

Child care workers and workplace hazards in the United States: Overview of research and implications for occupational health professionals

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In the past, the hazards facing child care workers have largely been ignored by health and safety professionals, due in part to a lack of awareness of hazards and inconsistencies in state health and safety requirements. The aim of this paper is to provide a summary and critique of the literature on the topic of occupational health and safety concerns for child care workers. Twenty-seven articles pertaining to child care workers, published between 1980 and 1998, were reviewed. The job roles and tasks related to physical care, janitorial functions and participation in child recreation lead to risk of exposure to biological, physical and chemical hazards. Psychological stressors were found to contribute to high levels of job dissatisfaction and turnover. Infectious disease transmission was the major topic of focus in the literature, whereas US statistical data for illnesses and injuries for this classification of workers revealed injuries as the prominent health problem. Directions for future research are described

Key words: Child care; day care workers; health and safety; occupational health.

Occup. Med. Vol. 49, 427-437, 1999

Received 23 February 1999; accepted in final form 15 June 1999

INTRODUCTION

According to the US Bureau of Labor statistics, the average annual employment in private sector child day care facilities in 1996 was 576,600 workers.¹ The actual number of child care workers is considerably higher when child care workers from public facilities and facilities with fewer than 11 employees are included. In addition, the number of child care workers is expected to increase significantly in the future. Parents are choosing child care centres over traditional babysitters or relatives to care for their children.¹ Furthermore, the US federal government's plans to expand child care block grants to serve an additional 1.15 million children will necessitate the training and development of additional child care workers.²

In spite of the increasing numbers of workers in this field, the health and safety concerns of child care workers have largely been ignored by health and safety professionals in the United States. Child care workers confront a variety of biological, physical and chemical hazards³ while caring for approximately 13 million children in child care centres.⁴ Several factors have contributed to the relative inattention to health and safety concerns of child care workers. First, the majority of hazards facing child care workers are not addressed directly by US federal safety and health standards. Child care workers are covered under the health and safety regulations of the Blood Borne Pathogen Standard; however, Occupational Safety and Health Administration (OSHA) monitoring and inspection of public and smaller child care centres is infrequent. Second, licensing of child care facilities at the state level is inconsistent in specifying health and safety provisions for workers, although protection for the health of children is routinely addressed by the state licensing agency. For example, in the state of Alabama prior

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to employment all child care workers must have a tuberculosis (TB) test or chest x-ray, and a physician statement of physical suitability (which is repeated every four years). In addition, the state requires reporting of all worker injuries that require medical treatment. In contrast to Alabama, the state of Texas has fewer health provisions for child care workers, requiring an annual tuberculosis examination and notification of any outbreak of illness for children or staff that results in the facility becoming unsafe.⁵ Third, responsibility for the health and safety of child care workers rests primarily with the management of individual centres and workers themselves. Placing responsibility for health and safety with the individual centres may be problematic in this traditionally underfunded industry since expenditures for health and safety tend to be forfeited in order to maintain and support general operations.⁶ In addition, child care workers may not have the knowledge to protect themselves adequately. Generally, there are minimal education and training requirements for child care workers; therefore, knowledge of health and safety hazards should not be assumed. Moreover, this workforce is not organized to the extent that a professional association or union exists to advocate for health and safety practices.

The lack of health and safety controls and regulations for child care workers reveal a gap in the safety net for this population, and serve as a barrier for health and safety professionals to assist this population. Little substantial progress appears to have been made in studying the health and safety issues facing this group. No thorough review of the literature pertaining to the occupational health issues relevant to child care environments has been located. This paper provides a comprehensive overview of the occupational health and safety hazards encountered by child care workers through a summary and critique of current literature and research in this field.

MATERIALS AND METHODS

In October 1998, a computer-based literature search was conducted using the following databases: Health Star, Eric, Medline, PubMed, ADI Form and the Internet. The search terms 'child care workers', 'daycare workers' and 'health and safety' were used. The search was limited to literature published between 1980 and 1998. Approximately 60 citations were screened and 50 of the 60 citations were reviewed further. Of the 50 articles reviewed, 16 were excluded. Articles were excluded for the following reasons: they focused mainly on the child or family; they were not written in English; they were not relevant to health and safety or they were published in obscure journals that could not be located by library services. Literature related to home day care centres, adult care providers and programmes for disabled, chronic or long-term care of children were also excluded. Articles included in the review were directly related to the health and safety of child care workers who worked with 'healthy' children. The search terms incorporating 'child

care' or 'day care' included references to similar facilities referred to as nursery schools, preschools and play groups. International articles were included if written in English. Employment statistics and population descriptions were obtained through Internet searches of government databases and relevant literature.

Defining the child care worker population

Information currently available indicates that child care workers represent a vulnerable population of workers consisting primarily of younger women of childbearing age, who are often of low educational and socioeconomic status. According to the 1996 US Bureau of Labor Statistics (1998), the population of child care workers consists primarily of women, aged 18 to 40 years. The educational levels of child care workers vary considerably across the country as each state sets caregiver education and training requirements as part of daycare licensing requirements.⁷ Currently, the education and training requirements range from a high school diploma or general education diploma to a college degree in child development or early childhood education.¹ Generally, there are large numbers of part-time workers in this field and the salary and wages for this occupation tend to be low. According to the Bureau of Labor statistics, the 1996 median annual earnings for full-time salaried child care workers was \$13,000 or below the poverty level for a family of four. According to the Department of Health and Human Services the poverty level for a family of four was \$15,600 per year in 1996.⁸

Although child care centres have not historically been viewed as 'dangerous' work environments, the literature available suggests that working in child care environments may pose a significant risk of illness and injury to workers. A combination of work role demands, environmental and organizational factors may contribute to work-related injuries, illness and to employee dissatisfaction. The specific work role, skills and job tasks of child care workers are described by Small and Dodge⁹ in a review article for professional child care. The child care worker assumes several roles: caregiver, educator and therapeutic helper that require a variety of skills. The job tasks and roles described in the literature such as 'diapering and toileting care, janitorial functions, first aid, and participating in child recreation' expose workers to potential health and safety hazards.³ Specifically, the American Public Health Association (APHA) and the American Academy of Pediatrics (AAP)⁷ health and safety performance standards for child care programmes identify the following hazards facing this worker population: infectious diseases, injuries and noninfectious diseases, stress and environmental exposures to hazardous materials (Table 1).

The literature clearly substantiates the assessment of the potential health and safety hazards for workers identified by the APHA and AAP. For the purposes of this review, the authors have further categorized these hazards according to biological, physical, chemical and psychological hazard criteria. In reviewing each article, the authors also used a standard format to outline key

Table 1. Occupational health hazards in child care

Infectious diseases	Health hazard category		
	Stress	Injuries and non-infectious diseases	Environmental exposure
Chicken pox	Undervalued work	Back injuries	Art materials
Cryptosporidium	Inadequate leave	Bites	Formaldehyde
Cytomegalovirus	Working alone	Dermatitis	Noise
Giardia	Responsible for children's welfare		Disinfecting solution
Hepatitis	Inadequate training		
Herpes	Inadequate facilities		
Influenza	Fear of liability		
Meningitis			
Polio			
Ringworm			
Rotavirus			
Rubella			
Scabies, lice			
Shigellosis			
Streptococcus			
Tuberculosis			

Source: American Public Health Association & American Academy of Pediatrics, 1992.

elements of the articles including the type of issue, sample size, study design, outcome measures, existence of a control group or follow-up and outcomes (Table 2). The type of studies located for the literature review varied considerably ranging from review articles to descriptive and intervention studies.

DISCUSSION

Biological hazards

Infectious diseases. The majority of the studies (19 of 27) focused on infectious disease transmission, control and prevalence. Cytomegalovirus (CMV) was a subject that received considerable attention. The cytomegalovirus is the leading cause of congenital infections and contraction of CMV during pregnancy carries a high risk of severe consequences for the foetus.¹⁰ This virus poses some concern for the child care worker population who are primarily women of childbearing age. The major risk factors for contraction of CMV in the daycare environment are contact with the secretions and excretions of CMV infected children. Contraction of the virus may be due to poor hygiene following contact with infectious agents found on toys and diaper change areas. Child care workers who test negative for CMV infection by blood sample are considered nonimmune. After these non-immune child care workers are exposed to the virus found in the urine or saliva of infected children they might contract CMV. Individuals with CMV infection will test positive by blood sample and are considered infected. DeJong *et al.*¹¹ reports that in the adult population, the prevalence of antibodies of CMV ranges from 40–100%. A cross-sectional study by Jackson *et al.*¹² found that 62% of child care workers were seropositive for CMV. In the longitudinal CMV studies by Pass *et al.*,¹⁰ Adler¹³ and Murph *et al.*,¹⁴ the seropositivity at enrolment into the studies ranged from 38–62.5%. Workers who tested seropositive at enrolment were more likely to be older, to be employed longer in child care and to

have worked with children under the age of 2–3 years. During the periods of study, the overall seroconversion rate among seronegative daycare workers ranged from 0–20% annually.^{10,13,14} Murph *et al.*¹⁴ found that the most significant risk factor for workers who seroconverted during the study was the rate of CMV excretion and acquisition among the children in the centres. However, Pass *et al.*¹⁰ reported that significant risk factors for seroconversion were exposure to children under the age of 3 years and a greater number of hours worked (a total of 20 hours per week or more). One review indicated that risk of transmission of the disease to child care workers could be prevented with proper handwashing. Worker education about the occupational hazard of contracting CMV during pregnancy was also recommended.¹⁵ The longitudinal studies of CMV were limited by high rates of attrition which may have been associated with high turnover in personnel. The studies also lacked adequate control groups and selection bias was identified.

Blood-borne pathogens, including AIDS, HIV, hepatitis B and C, are also infectious diseases of concern for child care workers, although transmission of these diseases in the child care setting has not been extensively reported.^{4,12,16} The viruses that cause these diseases are found in blood or body fluids and are more dilute in saliva and urine. Within the child care centres biting is a possible mode of transmission of these diseases.⁴ According to Donowitz⁴ there has only been one documented case of transmission of hepatitis B and no documented cases of transmission of hepatitis C or HIV/AIDS within a child care setting. Although the risk of transmission or contraction of these diseases is low, the consequences of contracting these diseases are severe with death from AIDS and chronic cirrhosis for the hepatitis B and hepatitis C viruses as possible adverse outcomes.⁴

Federal law mandates the provision of training programmes about protecting workers who could potentially be exposed to blood-borne pathogens.¹⁷ One study

Table 2. Summaries of reviewed articles on child care workers

<i>Study</i>	<i>Health and safety issue</i>	<i>Measurement</i>	<i>Outcomes</i>
<i>First authority/year/ target group</i>	<i>Type of issue/n/study design</i>	<i>Outcome measures/control group/ follow-up</i>	<i>Results</i>
Infectious diseases			
Churchill, 1997 ¹⁶ Day care centre personnel	Respiratory tract infection, enteric, invasive bacterial, aseptic meningitis, herpes virus, blood-borne disease, vaccine preventable disease, skin disease. Review article.	Infection control recommendations.	Guidelines for infection control procedures and policy, recommend education for disease prevention.
Renaud, 1997 ¹⁸ Day care workers, day care parents, public health nurses and others	Knowledge and attitudes regarding HIV/AIDS and Hep B. Pre-test $n = 2,279$, post-test $n = 2,207$, follow-up $n = 602$. 312 day cares and 37 family day cares. Pre-test/post-test study design.	Questionnaires measured knowledge and attitudes of policy for HIV/AIDS and Hep B. No control group, 3 month follow-up.	Pre-test knowledge of hygiene in day care was lacking. Post-test knowledge of hygiene in day care improved. Knowledge of policy increased significantly from pre-test to post-test. Attitudes changed significantly from pre-test and post-test and persisted over time.
Jackson, 1996 ¹² Child care providers	Hepatitis A, B, C, cytomegalovirus, varicella and measles, $n = 360$ providers from 49 centres. Cross-sectional study.	Demographic and immunity history questionnaire. Laboratory evaluation. No control group, no follow-up.	Seroprevalence: hepatitis A = 13%, CMV = 62%. 1% of workers showed evidence of Hep B disease, 0.5% of workers showed antibodies for hep C and workers under the age of 30 were more likely to be susceptible to measles.
Holaday, 1995 ²⁴ Caregivers and children.	Faecal contamination, $n = 25$ caregivers and $n = 109$ children in four child day care centres, Prospective longitudinal cross-over study.	Laboratory evaluation of faecal contamination. No control group, no follow-up.	All sites showed contamination. Caregivers hands and diaper changing areas greatest contamination, no difference between cloth and paper diapers in respect to faecal contamination. Outbreak of diarrhoeal illness led to improved hygienic practices and decreased faecal contamination.
Gratz, 1994 ²⁸ Female child care staff	Health risks for pregnant staff. Literature review.	Recommendations for female child care staff.	Recommendations for fatigue, exposure to infectious disease, back problems, frequent urination, swollen feet and varicose veins.
Pauley, 1993 ⁵² Day care workers	Educational approach for controlling infectious diseases, discussion and methods article for decreasing infection.	Reduction of infectious disease transmission. No control group, no follow-up.	Recommended training and education, health policy adoption and enforcement.
Coleman, 1992 ¹⁹ Child care providers	Knowledge vs. attitudes of AIDS, $n = 212$ female child care workers. Cross-sectional survey.	Likert scale response to survey items. No control group, no follow-up.	Worker's age, work experience, education and age of children not useful indicators for knowledge of AIDS. Age and experience were linked to more cautious attitudes towards AIDS and policies.
Grimsley, 1992 ²⁸ Day care workers	Varicella-zoster virus (VZV) $n = 545$. Case-control study.	Laboratory evaluation, demographic questionnaire. No control group but study results were compared to previous studies. No follow-up.	4.8% of workers susceptible to VZV, immune status uncertain for 31% of workers (by disease history).
Bassoff, 1991 ⁴⁹ Child day care providers	Determining feasibility of training in preventive health practices for child day care providers, $n = 983$ staff. Cross-sectional survey.	Providers: knowledge of child health and safety, training needs. Child health trainers: type, cost and length of training. No control group, no follow-up.	Providers' responses: 86% of centres reported one or more persons having had health training; workers answered half of the questions related to child health and safety, sanitation, food handling and disease prevention. Trainer's responses: 76% of courses offered were CPR and first aid.
Murph, 1991 ¹⁴ Day care providers	Cytomegalovirus, $n = 252$ day care providers in six centres. Cross-sectional study.	Questionnaire and lab evaluation, observation of hygienic practices. No control group, 30 months follow-up.	Demographic variables/risk factors not significant for seroconverters vs. non-converters. Seroconversion rates at six centres ranged from 7-40%, Positive relationship found at one centre between seroconversion rate and hygienic practices.

Table 2. Continued

Study	Health and safety issue	Measurement	Outcomes
First authority/year/ target group	Type of issue/n/study design	Outcome measures/control group/ follow-up	Results
Van, 1991b ²³ Caregivers and children	Enteropathogens, observed hygienic practices, examination of environmental contamination, <i>n</i> = 6 day care centres with 121 children, inanimate objects tested <i>n</i> = 1275, toy balls tested <i>n</i> = 724 and hands <i>n</i> = 924. Prospective longitudinal study.	Lab evaluation (cultures of inanimate objects, toy balls and hands). Availability of hygienic supplies and hygienic practices. No control group, no follow-up.	Age of children significant for faecal contamination: toddlers greatest level of contamination. Increased diarrhoea associated with increased contamination of hands, contamination of hands correlated with environmental contamination, inconsistencies in hygienic supplies and practices.
Van, 1991a ²² Caregivers and children	Faecal contamination with cloth vs. paper diaper, <i>n</i> = 2946 environmental samples, Prospective, longitudinal, crossover study.	Lab evaluation of inanimate objects and hands, survey of diaper leakage and handwashing practices. No control, no follow-up.	Faecal contamination of inanimate objects and hands ranged from 11–46%. Contamination decreased using paper diapers or when clothing worn over diapers. More frequent hand washing associated with cloth diapers.
Canadian Paediatric Society Infectious Diseases and Immunization Committee, 1990 ¹⁵ Children and women susceptible to CMV	Cytomegalovirus, review article.	Summary of transmission, issues related to reducing exposure.	Advice on limiting the spread of CMV.
Gillespie, 1990 ⁵¹ Day care provided to 0 to 5 years; kindergarten to grade 12 school personnel	Human parvovirus B19, questionnaire <i>n</i> = 571 and serologic testing <i>n</i> = 518 in 14 day care centres. Cross-sectional study.	Infection rate, symptom analysis, questionnaires and lab evaluations. No control group, no follow-up.	Highest infection rate = 54% for cafeteria workers; teaching personnel (including day care workers) = 16% Pregnancy outcomes = 6 of 6 healthy babies delivered to workers.
Pass, 1990 ¹⁰ Day care centre workers	Cytomegalovirus, <i>n</i> = 509 workers in 32 day care centres. Cross-sectional study.	Lab evaluation: serum, saliva, and urine. Follow-up semi-annually.	Annual seroconversion rate = 20%, working with children < 3 years old and > 20 hr/ week significant for seroconversion.
Adler, 1989 ¹³ Day care workers	Cytomegalovirus, <i>n</i> = 610 women day care workers. Prospective case-control.	Lab evaluation: serum, saliva and urine. 2 year study period, hospital based control group.	Seroconversion rate = 11% per year for day care workers vs. 2% for hospital workers, seroprevalence associated with race, marital status, duration of employment, caring for children < 2 years of age.
CDC, USPHS, DHHS, 1984 ⁵⁰ Public health authority, children's physicians, day care personnel	Faecal oral diseases, respiratory illness vaccine preventable, other important diseases such as CMV and chicken pox. Review article.	Summary of epidemiology.	Recommend that state and local governments provide guidance for disease prevention and control.
Black, 1981 ²⁷ Child care centre workers and children	Diarrhoeal illness in infants and toddlers, <i>n</i> = 62 children in handwashing centres, <i>n</i> = 54 children in control group, no 'n' for workers given. Pre- and post-test.	Laboratory evaluation of faecal specimen, direct electron microscopy. Control group, follow-up 9 week study period.	Centres with handwashing program experienced half of the diarrhoeal disease when compared to the control centres. Support for proper handwashing.
Hadler, 1980 ²⁶ Persons associated with day care centres	Hepatitis A. <i>n</i> = 1,098 cases of Hep A. Cross-sectional contact investigation based on public health reports, family survey, interviews with directors.	Disease transmission, serologic testing. No follow-up.	Hep A outbreak 15% in child care workers, 72% of workers with Hep A regularly worked with infants — four times the attack rate of employees who worked with older children.
Injuries			
King, 1996 ³⁶ Child care centre staff	Ergonomics of child care, <i>n</i> = 36 staff from one university-based child care centre. Case study design.	Ergonomic job analysis: Including environmental, machines, physical demands, sensory demands. Survey of child care worker symptoms and demographics. No control group, no follow-up.	Survey findings: workers' primary concern was lifting young children and physical endurance required for older children. Problem areas identified include: incorrect lifting of children, toys, supplies; inadequate work heights, frequent sitting on floor with unsupported back, reaching above shoulder height.
Owen, 1992 ³⁷ Child care workers	Musculoskeletal disorders, <i>n</i> = 27 day care workers, five participating centres. Interview and observation of child care workers.	Worker perception of physical stress of job tasks, and biomechanical assessment of physical stress associated with job tasks. No control group, no follow-up.	Workers perceived that tasks completed most frequently such as lifting were most physically stressful. Lifting postures observed were biomechanically stressful and exerted large compressive and shearing forces against the lower lumbar vertebral disks.

Table 2. Continued

<i>Study</i>	<i>Health and safety issue</i>	<i>Measurement</i>	<i>Outcomes</i>
<i>First authority/year/ target group</i>	<i>Type of issue/n/study design</i>	<i>Outcome measures/control group/ follow-up</i>	<i>Results</i>
Environmental			
Li, 1997 ⁴¹ Day care centre workers	Evaluation of sick building syndrome and respiratory symptoms related to moisture, dampness and mould. <i>n</i> = 612 employees (males = 31, females = 581) in 56 centres. Cross-sectional survey with questionnaire.	Employee perception of work-related sick building syndrome and chronic respiratory problems. No control group, no follow-up.	Significant association between dampness and sick building syndrome symptoms. Workers reported dampness in 75% of centres. Females reported more work-related SBS than males; males reported more chronic respiratory problems than females.
Ruotsalainen, 1994 ⁴⁰ Female day care workers	Symptoms among workers related to dampness in day care centres. <i>n</i> = 268 female workers in 30 centres. Cross-sectional survey and onsite observation.	Employee perception of work related Sick Building Syndrome (SBS) and chronic respiratory problems. No control group, no follow-up.	Respiratory symptoms higher among the day care workers exposed to dampness compared to workers with low or no exposure.
Psychological			
Manlove, 1993 ⁴⁵ Child care workers	Factors associated with burnout <i>n</i> = 186 child care workers in 28 centres. Cross-sectional study (questionnaire).	Maslach Burnout Inventory, Eysenck Personality Inventory, demographic variables, questionnaire about work roles and ambiguity. National Child Care Staffing Study staff survey adapted to measure organizational commitment and job satisfaction. No control group, no follow-up.	Predictors of burnout: 'emotional exhaustion', 2 of 7 variables were significant (work role conflict/ambiguity and organizational commitment); 'depersonalization', 2 of 7 variables were significant (work role conflict/ambiguity and staff relations); 'personal accomplishment', 4 of 7 variables were significant (education/training, work experience, work role conflict/ambiguity and organizational commitment).
Kushnir, 1992 ⁴⁶ Directors of day care centres	Stress and burnout in directors of day care centres, <i>n</i> = 34 Inexperienced directors in 169 day care centres, pre-test post-test study design, psychoeducational intervention.	Stressors, burnout and psychological resources. Control group, Pretest, post-test and 6 months follow-up questionnaire.	Significant changes post-intervention for 'stressors' (staff problems), overload and too much responsibility, role conflict and conflict with children's parents. 'Resources' (assertiveness, perceived control and self-efficacy) and 'Stress complaints, depression, stress work, stress home, life satisfaction, job satisfaction, suppressed hostility and coping.
Whitebook, 1983 ³⁹ Child care workers	Child care worker's health and safety, <i>n</i> = 89 workers in 20 states. Cross-sectional survey.	Variables: demographic, rate of illness and infection, administrative policies, ergonomic issues and injuries, chemical hazards, sources of stress, health care benefits and access to care. No control group, no follow-up.	High rates of infection for colds, sore throat, flu and impetigo. Administrative policies inconsistent or non-existent. Lack of adult-sized furniture identified implications for hygiene, physical safety and mental health of the staff. Respondents reported chemical hazard exposure. 96% indicated that job was stressful. Inadequate health care screening and coverage. Proposal for improving conditions within centres.
Whitebook, 1980 ⁴⁷ Child care workers	Burnout and turnover among child care workers. <i>n</i> = 95 workers in 32 centres. Cross-sectional survey (telephone survey).	Employee perception of tension and satisfaction reason for turnover, suggestions for changes in day care centres. No control group, no follow-up.	Reasons for job dissatisfaction: overwork, underpayment (including limited or no medical benefits for almost 50% of workers). 72% of workers indicated unpaid time. Turnover most frequently attributed to low pay and unpaid overtime. Only 24% intended to make child care a career. Staff suggestions for improving work situation: higher pay, more benefits, increased job security and career mobility.

included a training programme designed to teach child care workers about universal precautions.¹⁸ Two investigators assessed workers' knowledge of transmission of AIDS/HIV.^{18,19} Despite demonstrated knowledge of HIV transmission and clarification of misconceptions about the disease, workers in these studies continued to express fears of transmission of the virus. Further research is needed to develop effective interventions that allow workers to fulfil policies on caring for children with HIV/AIDS based on scientific facts and not irrational fears. Regarding viral hepatitis, a 1996 study by Jackson *et al.* tested for antibody prevalence of hepatitis B and hepatitis C in day care workers.¹² The antibody prevalence of these diseases was extremely low suggesting that these diseases were not significant occupational health risks for the relatively small population studied. The demonstrated efficacy and extended protection conferred by the hepatitis B vaccines have resulted in wide acceptance of the vaccine and routine immunization of children in the US.²⁰ In spite of the low risk of child care workers becoming infected with hepatitis B, risk of exposure to blood does exist; therefore, Donowitz suggests that child care workers also receive the hepatitis B vaccine.⁴

Child care workers infected with HIV/AIDS are exposed to various opportunistic diseases that occur routinely in the child care environment. The US Public Health Services Infectious Diseases Society of America (USPHS) (IDSA) have produced draft guidelines for prevention of opportunistic disease for HIV/AIDS patients.²¹ The guidelines specifically address the occupational health concerns of child care providers. According to the USPHS, child care providers with HIV 'are at increased risk of acquiring CMV infection, cryptosporidiosis, and other infections (*e.g.*, hepatitis A and giardiasis) from children. The risk of acquiring infection can be diminished by good hygienic practices such as hand washing after faecal contact (*e.g.*, during diaper changing and after contact with urine and saliva)². Recommendations for immunizations of persons infected with HIV should consider the stage of HIV infection and the type of immunization.²¹

Child care centre workers that care for non-toilet-trained children are at risk for contracting enteric pathogens. Faecal-oral contamination is responsible for a variety of infectious disease hazards within the daycare setting. Agents commonly transmitted through the faecal-oral route include hepatitis A, cryptosporidium, giardia, shigella, campylobacter, enteroviruses and rotavirus among others.⁴ Enteric infections are high among infants and toddlers, and minimizing faecal contamination is important in reducing the transmission of enteropathogens in the daycare environment.²² Diarrhoeal outbreaks are common in child care centres^{22,23} although the actual incidence of diarrhoeal illness among child care workers is not documented. Enteric infections are responsible for increasing medical costs due to physician consultation, medications and employee absenteeism.²⁴ In the US hepatitis A vaccination has been recommended for child care workers.⁴ Hepatitis A vaccines provide long-term pre-exposure prophylaxis against infection and lead to

high seroconversion rates (exceeding 95%) and are safe for use during pregnancy.²⁵

Four studies included in the review examined diarrhoeal illness in daycare settings. Three of the four studies monitored levels of faecal contamination in environmental sources (diaper changing areas, sleep/play areas, hands of child care workers and children's toys). Child care workers who worked with 1–2 year olds had the greatest exposure to enteric pathogens.²³ Faecal contamination of hands and inanimate objects used in the work environment may account for one documented outbreak of Hepatitis A in a day care centre.²⁶ The three studies of faecal contamination were limited to assessment of environmental surfaces and hands. In each study, the Hawthorne effect was a major methodological limitation since the investigators monitored the staffs' hand washing and hygienic practices. Education and enforcement of handwashing and proper hygiene have been shown to prevent some of the diarrhoeal illness in day care centres.²⁷

Varicella-zoster virus and human parvovirus B19 are two viral agents that have the potential to cause adverse foetal outcomes in child care workers.⁴ Varicella-zoster (VZV) (commonly referred to as chicken pox) is a routine and highly contagious illness that is not usually severe in childhood. However, child care workers who are susceptible to varicella often experience serious illness when infected with this disease.²⁸ The incidence of varicella-zoster and the number of workers who are susceptible to the virus is unknown. One study documented that 4.8% of workers in the study sample were susceptible to the virus. These workers are at increased risk of infection and complications such as pneumonia.²⁸ With the potential for severe illness and adverse foetal effects, day care workers of child-bearing age who are susceptible and who are exposed to varicella should be evaluated by their health care provider within 24 hours of exposure.²⁹ Proper handwashing is recommended as the preventive strategy.¹⁶ Despite the National Health and Safety Standard ST 71 recommendation for assessment of the need for vaccines upon employment, a random selection of several state licensing requirements indicated that VZV had not been adequately addressed by the states within the US.⁵ During a three month period in 1997 there were three varicella fatalities among unvaccinated and susceptible young women who were exposed to unvaccinated preschoolers.³⁰ These deaths may have been prevented with the vaccine for VZV. Although varicella vaccination has been recommended for child care workers in the US,⁴ the varicella vaccine is not generally available in the United Kingdom.³¹

Human parvovirus B19 is also a childhood illness, manifest as a benign rash called erythema infectiosum or 'fifth disease'. The more serious consequences of the disease are those related to the negative foetal outcomes possible when pregnant workers become infected. In the studies reviewed, one outbreak of parvovirus B19 was documented in workers within a school district that also maintained child care centres. Within the population of daycare workers, at pre-outbreak 68% of workers tested had a previous parvovirus B19 infection. During the

outbreak of parvovirus B19, 31% of susceptible child care workers became infected with the virus. A study of B19 infection in Danish pregnant women compared infection rates of pregnant women in the general population to nursery school teachers and found that nursery school teachers had a threefold increased risk of infection.³² In addition, a recent study of B19 infection in the UK general population found an excess rate of foetal deaths (averaged at 9%) occurring during the first 20 weeks of gestation. Although the early weeks of gestation posed the greatest risk, the overall risk of acquiring human parovirus was approximately 1 in 400, and the risk of an adverse outcome of pregnancy after week 20 was remote.³³ The results of these studies support the existence of the occupational risk of B19 infection in the child care worker population. According to Donowitz,⁴ handwashing and decontamination of environmental surfaces have not been proven to be effective in reducing the risk or preventing transmission of this virus. However, until more research in this area has been conducted, proper handwashing and hygiene are prudent. Work exclusion policies for pregnant child care workers are not routinely recommended in the US.⁴ Vaccination for parovirus B19 is currently in the stages of development.³³

The APHA and AAP have also identified several other infectious disease hazards such as pinworm, herpes and influenza. However, no research studies were located that examined the prevalence and impact of these diseases in day care workers. Donowitz⁴ provided infection control recommendations for personnel which emphasized the importance of handwashing in preventing transmission. Currently, the UK Public Health Laboratory Service³⁴ and the US Center for Disease Control³⁵ recommend vaccination against flu for elderly and persons with weakened immune systems. Donowitz also recommends that all child care workers receive an influenza vaccine annually.⁴

Physical hazards

Injuries. The Occupational Safety and Health Administration (OSHA) injury statistics for the industry classification 'child day care services' reported 11,600 work-related injuries for the period from October 1997 through September 1998. A combination of sprains, strains, fractures, cuts, bruises and back injuries make up the list of injuries included in OSHA logs during this period (Table 3).¹ Only two published studies have described the ergonomic issues relevant to child care workers.^{36,37} These researchers found that the risk of work-related ergonomic injury was a concern. The results of the job analyses indicated that injuries involving the lower back were likely to occur because of the mechanics of lifting, bending, squatting and reaching. The lack of adult-sized furniture for workers has also been cited as contributing to physical discomfort and injury as well as psychological stress. Both studies arrived at similar conclusions; recommending the purchase of adult-sized furniture, task and work area redesign and staff training on general ergonomic principles. The limitations of these

Table 3. Occupational injuries and illness for child day care services leading to lost work days

<i>Per 10,000 full-time workers</i>	
Sprains	59.8
Fractures	10.9
Cuts/punctures	2.4
Bruises	20.0
Back pain and pain except back	15.1
Multiple traumatic injuries	8.3
And disorders	27.6
All other types	
Total cases	145.9

* Statistics based on the US Bureau of Labor 1996 data for child care services industry.

two studies are small sample sizes, selection bias and reliance on workers' perception of physical stress. In addition, the studies failed to report demographic characteristics and anthropometric measurements. A description of the objective ergonomic measures that led to the recommendations for environmental changes and education would have been helpful. The APHA and the AAP⁷ have also identified noise and bites as occupational health hazards in child care; however, no studies were located which documented the prevalence or impact of either of these hazards. Biting by children has been documented in early childhood research literature.³⁸

Chemical hazards

Environmental exposure. The APHA and AAP⁷ have identified potential chemical hazards in child care settings including disinfecting solutions, art materials and formaldehyde; however, no studies were found which examined the health effects of these hazards. The survey of child care workers by Whitebook³⁹ contained self-reported exposure to art materials (powdered paint, permanent markers and dry clay) that was accompanied by respiratory and skin irritation. Whitebook³⁹ also identified contact with pesticides and cleaning solutions as potential chemical hazards for child care workers. The APHA and AAP identify dermatitis as an occupational health hazard in child care centres.⁷

Other environmental exposures which were not identified by the APHA and AAP were documented in two international studies of child day care centres. A Finnish study examined dampness and moulds in day care centres and found that workers reported eye irritation, upper and lower respiratory symptoms and chronic respiratory diseases.⁴⁰ A second study in China examined the association between dampness in centres and respiratory illness in day care workers and found a statistically significant relationship between exposure to moulds and dampness and the prevalence of sick-building syndrome (SBS) symptoms.⁴¹ One methodological problem identified in the China study may have been misclassification bias. The environmental exposure data was based on subjective assessment of water damage and mould odour. This may have led to errors in the relationships identified between respiratory symptoms and

exposure. Although no studies were located which focused on sick building syndrome symptoms in child care centres in the United States, it is estimated that 10–25 million employees who work in commercial buildings have symptoms associated with SBS.⁴² Since SBS has been found in child care centres in other countries, it may be prudent to conduct studies in the United States to determine whether SBS is a concern.

Psychological hazards

Stress. Stress has been defined as ‘the subjective mental state that results from exposure to a stressor’.⁴³ Occupational stressors may be attributed to a variety of exposures including ‘psychological factors as well as interpersonal, organizational, environmental, and physical demands’.⁴⁴ Four studies in the review examined stressors associated with child care work including job dissatisfaction and work conditions.^{39,45–47} A comprehensive study by Manlove⁴⁵ found that child care workers experienced psychological stress triggered by interactions with children and families. Psychological factors such as neurotic personality as well as conflict with organizational and job demands were correlated with staff burnout. Burnout in child care workers is related to the high turnover rates and low morale that have been described as a chronic problem with this occupation.⁴⁵ Whitebook⁴⁷ first identified a variety of stressors that impacted on the child care workers, citing the organizational stressors of low wages and lack of benefits, understaffing and low job satisfaction. In addition to these descriptive studies, a stress reduction intervention designed for less experienced directors of child care centres was documented. The results showed that with training the directors of day care centres learned coping skills and practised stress reduction in order to improve coping and well-being.⁴⁶ These two surveys, the descriptive study, and the intervention are the only existing studies we were able to locate on the topic of job burnout and stress in child care workers. Unfortunately, the existing studies have largely relied on self-reported data collected with survey instruments and personal interviews. Supporting observational data may help to validate these results and clarify the relationship between high employee turnover and job stress.

CONCLUSIONS

The US Department of Labor, Occupational Safety and Health Statistics (OSH) 1996 injury and illness rates indicate that there were 145 injuries and illnesses per 10,000 child care service workers in 1996.¹ Thus far, infectious disease transmission has been the major focus of research. Based on the available research, prevention of infectious disease transmission is a priority concern for child care workers. Current research, however, does not adequately describe the prevalence, transmission and prevention of the illnesses that are potential concerns for this population.

Limitations of the current studies of infectious diseases are noteworthy and include: the quality of the

studies located tended to be less than rigorous; the studies were geographically limited thereby decreasing generalizability; sample sizes were small; randomized controls were not used and there was little effort to replicate any findings among studies. Specifically, large-scale studies are needed to determine the magnitude of the problem of infectious diseases and effective ways to prevent disease transmission.

In contrast to the number of articles related to child care workers and infectious disease, scant literature is available about the other occupational health concerns for child care workers. With the exception of two ‘first studies’ of ergonomic issues in child care, injuries and non-infectious diseases including back injuries and dermatitis were minimally addressed.^{36,37} Environmental hazards such as noise, potentially hazardous chemicals such as disinfecting solutions and insecticide exposure need to be addressed. Finally, the occurrence of sick building syndrome among child care workers in the US may deserve further investigation.

Ironically, the OSH statistics currently available indicate that injuries are a more serious problem than illness among child care workers. The majority of reported injuries were related to musculoskeletal injury, not infectious illness. The authors suspect that the incidence of illness in this population is significantly higher than the reported statistics for at least three reasons. First, a large number of child care workers are employed in businesses with fewer than 11 workers; therefore, they are excluded from the OSH statistics. Second, the illnesses would tend to be underreported because they would not necessarily be attributed to the workplace. Third, it is commonly accepted that workers and employers underreport injuries.⁴⁸ However, the fact that there are few documented illnesses should not lead to the conclusion that employee illness in child care settings does not have a negative financial impact on these business. In the case of child care workers, the accumulation of sick days due to ‘routine’ illness may significantly impact upon job loss, productivity, turnover and increased insurance premiums.

Compounding many of the problems previously identified with the collection and completeness of current statistics and available research is the well-documented phenomenon of high employee turnover rates. The high turnover rates in this occupation could mask some of the problems within these centres since the ‘day care working life’ of these employees tends to be short due to organizational factors like money and job dissatisfaction.

The problem of employee turnover in child care centres also appears to be correlated with psychological stressors. Although some work has been initiated in the area of stress and child care work, the reviewed studies should be considered ‘first studies’. There is every indication that stress is a major health and human resource concern. More work is needed to provide the groundwork for future research addressing job burnout and stress.

A pioneer in identifying issues related to occupational health and safety, Whitebook conducted surveys of child

care workers' concerns almost 20 years ago.^{39,47} Since this time, child care services and environments have changed. With the national demand for more child care, there will be an increase in the number of child care workers entering the workforce. We recommend that a health and safety survey of the occupational health concerns of child care workers be conducted. By defining the risks to current child care workers, future researchers can begin to assemble an agenda for addressing occupational health and safety problems appropriately.

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