious diseases, injuries, and inadequate nurturing.⁴⁻⁶ However, high quality ECE offers several benefits, including developmentally appropriate care, fewer illnesses and injuries, greater likelihood of health care access, health screenings, early identification and referral for health, developmental and behavioral concerns, and care for children with special health care needs.^{6,7} Quality ECE is a critical component of a healthy trajectory necessary for children's readiness to learn and is associated with long-term health and well-being.⁸⁻¹⁰

Initiatives to improve health and safety for children in ECE are occurring on both national and state levels. To promote access to healthy, safe, and developmentally appropriate ECE programs, the US Department of Health and Human Services Maternal Child Health Bureau, in partnership with the American Public Health Association and the American Academy of Pediatrics, has supported national health and safety standards (*Caring for Our Children* [(CFOC)],¹¹ state grants, and resource centers for information, technical assistance, and training.¹² Furthermore, the National Association for the Education of Young Children (NAEYC), the professional organization of early childhood professionals, has aligned their accreditation standards with CFOC health and safety standards.¹³ Simultaneously, as states launch universal preschool initiatives to better prepare children for kindergarten¹⁴ many

Objectives. We assessed the prevalence of regulatory noncompliance of licensed child care centers and identified factors associated with improved compliance.

Methods. We analyzed 676 routine, unannounced reports of child care centers collected by the Connecticut Department of Public Health licensing specialists over a 2-year time period, included characteristics of centers, and created categories of regulations.

Results. The sample included 41% of licensed child care centers. Of the 13 categories of regulations in the analyses, 7 categories (outdoor safety, indoor safety, indoor health, child and staff documentation, emergency preparedness, infant-toddler indoor health, and infant-toddler indoor safety) had regulations with center noncompliance greater than 10%. Playground hazard-free was the regulation with the highest frequency (48.4%) of noncompliance. Compliance with the regulation for 20 hours of continuing education per year for child care providers was the characteristic most frequently associated with regulations compliance.

Conclusions. Efforts to support continuing education of child care providers are essential to improve and sustain healthy and safe early-care and education programs. Analyses of state child care licensing inspection reports provide valuable data and findings for strategic planning efforts. (*Am J Public Health.* 2013;103:e52-e58. doi:10.2105/AJPH.2013.301298)

are recognizing that children's health status during the preschool years influences their readiness to learn.^{8,15}

Although efforts are under way to promote quality ECE through implementation of national health and safety standards and accreditation, state child care regulations represent the minimum requirements below which a program should not operate.¹¹ The intent of regulations is to ensure a basic level of acceptable care. Because state regulations vary widely, there are limited comparisons of child care health and safety across states. In a 1995 study researchers measured child care quality in center classrooms in 4 states, including Connecticut, using the Infant-Toddler and the Early Childhood Environment Rating Scales, instruments which were initially designed to assess quality in early care programs for research purposes.¹⁶ Connecticut ranked highest in health and safety items, which the

researchers attributed to strong regulations. Nevertheless, even in Connecticut only 24% of the classrooms were rated as good quality, that is, developmentally appropriate, healthy, and safe. No summary data on the health and safety status of Connecticut child care centers have been reported since that study, and no comprehensive report of routine, unannounced inspections, which measure minimal health and safety rather than quality, has been released.

All states require periodic, routine, unannounced inspections of ECE facilities to monitor compliance with state child care regulations.¹⁷ CFOC recommends that all ECE programs should be inspected at least semiannually.¹¹ Connecticut child care regulations require every other year, unannounced, random inspections of child care centers caring for 13 or more children and group family care homes caring for 7 to 12

children.¹⁸ However, the findings are not analyzed or published.

This study addressed the following research questions. (1) What is the frequency of regulatory noncompliance of child care centers as determined by unannounced, random inspections? (2) Is there an association of regulatory compliance with the following child care center factors: (a) NAEYC accreditation, (b) source of funding (state-funded child care, School Readiness [public pre-K] programs, Head Start), (c) access to a trained child care health consultant (CCHC), (d) compliance with continuing education of child care providers, and (e) median household income of child care center location?

As university-based researchers, we received funding from a private foundation to conduct this study. We used data collected by the Connecticut Department of Public Health (DPH) Child Care Licensing Specialists and other data sets to explore these questions and provide the first aggregate report of the health and safety status of Connecticut licensed child care centers.

METHODS

We examined the findings of unannounced licensing specialists' inspections of child care centers and group child care homes, which will hereafter be referred to as centers. The inspections were conducted between January 2006 and March 2008. The sample included both retrospective data (i.e., licensing inspection reports collected between January 2006 and August 2007, which were part of an internal review by the Connecticut DPH Environmental Health Section) and prospective data (i.e., all copies of licensors' inspection reports collected between September 1, 2007, and March 31, 2008). DPH did not reveal the sampling methodology for the retrospective data. The DPH redacted all the reports (i.e., removed extraneous, confidential data, such as child's name); however, all other data that are in the public domain were included in the database. The overall goal was to collect a representative sample within the grant budget.

Variables and Category Development

All items, which represent child care regulations, on the inspection forms were included as variables. For the child care center inspection

reports there are 131 health and safety regulations referenced on the child care inspection forms. Most of these regulations are operationalized as binary variables, that is, compliant or noncompliant. Seventy-two of these regulations are included in inspections of all programs. In addition, there are 29 regulations for programs licensed for infant and toddler care. The remaining 20 regulations pertain to medication administration, school-age and night care, which are not addressed in this article.

To conceptualize the regulations as meaningful, we created categories of related regulations. Using our expertise in child care health and safety, 2 authors independently classified each regulation into a category, then met to discuss categories and negotiate consensus. The 72 regulations for which all child care centers are assessed were grouped into 9 categories: outdoor safety, indoor safety, indoor health, child and staff documentation, emergency preparedness, child physical health, child supervision, program documentation, and educational program. The 29 regulations pertaining to centers endorsed for infant and toddler care were divided into 4 categories: indoor safety, outdoor safety, health, and development.

Additional Data Sets and Variables

Each program was categorized as Head Start, NAEYC Accredited, School Readiness funded, or state-funded or not; CCHC Trained or not; continuing education compliance or not; registered nurse (RN) log on-site or not; and median income of child care center zip code per \$10 000 increments. To accomplish this characterization, first we merged data sets from the Head Start Locator Web site (Head Start, <http://eclkc.ohs.acf.hhs.gov/hslc/HeadStartOffices>, January 19, 2008), NAEYC Accreditation Web site (<http://www.naeyc.org/accreditation>, January 19, 2008), Connecticut Department of Social Services School Readiness database (file sent via e-mail by Peter Palermino, Child Care Administrator, on February 6, 2008), and the Connecticut Nurses' Association database (2002–2007) of trained CCHCs (file sent via e-mail by Pat Anderson on January 15, 2008).

Second, we identified variables in the regulations, such as continuing education and RN log on-site, that we hypothesized may be markers for compliance. Continuing education

is a regulation, which is assessed for all programs. Connecticut child care regulations require that full-time center providers must show evidence of 20 hours of continuing education each year in areas such as early childhood education, child development, and health topics.¹⁸ There is no minimum requirement of hours in any specific topic area, such as health and safety, and specific training topics are not listed on inspection forms. The regulation RN log on-site, which refers to compliance with a weekly health consultant visit, is included in the category of infant-toddler health. Although centers are required by regulation to have quarterly health consultant visits, at the time of this study, licensing specialists reviewed compliance only when children younger than 3 years were enrolled. The independent variable "trained CCHC" included nurses who fulfilled the requirement for RN log on-site and were formally prepared for the role.

Third, to explore the influence of income as a covariate for the child care center analysis, we first derived median income per \$10 000 increments from zip codes of centers. Median household income by zip code data were downloaded from the 2000 Decennial Census of Population (US Census Bureau), and merged with zip code data of child care centers.¹⁹ We then dichotomized income at the median level. Although zip-code median income does not specifically reflect the available resources for a center, it serves as a reasonable proxy.²⁰ Connecticut DPH hard-copy licensing-report data were entered twice into an Access database by research assistants, Health Insurance Portability and Accountability Act (HIPAA) trained graduate students, to conduct PROC COMPARE, SAS version 9.2 (SAS Institute, Cary, NC) to clean the data; that is, to ensure that all key punch errors were corrected.

Data Analyses

To determine characteristics of child care centers associated with compliance with regulations, we first identified the frequency of compliance with regulations. Four (child physical health, program documentation, child supervision, and educational programming) of the 9 categories of regulations required for all centers and 2 (infant-toddler outdoor safety and infant-toddler development) of the 4 infant-toddler categories had very high

regulations compliance and had no items with noncompliance frequency greater than 10%. Therefore, those categories were excluded from additional analyses because classifications would not be meaningful. We then employed latent class analysis (LCA) using PROC LCA²¹ to classify the centers based on the patterns of dichotomized compliance level on multiple regulations in each of the remaining categories. The LCA provided the individual probability of belonging to “high” or “low” compliant group in each of the categories. Because the regulations in the remaining 2 infant-toddler categories (infant-toddler indoor safety and infant-toddler indoor health) had extremely high compliance, we did not perform multivariate analyses for these 2 categories because we had overall very small event counts (i.e., low noncompliance) for the infant-toddler regulations and the standard error was not estimable. To identify factors associated with the compliance on regulations for the 5 remaining categories, we used a logistic regression model with covariates including NAEYC accreditation, source of funding (specifically, state-funded, School Readiness, or Head Start), compliance with continuing education, and dichotomized median income of child care center zip code. We could not analyze the potential association of a trained CCHC and RN log on-site for centers because no infant-toddler regulations categories were included in the model. To address the potential for variability of compliance reporting by multiple licensing specialists, the logistic model included the random effect of licensing specialists incorporating the correlation within centers inspected by the same person. This random effect was tested and removed if it was not significant.

RESULTS

The sample includes the first routine inspections of 676 centers conducted between January 2006 and March 2008, including 232 (34.3%) retrospective and 444 (65.7%) prospective inspections, and represents 41% of all Connecticut child care centers (Table 1).²² In this sample, 551 (81.5%) centers were licensed for preschool age children between 3 and 5 years old, and 307 (45.6%) centers were licensed to care for infants and toddlers (children younger than 3 years). The 676 centers

TABLE 1—Characteristics of Child Care Centers (n = 676): Connecticut Department of Public Health, January 2006–March 2008

Characteristic	No. (%) or Mean/Median (SD)
Licensed for aged ≥ 3 y (n = 673) ^a	551 (81.5)
Licensed for aged < 3 y (n = 673) ^a	307 (45.6)
NAEYC accredited (n = 673)	106 (15.7)
State funded (n = 673)	15 (2.2)
Head Start (n = 673)	19 (2.8)
School readiness (n = 673)	61 (9.1)
RN log on-site ^a (n = 288)	243 (84.4)
Consultant trained (n = 672)	78 (11.6)
Continuing education (n = 644)	514 (79.8)
Median income, \$ (n = 660)	61 000/60 000 (22 000)

Note. NAEYC = National Association for the Education of Young Children; RN = registered nurse.

^aRN log on-site is only required for centers that enroll children younger than 3 years.

represent a sum total of 40 569 child care slots for preschool children with a capacity range of 9 to 406 (mean = 60.36; SD = 44.99) children per center. Sampled centers licensed to enroll children under 3 years had a capacity range of 4 to 112 children (mean = 27.77; SD = 18.76), and a sum total of licensed capacity for 8498 children. The number of children aged 3 years and older present at the time of inspection was 19 889 or 49% of available slots for preschool children, and the number of children present younger than 3 years was 4670 or 55% of available slots for infants and toddlers.

Table 1 lists descriptive statistics for center characteristics of interest. Zip code data were available for 660 (97%) of the centers. Median household income for all centers was \$60 000 (SD = \$22 000). Head Start (83.4%), state-funded, (85.8%), and School Readiness programs (89.7%) were almost entirely located in areas with median incomes less than \$60 000. Two thirds (67%) of centers with NAEYC accreditation were located in areas with median incomes less than \$60 000.

Frequency of Regulatory Noncompliance for All Centers

Of the 13 categories in the analyses, 9 categories included regulations required for all centers. Among those categories, the 4 with highest compliance included child physical health (e.g., nutritious meals and snacks; 0.6% noncompliance); child supervision for

preschool children (i.e., child-to-staff ratios; 3.9% noncompliance) and group size (0.7% noncompliance); program documentation (e.g., posted license; 2.4% noncompliance); and educational programming (e.g., written daily plan; 1.5% noncompliance).

Table 2 includes the 5 categories of regulations required for all centers, which had at least 1 item with greater than 10% noncompliance, the frequencies of noncompliance, and the classified compliance group. The item “playground hazard-free” in the category outdoor safety, was the regulation most frequently found to be in noncompliance (48.4%) of all programs for which the playground was observed. Other notable regulations with high noncompliance rates include those in the categories indoor safety, such as no hazards indoors (38.2%), hot water temperature 115° maximum (33.9%), hazardous substances locked (28.1%); Indoor Health, such as premises clean and in good repair (28.7%); child and staff documentation, such as staff health record (36.2%), child health record (21.6%); and emergency preparedness, such as fire marshal certificate posted (22.8%). Although the regulations for CPR certified person (11.8%) and first aid certified person (10.1%) are relatively low in center noncompliance frequency compared with other regulations, those regulations represent approximately 1 in 10 centers with no CPR or first aid certified person available at the time of inspection.

TABLE 2—Frequency of Regulatory Noncompliance and Classified Compliance Level by Latent Class Analysis: Connecticut Department of Public Health, January 2006–March 2008

Regulations	Noncompliant, No. (%)	Classified Compliance Group ^a	
		High Compliance No. (%)	Low Compliance No. (%)
All child care centers (n = 676)			
Outdoor safety		480 (79.2)	126 (20.8)
Playground hazard-free	327 (48.4)		
Shock-absorbing surface	148 (21.9)		
Equipment anchored/safe	65 (9.6)		
Fence 4-ft high, protected	47 (7.0)		
Peeling paint observed outdoors	29 (4.3)		
Walkway	12 (1.8)		
Indoor safety		302 (44.7)	373 (55.3)
No hazards indoors	258 (38.2)		
Hot water 115 °F max	229 (33.9)		
Equipment clean, safe, nontoxic	220 (32.5)		
Hazardous substance locked	190 (28.1)		
Lighting 50 foot-candles	161 (23.8)		
Lead test water date	99 (14.6)		
Approved safety outlet cover	89 (13.2)		
Radon test	72 (10.7)		
Glass protected to 36 in	24 (3.6)		
Opening for ventilation screened	17 (2.5)		
Exits, halls, stairs unobstructed	6 (0.9)		
Stairs good repair, hand rail	6 (0.9)		
Overhead door locking device	2 (0.3)		
Child and staff documentation		542 (81.0)	127 (19.0)
Staff health record	245 (36.2)		
Child health record	146 (21.6)		
Staff attendance record	108 (16.0)		
Child attendance record	101 (14.9)		
Enrollment info	54 (8.0)		
Authorized release form	42 (6.2)		
Authorized transport form	16 (2.4)		
Authorized field trip form	3 (0.4)		
Indoor Health		439 (65.1)	235 (34.9)
Premises clean/good repair	194 (28.7)		
Wall, ceiling, floor clean	180 (26.6)		
Air temperature 68 °F—thermostat	130 (19.2)		
Required toilet/sink/supplies	130 (19.2)		
Toilet room vent	65 (9.6)		
Adult toilet	40 (6.0)		
Individual storage bed/clothing	29 (4.3)		
Cots stored maintained	14 (2.1)		
Animals maintained	13 (1.9)		
Sanitary drinking fountain cups	7 (1.1)		
Garbage disposed	7 (1.0)		
Toileting and clean-up	6 (0.9)		

Continued

Frequency of Infant-Toddler Regulation Noncompliance

Two of the 4 categories of regulations for centers enrolling infants and toddlers had very high compliance and included infant-toddler outdoor safety, such as outdoor area fenced (1.3%), and infant-toddler development, such as infant held during feeding (0.3%). The remaining 2 categories had regulations with greater than 10% noncompliance (Table 2). For the Infant-Toddler Indoor Safety category, 28.1% of centers had plastic bags, balloon, and styro-foam within reach of young children. The infant-toddler health category was notable for 14.7% of centers with noncompliance for RN log on-site (i.e., there was no documentation of a weekly health consultant visit as required by regulations), and 13.7% of centers were non-compliant for diaper changing procedure posted and followed. Because 15 (5.1%) and 23 (7.8%) centers were identified in the low compliance group for these 2 infant-toddler categories, the number of cases (noncompliance) was not enough to get reliable estimates and standard errors in the multivariate models.

Regulation Compliance and Child Care Center Characteristics

We addressed the potential for variability of compliance reporting by multiple licensing specialists by including the random effect of licensing specialists in our analyses. We found significant random effects of licensing specialists in the Indoor Safety and Indoor Health categories. Therefore, the logistic regression model included the random effect of the licensing specialists for these 2 categories. Compliance with the regulatory requirement for 20 hours per year of continuing education for each full-time staff member was most frequently associated with compliance of category regulations (Table 3). Programs, which were compliant with the regulation for staff continuing education in various topics, including but not limited to health and safety, had greater odds of compliance for 4 of 5 categories: indoor safety (odds ratio [OR] = 1.77; 95% confidence interval [CI] = 1.03, 2.51), indoor health (OR = 1.97; 95% CI = 1.10, 32.84), child and staff documentation (OR = 3.96; 95% CI = 2.56, 6.11), and emergency preparedness (OR = 4.92; 95% CI = 3.11, 7.78). Programs with greater median

TABLE 2—Continued

Emergency preparedness		569 (84.2)	107 (15.8)
Fire marshal certificate posted	154 (22.8)		
First-aid kit	149 (22.0)		
Emergency plan posted	116 (17.2)		
CPR certified person	80 (11.8)		
First-aid person certified	68 (10.1)		
Emergency phone posted	36 (5.2)		
Authorized emergency medical permit	31 (4.6)		
All centers enrolling infants and toddlers (< 3 y of age; n = 302)			
Indoor safety		280 (94.9)	15 (5.1)
Plastic bags, balloons, Styrofoam	85 (28.1)		
High chair strap	34 (11.1)		
No toy < 1" diameter	21 (7.0)		
Free-standing crib	18 (6.0)		
Physical barriers—groups of 8	16 (5.3)		
Ratio 1:4	15 (5.0)		
Group size < 8	15 (5.0)		
Indoor health		272 (92.2)	23 (7.8)
RN log on-site	45 (14.7)		
Diaper change procedure followed	42 (13.7)		
Bottle identified with name	41 (13.4)		
Diapering area with rail	28 (9.2)		
Adequate sinks	25 (8.3)		
Refrigeration and food preparation	24 (8.0)		
Hand washing procedure	18 (5.9)		
Covered waste receptacle	11 (3.6)		
Unused formula discarded	8 (2.6)		
Washable cots	7 (2.3)		
Approved bottle washing	5 (1.7)		
Clean bottle provided by parent	4 (1.3)		
Crib cot cleaned	3 (1.0)		
Toys washed	2 (0.7)		
Disposable paper	2 (0.7)		
Food served from dish/jar	0 (0.0)		
Child clothes stored	0 (0.0)		

Note. CPR = cardiopulmonary resuscitation; RN = registered nurse.

^aClassified compliance group includes "high" and "low" compliance groups classified using latent class analysis with compliance on regulations of each category.

income (as measured per \$10 000 increment) had greater odds of compliance with 3 of 5 categories: Indoor Safety (OR = 1.11; 95% CI = 1.02, 1.19), Indoor Health (OR = 1.25; 95% CI = 1.13, 1.37), and emergency preparedness (OR = 1.18; 95% CI = 1.05, 1.33; Figure 1). NAEYC accredited programs had greater odds of compliance with child and staff documentation (OR = 2.73, 95% CI = 1.20, 6.23). Although not statistically significant, School

Readiness programs had greater odds of compliance with outdoor safety (OR = 2.30; 95% CI = 0.91, 5.82,) and emergency preparedness (OR = 2.89; 95% CI = 0.94, 8.91). By contrast, state-funded programs had less odds of compliance with outdoor safety (OR = 0.31; 95% CI = 0.08, 1.18). Head Start programs had no greater odds of compliance for any categories of regulations. We performed the logistic model with the inclusion of all child care center

characteristics, including median income and continuing education compliance. Thus, the effect of continuing education on compliance was tested after controlling for median household income of the child care center location.

DISCUSSION

Enrollment in licensed child care, preschool, and Head Start programs, allows parents the opportunity to pursue employment and children the potential to acquire skills necessary for later school achievement. Parents report that healthy and safe child care is their most important goal when entrusting their children's care to providers,^{2,3} and they expect that state licensing ensures optimal level of care.

Our findings revealed that most of the centers in this sample were compliant with a majority of child care regulations. Child Supervision was among the categories with high compliance frequency and of particular interest. Connecticut child care center regulations mandate a 4:1 child to staff ratio for children younger than 3 years with a maximum group size of 8 children, and a 10:1 ratio with a maximum group size of 20 children for children older than 3 years.¹⁸ Thus, Connecticut child care regulations meet some of the CFOC best practice standards for supervision. Research clearly establishes an association between low child-to-staff ratios and small group size and children's health and safety.^{24,25}

In turn, the Child Supervision finding may be explained to some extent by the contrast between licensed capacity and enrollment; specifically, only about half of the capacity for children was present on the day of inspection. This finding raises several questions. Do programs voluntarily choose lower child to staff ratios to promote best practice? Are the programs filled to capacity? Are there seasonal variations in enrollment? To what extent does the prevalence of infectious diseases and injuries in child care centers influence children's attendance? Future research should address these questions.

Our findings revealed several health and safety challenges, which pose risks for the transmission of infectious diseases and prevalence of injuries. Regulations focused on a healthy and safe environment are critical for reducing the incidence of infectious diseases and injuries in child care.¹¹ Children enrolled in child care centers experience more respiratory

TABLE 3—Associations between Child Care Center Characteristics and Category Compliance: Connecticut Department of Public Health, January 2006–March 2008

Child Care Characteristics	OR (95% CI)
Outdoor safety	
School readiness	2.30 (0.91, 5.82)
State funded	0.31 (0.08, 1.18)
Indoor safety	
Continuing education	1.77** (1.03, 2.51)
Median income (per \$10 000)	1.11** (1.02, 1.19)
Indoor Health	
Continuing education	1.97** (1.10, 32.84)
Median income (per \$10 000)	1.25*** (1.13, 1.37)
Emergency preparedness	
Continuing education	4.92*** (3.11, 7.78)
Median income (per \$10 000)	1.18** (1.05, 1.33)
School readiness	2.89 (0.94, 8.91)
Child/staff documentation	
Continuing education	3.96*** (2.56, 6.11)
NAEYC accredited	2.73** (1.20, 6.23)

Note. CI = confidence interval; NAEYC = National Association for the Education of Young Children; OR = odds ratio. Significant random effect of inspector was found in Indoor Safety and Indoor Health. The odds ratios and confidence interval for these 2 outcomes were estimated after controlling for the random effect of inspector. * $P < .05$; ** $P < .01$; *** $P < .001$.

and gastrointestinal illnesses than children who are cared for full time at home or in small group settings.²⁶ Moreover, illnesses commonly spread to staff, families, and household contacts, which in turn lead to absenteeism and lost productivity.^{27,28} Parents miss an average of 13 days per year of work because of children’s illnesses. Safety includes a broad range of categories including outdoor and indoor safety, and emergency preparedness. Playgrounds and outdoor space provide important opportunities for physical activity and learning; however, according to a 1998 study, 90 000 injuries are sustained each year by children younger than 6 years.²⁹

The most compelling finding in our study was the strikingly positive association between compliance with the regulation for staff continuing education and compliance with other health and safety regulations which supports the importance of available, ongoing training to improve and sustain health and safety in ECE programs. This finding is notable in that compliance with continuing education was more frequently associated with regulatory compliance than median household income

greater than \$60 000. Therefore, child care provider access to continuing education may address some of the inherent disparities within neighborhoods across the state.

Frequency of inspections, active surveillance, and consistency of licensing specialists’ reporting are critical aspects of ECE health and safety, system planning, and improvement.^{11,30} According to the National Association of Child Care Resource and Referral Agencies, Connecticut ranks 10th with regard to strong regulations, but oversight is weak (49th) with inspections less frequent than quarterly.¹⁷ In addition, this analysis of licensing specialists’ reports revealed significant variation among specialists; that is, they differed in their reporting of regulation compliance, thereby requiring controlling for the random effect of the licensing specialist for some categories and demonstrated inconsistency among licensing specialists. Consistency in reporting compliance and noncompliance among licensing specialists is essential to ensure reliability of the data and findings as well as a standardized and fair licensing experience for ECE providers.

There were limitations to this study. Our sample did not include inspections triggered by complaints to the Connecticut DPH. In addition, the reports were collected both retrospectively and prospectively, which may have introduced potential bias. Although researchers use zip code data to designate socioeconomic status and potential disparities, such data are dependent on the degree of socioeconomic homogeneity within a postal

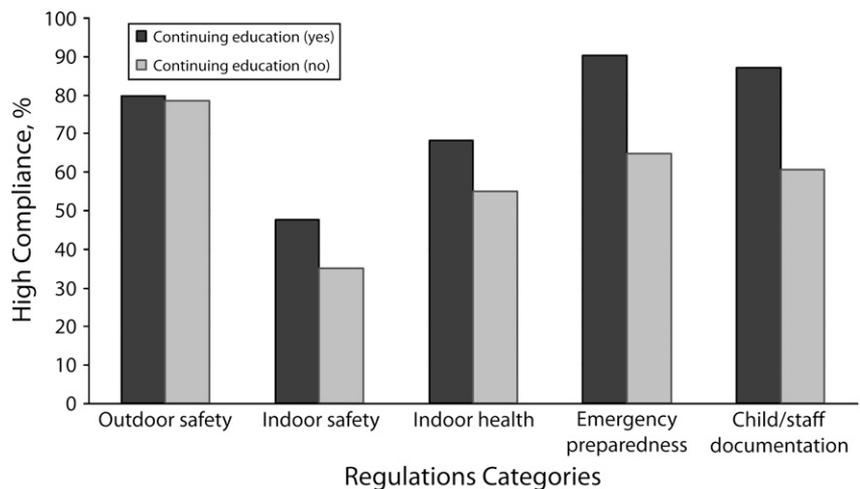


FIGURE 1—Proportions of child care centers with high compliance with category regulations classified by latent class analysis and association with continuing education compliance: Connecticut Department of Public Health, January 2006–March 2008.

code area.²⁰ Evidence suggests that zip code data may underestimate rather than overestimate socioeconomic effects.

Our study provided the Connecticut DPH with an assessment and methodology for examining child care center health and safety strengths, challenges, and factors associated with compliance. The findings present important implications for policymakers, providers, and parents. All states collect these data; thus, such a methodology could be applied in other states for targeted and strategic planning and to improve the health and safety of ECE programs. ■

About the Authors

Angela A. Crowley and Sangchoon Jeon are with Yale University School of Nursing, Yale University, New Haven, CT. Marjorie S. Rosenthal is with the Department of Pediatrics, Yale University School of Medicine, and the Robert Wood Johnson Clinical Scholars Program, New Haven.

Correspondence should be sent to Professor Angela Crowley, PhD, APRN, PNP-BC, FAAN, Yale University School of Nursing, PO Box 9740, 100 Church St South, New Haven, CT 06536-0740 (e-mail: angela.crowley@yale.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted February 17, 2013.

Contributors

A. A. Crowley initiated, designed, and supervised the study, and led the writing of this article. S. Jeon conducted the study analysis and contributed to the writing of this article. M. S. Rosenthal contributed to the design, analysis plan, interpretation of findings, and writing of this article.

Acknowledgments

This study was funded by The Children's Fund of Connecticut and the Child Health and Development Institute of Connecticut, Inc.

We thank the Connecticut Department of Public Health for assistance with data access and Tony Ma, Siobhan Thompson, and Kristopher Fennie for assistance with database development, data cleaning, and analyses, and Janene Batten for editorial assistance.

Note. The findings and conclusions of this study are those of the authors and do not necessarily represent the official view of the funding agency acknowledged here.

Human Participant Protection

No protocol approval was required because no human participants were involved.

References

- US Department of Labor, US Bureau of Statistics. Women in the labor force: a databook. 2011. Available at: <http://www.bls.gov/cps/wlf-databook-2011.pdf>. Accessed June 13, 2012.
- Oliveira P. Connecticut voices for children: Beyond child day care centers: Infant and toddler child care. 2007.

Available at: <http://www.ctvoices.org/sites/default/files/eave07infantottdler.pdf>. Accessed June 9, 2012.

- Esty S, Oppenheimer C. Connecticut early care & education progress report, 2011. New Haven, CT: Connecticut Voices for Children. 2011. Available at: <http://www.ctvoices.org/publications/connecticut-early-care-and-education-progress-report-2011>. Accessed June 13, 2012.
- Waibel R, Misra R. Injuries to preschool children and infection control practices in childcare programs. *J Sch Health*. 2003;73(5):167–172.
- Lee MB, Greig JD. A review of enteric outbreaks in child care centers: effective infection control recommendations. *J Environ Health*. 2008;71(3):24–32. Accessed 12 June 2012.
- Bradley RH, Vandell DL. Child care and the well-being of children. *Arch Pediatr Adolesc Med*. 2007;161(7):669–676.
- Ramler M, Nakatsukasa-Ono W, Loe C, Harris K. The influence of child care health consultants in promoting children's health and well-being: a report on selected resources. 2006. Available at: <https://apha.confex.com/apha/137am/recordingredirect.cgi/id/28695>. Accessed June 9, 2012.
- Dworkin P, Honigfeld L, Meyers J. *A Framework for Child Health Services: Supporting the Healthy Development and School Readiness for Connecticut's Children*. Farmington, CT: The Child Health and Development Institute of CT, Inc.; 2009.
- Reynolds AJ, Temple JA, Ou SR, et al. Effects of a school-based, early childhood intervention on adult health and well-being: a 19-year follow-up of low-income families. *Arch Pediatr Adolesc Med*. 2007;161(8):730–739. Accessed 12 June 2012.
- Banghart P, Kreader JL. What can CCDF learn from the research on children's health and safety in child care? Urban Institute. 2012. Brief #03. Available at: <http://www.urban.org/publications/412579.html>. Accessed June 9, 2012.
- American Academy of Pediatrics, American Public Health Association, National Resource Center for Health and Safety in Child Care and Early Education. *Caring for Our Children, National Health and Safety Performance Standards: Guidelines for Early Care and Education Programs*. 3rd ed. Washington, DC: American Public Health Association; 2011.
- American Academy of Pediatrics. Telling the healthy child care America story. 2004. Available at: <http://www.healthychildcare.org/pdf/TellingHCCA.pdf>. Accessed June 9, 2012.
- Aronson S, ed. *Healthy Young Children: A Manual for Programs*. 4th ed. Washington, DC: National Association for the Education of Young Children; 2002.
- Oshyn K, Newland L. The Century Foundation's security and opportunity agenda: promoting school readiness through universal preschool. 2005. Available at: <http://tdf.org/publications/2006/10/pb585?searchterm=oshy%20and%20newland>. Accessed June 2, 2012.
- Shonkoff JP, Phillips DA, eds. *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Washington, DC: National Academies Press; 2000.
- Helburn SW, ed. Cost, quality, and child outcomes in child day care centers: technical report. Denver, CO: Department of Economics, Center for Research in Economic and Social Policy, University of Colorado. 1995.

Available at: <http://eric.ed.gov/PDFS/ED386297.pdf>. Accessed June 9, 2012.

- Childcare Aware of America. We can do better: 2011 update. NACCRA's ranking of child care center regulations and oversight. 2011. Available at: <http://www.naccra.org/about-child-care/state-child-care-licensing/we-can-do-better-state-child-care-center-licensing>. Accessed June 2, 2012.
- Connecticut Department of Public Health. Statutes and regulations for licensing child day care centers and group day care homes. 2007. Available at: <http://www.dph.state.ct.us/daycare/statutes.htm>. Accessed September 3, 2007.
- US Bureau of the Census. Decennial census of population survey summary file 3. P53. Median household income in 1999(dollars). 2000. Available at: <http://www.census.gov/hhes/www/income/data/microdata.html>. Accessed June 15, 2012.
- Krieger N, Williams DR, Moss NE. Measuring social class in US public health research: concepts, methodologies, and guidelines. *Annu Rev Public Health*. 1997; 18:341–378.
- Lanza ST, Dziak JJ, Huang L, Xu S, Collins LM. *Proc LCA & Proc LTA User's Guide*. 1.2.6 ed. University Park, PA: The Methodology Center, Penn State University; 2001.
- Oppenheimer C. Connecticut early care & education progress report, 2009. New Haven, CT: Connecticut Voices for Children. 2009. Available at: <http://www.ctvoices.org/publications/connecticut-early-care-and-education-progress-report-2009>. Accessed June 13, 2012.
- National Association of Child Care Resource and Referral Agencies. Parents' perceptions of child care in the United States: NACCRA's national parent poll. 2006. Available at: http://www.naccra.org/sites/default/files/default_site_pages/2011/2006parentpoll-sec_final_0.pdf. Accessed June 2, 2012.
- Vandell DL. Characteristics of infant child care: factors contributing to positive caregiving: NICHD early child care research network. *Early Child Res Q*. 1996;11(3):269–306.
- Fiene R. 13 indicators of quality child care: research update. Washington, DC: US Department of Health and Human Services, Office of Assistant Secretary for Planning and Evaluation. 2002. Available at: <http://aspe.hhs.gov/hsp/ccquality-ind02>. Accessed June 9, 2012.
- Bradley RH, National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network. Child care and common communicable illnesses in children aged 37 to 54 months. *Arch Pediatr Adolesc Med*. 2003;157(2):196–200.
- Cordell RL, Waterman SH, Chang A, Saruwatari M, Brown M, Solomon SL. Provider-reported illness and absence due to illness among children attending child-care homes and centers in San Diego, Calif. *Arch Pediatr Adolesc Med*. 1999;153(3):275–280.
- Brady MT. Infectious disease in pediatric out-of-home child care. *Am J Infect Control*. 2005;33(5):276–285.
- US Consumer Product Safety Commission. CPSC staff study of safety hazards in child care settings. 2009. Available at: <http://www.cpsc.gov/library/ccstudy.html>. Accessed June 12, 2012.
- Bartlett AV, Jarvis BA, Ross V, et al. Diarrheal illness among infants and toddlers in day care centers: Effects of active surveillance and staff training without subsequent monitoring. *Am J Epidemiol*. 1988;127(4):808–817.