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## Health Status in an Invisible Population

### Carnival and Migrant Worker Children

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One goal of *Healthy People 2010* (2003) is to close the gap of disparities in access to care and health. The purpose of this descriptive exploratory study was to evaluate health status indicators in the children of itinerant carnival and migrant farmworkers aged birth to 12 years. Health status outcomes (immunization records, well-child examinations, dental health status, and growth parameters) were compared between the two groups and to national averages to identify health disparities. All forms were available in Spanish and English. A total of 97 children were recruited for this study: 45 carnival children and 52 migrant farmworker children.

**Keywords:** *carnival children; migrant farmworker children; health disparities; health status indicators*

The warmth of the summer sun brings an abundance of fresh fruits and vegetables to the market for consumer consumption. At the same time, state and county fairs arrive in town for agricultural competitions and outdoor amusement rides. Little thought is given to the welfare of the children of these seasonal itinerant workers. These invisible children are a vulnerable population with limited or compromised access to health care that may result in health disparities.

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## Health Issues Among Itinerant Children

### Disparities

One goal of *Healthy People 2010* is to close the gap of disparities in access to care and health (U.S. Department of Health and Human Services [USDHHS], 2002). The Institute of Medicine (IOM) has defined access to care as the use of personal health services to achieve the best possible health outcome (Lurie, 2002). The IOM (2002) reported several traditional core measures of access that can be applicable to the pediatric population, including insurance status, the stratified health status of children who have received no medical visits, a regular site of care with a consistent provider, childhood immunization status, and proportion of children who have not had a dental visit. Utilization of health care for children is dependent on the parent or guardian acting on their behalf. Caregiver characteristics may represent an intrinsic barrier to access. Language barriers, lack of trust, fears of discrimination or disrespect of one's culture, and cultural insensitivity can all be manifested in health care use patterns (Lurie, 2002).

Disparities in health coverage, access, and quality of care are influenced in large part by citizenship status and language (Kaiser Commission on Medicaid and the Uninsured [Kaiser], 2003). Country of citizenship can impact a family's ability to obtain health coverage by affecting the possibility of having employment-based health insurance and eligibility for Medicaid or state health programs. Without insurance, noncitizens have difficulty accessing preventive and primary care and experience difficulty in establishing a relationship with the health care system; even if they do have access, they receive less care (Ku & Matani, 2001). Salsberry (2003) reported that uninsured children have the worst health and the poorest access to care, and their parents lack knowledge of and experience with the health programs that are available to them. Studies have concluded that within the United States, Latinos have the highest uninsured rates among all racial and ethnic groups, and of that, one third of U.S. Hispanics are foreign-born (Ku & Matani, 2001). Access to health care for migratory agricultural workers has been operationalized in one research study as the number of times during the past year the caretaker felt the child had a medical need but could not receive care (Weathers, Minkovitz, O'Campo, & Dierner-West, 2004). Among a sample of migrant farmworker children ( $n = 300$ ), 73% were uninsured, 34% never had a well-child examination (WCE), 79% never had an examination by a dentist, and 53% had an unmet medical need (Weathers, Minkovitz, O'Campo, & Dierner-West, 2003).

Being of Hispanic ethnicity was associated with receiving less medical care. Since the 1996 Personal Responsibility and Work Opportunity Reconciliation Act, Medicaid eligibility for immigrants has been restricted, and this political debate continues today (Ku & Matani, 2001).

### **The Working Poor**

The working poor, totaling 6.4 million in the United States, are so classified if they are in the labor force for 27 weeks of the year or more and their income falls beneath the official poverty level (Mosisa, 2003). Farmworkers and service employees such as carnival workers are more likely to be categorized as the working poor than are those in other occupations. They accounted for 31%, or 2 million, of the working poor in 2001. Because of the seasonal nature of employment, carnival workers are exempt from the guarantee of minimum wage (U.S. Department of Labor [USDOL], 2006). Yearly salary figures for migrant workers are reported as \$5,000, an amount much less than the federal poverty threshold for a family of any size (Cessato, 2005; USDHHS, 2005a; USDOL, 2001, 2006; Mosisa, 2003).

### **Carnival and Migrant Farmworker Children**

The health status of migratory agricultural workers has been underrepresented in the literature, and even less documentation is published on migrant farmworker children. An extensive review of the research databases has yielded no information about the health of children of carnival workers. The National Office of Migrant Health estimates the size of the migrant and seasonal farm worker population to be between 3 and 5 million people, with 66% migrating with children, resulting in approximately 500,000 children (National Center for Farmworker Health, Inc. [NCFH], 2004). The use of health services by migrant children is distinct from nonusers because of their unique sociodemographic factors and limited enabling resources (Weathers et al., 2003). Despite increased public visibility and the organization of the United Farm Workers Union, Berman (2003) reported that we have been unable to design health care systems for these workers that counter the impact of poverty, lack of insurance, mobile lifestyle, inability to speak English, and social isolation. Primary health care barriers to access for migrant children and their families are geographic, financial, and cultural (Gwyther & Jenkins, 1998). Many families reside in their state of legal residence fewer than 4 months each year. Their constant relocation presents barriers to accessibility to local health care

contributed by their low levels of income, powerlessness in the political arena, limited health resources and lack of information about availability, hours of operation, and eligibility (Bechel, Shepherd, & Rogers, 1995). Much that is known about migrant children applies to the children of carnival workers. Carnival children also experience distance from their medical home, lack of information about local health care resources during their travels, and restricted housing and play areas.

## Purpose

The purpose of this descriptive exploratory study was to evaluate health status indicators in children of itinerant carnival workers and migrant farmworkers aged birth to 12 years. Health status outcomes were compared to national averages and between the two groups to identify health disparities. The first research question was: Do the children of itinerant populations have lower levels of health indicators compared to available national and community levels? The second research question was: Do the children of migrant farmworkers have higher measures of health status, indicating better access to health care, compared to the children of carnival workers? The health status indicators included (a) immunization status in regard to adherence to the American Academy of Pediatrics (AAP) schedule of immunizations, (b) the frequency and timeliness of WCEs, (c) dental health status per age-appropriate guidelines established by the American Dental Association (ADA), and (d) growth parameters, including height, weight, head circumference (when appropriate), and body mass index-for-age percentiles.

## Method

### Design and Sample

A descriptive cross-sectional design was employed for this exploratory study. Inclusion criteria included (a) children aged birth to 12 years, (b) parent or legal guardian to sign consent and to complete questionnaires in either Spanish or English, (c) child present and assent given if older than 9 years, and (d) immunization/WCE record presented if available. The reason for the selection of this age range was to capture a period of time during which recommendations for preventive care were established by organizations such as the AAP and the ADA. *Healthy People 2010* (USDHHS,

2002) target goals and the National Center for Health Statistics, through the Centers for Disease Control (CDC), provided yardsticks to compare these itinerant populations.

A total of 97 children were recruited for this study: 45 carnival children and 52 migrant farmworker children, with similar numbers of male and female participants. Three fruit and vegetable farms and seven outdoor amusement companies (or carnivals) served as recruitment sites that varied in personnel size, acres of land, and degree of mobility. Calculations for power analysis for a one-tailed independent *t* test comparison with a medium effect size of 0.55 and alpha of 0.05 yielded the requirement of 42 subjects per group (Cohen, 1988). Siblings were included in the original recruited sample of 150, as when parents brought more than one child, they were not turned away. A random numbers table was used to select one sibling per family for analysis, yielding the sample of 97 subjects. Their self-identified ethnicity, race, and selected demographics are shown in Table 1. The carnival children's mean age was 4 years 7 months ( $SD = 3$  years 4 months), with a range of 8 months to 12 years 9 months, whereas migrant children were somewhat older with a mean age of 5 years 9 months ( $SD = 3$  years 11 months), with an age range of 4 months to 12 years.

Items included in the demographic questionnaire were derived from sample questions from the Lifestyle Questionnaire for School-Aged Children, which examines health-promoting behaviors (VanAntwerp, 1995). Anticipatory care and patient educational guidelines, patient care, health maintenance, and preventive care programs established by the National Association for Pediatric Nurse Practitioners (NAPNAP, 2006) and the AAP (2004) were also a source of items. The demographic questionnaire was designed to be user-friendly in a booklet of 57 multiple-choice questions. Reading level of the questionnaire was assessed, resulting in a Flesch-Kincaid grade level of 3.9. The services of two local native-Spanish speakers were employed to translate and back-translate all documents and forms into Spanish until the two forms were equivalent. Items were analyzed independently.

The number, type, and timing of immunizations and WCEs were recorded as data from parent report or from documents that they brought with them. Each immunization administration was recorded and a table of frequencies was constructed for immunizations received. Evaluation criteria were obtained from Recommendations for Preventive Pediatric Health Care (RE 9535), developed by the Committee on Practice and Ambulatory Medicine of the AAP (2004, 2005), and yearly established immunization requirements from the CDC (2005a; AAP, 2004, 2005). The unit of analysis for individual subjects used here was the percentage of immunizations

**Table 1**  
**Selected Demographics of Carnival and Migrant Worker Children:**  
**Independent Samples**

		Total		Carnival Children		Migrant Children	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Sample size		97		45	46	52	54
Ethnicity	Hispanic/Latino	49	51			49	94
	Non-Hispanic/Latino	43	44	40	89	3	6
	Missing	5	5	5	11		
Race	Native American	4	4	1	2	3	6
	White	56	58	43	96	13	25
	Multi-group/mixed	5	5	1	2	4	8
	Other	12	12			12	23
	Missing	20	21			20	38
Nativity	U.S. citizen	85	88	43	96	42	81
	Other	12	12	2 <sup>a</sup>	4	10 <sup>b</sup>	19
Gender	Male	48	49	21	47	27	52
	Female	49	51	24	53	25	48
Parental education	Lower than 9th grade	21	23	1	2	20	39
	9th through 11th	32	36	14	31	18	35
	High school graduate	17	19	11	25	6	11
	Some college	11	12	10	22	1	2
	College graduate	9	10	9	20		
	Missing					7	13

a. From England.

b. From Mexico.

that met recommendations for immunizations and WCEs. Immunization data were compared to the National Immunization Survey (NIS), which is conducted for the CDC by the National Opinion Research Center at the University of Chicago. The NIS is a list-assisted, random-digit-dialing telephone appraisal of 78 survey areas targeted to parents of children aged 19 to 35 months, which is then followed by a mailed survey to the child's immunization health care provider (CDC, 2005b; USDHHS, 2005b).

All children received an oral health screening by the researcher, who was trained in oral screening and interpretation of findings by a dentist from the Ohio State University (OSU) College of Dentistry until 100% interrater reliability was established (ADA, 2004). Children were assessed for the number of untreated caries and treated caries (American Academy of Pediatric Dentistry [AAPD], 2003). The measure used in dentistry is the

number of decayed, filled teeth (dft), with lowercase letters indicating primary teeth for children aged approximately 5 years and under, and permanent teeth based on the number of decayed, missing, and filled teeth (DMFT) (Lewit & Kerrebrock, 1998). Both measures were reported for children with mixed dentition aged 5 to 11 years. Filled teeth are defined as those in which caries have been repaired. Decayed teeth are defined as those with untreated caries present. An indicator for dental health in groups of children is the percentage of children who are "caries-free," which means that teeth show no evidence of dental caries, either treated or untreated (Lewit & Kerrebrock, 1998). An oral hygiene assessment was performed on children with 20 teeth or more, including the presence and extent of debris accumulation developed by Glass for assessing toothbrushing efficacy (Carranza, 1979). Scoring was as follows: 0 = no visible debris; 1 = debris visible at gingival margin but discontinuous—less than 1 mm in height; 2 = debris continuous at gingival margin—greater than 1 mm in height; 3 = debris involving entire gingival third of tooth; and 4 = debris generally scattered over tooth surface; and the index for debris is then obtained by totaling all the debris scores per tooth and dividing by the number of teeth examined (Carranza, 1979; Eilers, Berger, & Petersen, 1988; Maurer, 1977). The unit of analysis for individual subjects used here was the mean number of decayed and filled teeth, number of caries present and treated, percentage of caries-free children, and the oral hygiene assessment score (Lewit & Kerrebrock, 1998).

Recumbent or standing weight of all infants and children was obtained on a Tanita 1582 Baby/Mommy Scale with a capacity for infants 0 to 30 lbs to the nearest ounce and older children 0 to 250 to the nearest 0.2 lbs. The scale is standardized at the factory before shipment with a 150 lbs weight and its accuracy is  $\pm 0.25\%$ . Calibration was not required during data collection. Recumbent length was assessed on a Seca Measure Mat for Infants and Small Children with a measuring range of 4 to 39 inches with graduations of one eighth inch and is manufactured with plastic and a coated nonstretch material. Standing height was assessed on the Seca 214 Portable Height Rod stadiometer with a measurement range of 10 inches to 6 feet 6 inches. Graduations of measurement are in 0.1 cm or one eighth inch and the error measurement is  $\pm 1$  graduation or one eighth inch. The Seca 200 Girth Measuring Tape was used for chest and waist measurement and for head circumference of those children aged 2 years or younger. Graduation of this instrument is 1 mm or one eighth inch, and capacity is 0 to 150 cm or 0 to 78 inches. The tape measure is manufactured in a coated nonstretch fabric that is neither latex nor rubber. All measurements were obtained twice. Any



discrepancies required additional measurement. The value of two matched readings were recorded. The percentiles for all growth parameters and body mass index-for-age (BMI) were determined from the Epi Info™ 3.3.2 program downloaded from the CDC (2006), which eliminates errors from paper-and-pencil markings on individual growth charts (CDC, 2006). BMI percentiles were calculated on children 2 years and older and weight-for-height percentiles were obtained for infants and toddlers younger than 2 years.

The rates of overweight-for-age children, BMI percentiles and dental health status were compared to levels found in the National Health and Nutrition Examination Survey (NHANES), which provides data for surveillance at the national level and is conducted by the National Center for Health Statistics, which is part of the CDC (2005b; USDHHS, 2005c). The NHANES is an ongoing process of a stratified, multistage, probability sample of the civilian, noninstitutionalized U.S. population for those ages 2 months and older with the dental component gathered on children aged 2 years and older.

The OSU Internal Review Board for the Protection of Human Subjects approved this study. A pilot study ( $n = 41$ ) was conducted the summer prior to the implementation of this research study, and the first author learned many valuable lessons about the recruitment, operations, feasibility, utility of the questionnaire and forms, appropriateness of instruments for the population, and logistics of this project (Kilanowski, 2006). Only minor adjustments in procedure and forms were made, so subjects recruited from the pilot study were included in the final sample.

Identification of possible research sites was labor intensive, and the researcher needed to be resourceful in securing possible sites. It was imperative to gain the trust of gatekeepers to the farms and carnivals, and it was necessary to assure that the data would be confidential and not used against the person or facility. The support of leaders within professional and fraternal organizations was invaluable in obtaining research sites. Subject recruitment required travel to seven states and a total of 4,434 miles of traveling by car.

One week before the first author's arrival, posters were hung in visible locations and/or flyers were mailed to the recruitment sites. Subjects were also recruited through the snowball technique and by the researcher walking the grounds of the facility. Data were obtained in locations and time periods that had been suggested by the carnival managers and vegetable farm owners, so that parents did not need to forfeit work hours to participate in the study. Data collection settings were varied and ranged from the inside of a worker break room and mobile home, to outside under a canopy.

Nonparticipants were mainly from parent-child dyads from the carnival workers group who voiced opinions that they did not have time to complete forms because of work commitments or previous appointments or had unfriendliness toward revealing personal data. The migrant farmworker families seemed eager to participate and often waited in line to sign consent forms and join the study.

All forms and instruments were available in Spanish and English. Parents answered demographic questions, and children older than age 9 were asked whether they would like to participate and verbal assent was obtained (Allmark, 2003). The cooperation of all verbal children was requested. The investigator then measured the children's height/length and weight and conducted a dental screening. At the conclusion of the encounter, the parents received a written report of the children's growth parameters and recommendations for follow-up. In appreciation of the parental time involved in the study, \$10 was given to the adult, and the child was asked to select one age-appropriate, safe, and nonviolent toy from the investigator's toy table worth approximately \$10. In addition, a new toothbrush was given to the child from the OSU College of Dentistry. The toy table served as a valuable incentive for participation (Rice & Broome, 2004). Test burden for the participants was approximately 20 minutes.

### **Data Analysis**

Preliminary data were analyzed with tables of descriptive data, frequencies and prevalence. Independent *t* tests demonstrated comparisons of means between the carnival and migrant farmworker children groups. Chi-square tests were used with dichotomous data. The nonparametric Mann-Whitney U test was used for ordinal data in the oral hygiene assessments and differences in proportions showed relationships with national and sample data with immunization coverage levels.

## **Results**

### **Selected Health Care and Income Demographics**

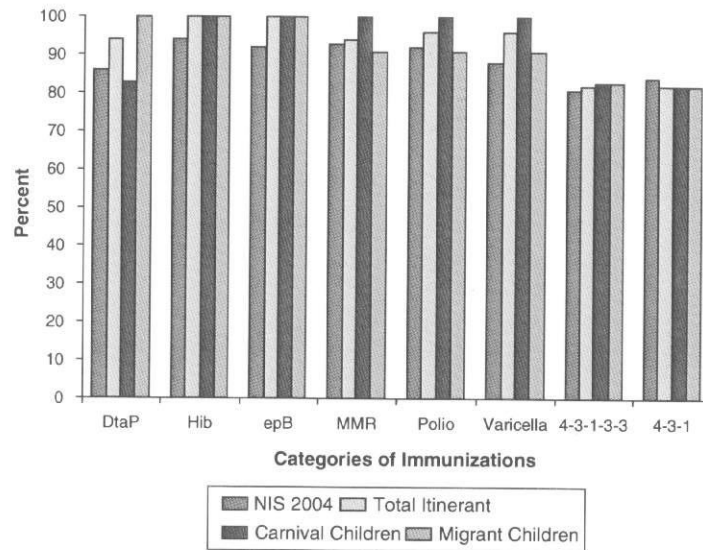
Parents of children were asked to rate their children's health. None of the carnival parents rated their child's health as fair to poor, compared to 8% of the migrant parents. Sixteen percent of the carnival parents and 27% of the migrant families stated that they delayed health care because of cost. In the

carnival sample, 7% self-pay for health care, 34% look for free care, and 21% have Medicaid. In the migrant sample, 61% looked for free care and 16% qualified for Medicaid. A monthly family income of less than \$1,000 was much more common among migrant families (67%) as compared to carnival parents (15%;  $\chi^2 = 23.74, p \leq .001$ ).

### Immunizations

Sixty-six percent ( $n = 64$ ) of the sample presented with complete immunization records. More migrant ( $n = 46, 89\%$ ) than carnival ( $n = 18, 40\%$ ) parents had immunization records ( $\chi^2 = 25.33, p \leq .001$ ). Parents who did not have an immunization record or presented with partial records (carnival  $n = 27$ , migrant  $n = 6$ ) were then asked if they thought their child's vaccinations were up-to-date (UTD). All parents of the migrant children expressed the opinion that their child was UTD. Only 70% ( $n = 19$ ) of the carnival parents thought their children were UTD, with 15% ( $n = 4$ ) saying that their child was behind in the recommended schedule and 15% ( $n = 4$ ) did not know. This comparison, however, was nonsignificant ( $\chi^2 = 2.35, p > .05$ ). For those who did not have records, families were given stamped, self-addressed envelopes with forms to copy immunization records. An additional three records were received. The immunization compliance for the total itinerant sample of children with complete records aged birth to 12 years ( $n = 64 + 3 = 67$ ), was nonsignificant ( $t = 0.39, p > .05$ ). The mean carnival family level of adherence to the recommended immunization schedule was 92.6% ( $SD = 8.6$ , range 73-100); for the migrant children, the adherence was 90.0% ( $SD = 12.7$ , range 35-100). Extra immunizations were common among nearly half (49%) of the sample. The rates of extra immunizations were similar for carnival children ( $n = 8, 40\%$ ) and migrant children ( $n = 25, 53\%$ ;  $\chi^2 = 0.51, p > .05$ ). Group differences in hepatitis A vaccine were observed. None of the carnival children had received any hepatitis A vaccine, although 49% of the migrant children had a partial or complete series ( $\chi^2 = 16.97, p \leq .001$ ). The same pattern was seen with the frequency of influenza vaccination. None of the carnival children received the vaccination, whereas 10% of the migrant children had records of influenza vaccination ( $\chi^2 = 47.90, p \leq .001$ ). National averages are available for immunizations of children aged 19 to 35 months. Figure 1 illustrates the comparison of data from NIS 2004 to the total itinerant sample as well as the carnival and migrant groups. Hepatitis A and influenza are not in the figure because they are not included in the NIS. Among children with records, immunization rates for individual vaccinations were often at 100%.

**Figure 1**  
**Vaccination Coverage for Children Aged 19 to 35 Months**  
**Comparing the NIS 2004, Total Itinerant Sample,**  
**Carnival Children, and Migrant Children**



Note: NIS (National Immunization Survey) data is a weighted sample.

### Well-Child Examinations

Eighty-seven percent of the entire sample reported that the children had regularly scheduled WCEs, with 10% having no regularly scheduled examination and 3% saying that their child was off schedule. Carnival children (77%) were significantly less likely to have regularly scheduled WCE than migrant worker children (94%;  $\chi^2 = 6.46, p \leq .05$ ). In addition, receiving a WCE at the time of immunization occurred significantly more often in the migrant sample than in the carnival sample (94% vs. 78%,  $\chi^2 = 6.46, p \leq .05$ ).

### Dental Health

The dental health of the two samples was examined by the age groups of 2 to 5 years and 6 to 11 years (CDC, 2005c). There were significant

differences in comparisons of means, with the itinerant group having less positive oral health compared to NHANES in the 2 to 5 year age group in dft ( $t = 3.93, p < .05$ ), decayed teeth (dt) ( $t = 2.03, p < .05$ ), and filled teeth (ft) ( $t = 2.99, p < .05$ ). In the 6 to 11 year age group, significant differences were found in primary dft ( $t = 1.87, p < .05$ ), primary dt ( $t = 2.58, p < .05$ ), and in the permanent dt ( $t = 5.34, p < .05$ ). Significant differences were found among 2 to 5 years of age (carnival  $n = 23$ , migrant  $n = 22$ ) in the number of primary dft (carnival < migrant,  $t = -2.62, p = .014$ ) and in primary ft (carnival < migrant,  $t = -3.19, p = .004$ ). Rates of caries-free primary teeth among children 2 to 5 years of age were not significantly different between carnival children (61%) and migrant children (35%;  $\chi^2 = 2.70, p > .05$ ). There was a significant difference according to the Mann-Whitney U test ( $p = .048, \alpha^2 = .05$ ) between toothbrushing efficacy in 2 to 5 year age groups, with the carnival children having better scores than the migrant children. There was no significant group differences in toothbrushing efficacy ( $\chi^2 = 2.70, p > .05$ ), caries-free primary teeth ( $\chi^2 = 0.36, p > .05$ ), or caries-free permanent teeth ( $\chi^2 = 0.19, p > .05$ ) of the children aged 6 to 11 years. The Mann-Whitney U test was nonsignificant for comparing toothbrushing efficacy between the 6 to 11 year age groups ( $p > .05, \alpha^2 = .05$ ).

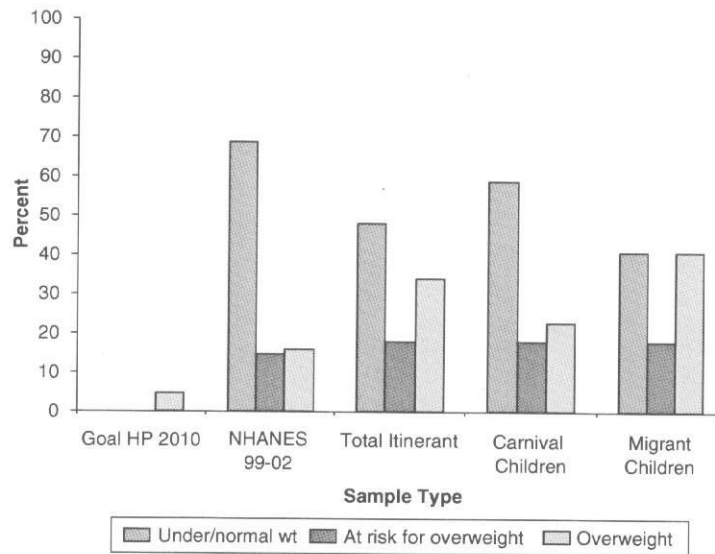
Among children aged 2 years and older ( $n = 81$ : carnival  $n = 36$ , migrant  $n = 45$ ), carnival children saw a dentist last year less frequently than did migrant children (58%,  $n = 21$  vs. 86%,  $n = 37, \chi^2 = 7.71, p \leq .001$ ). More carnival (36%) than migrant children (17%) were without a regular dental health care provider ( $\chi^2 = 1.41, p > .05$ ). Both carnival children (56%) and migrant children (43%) often used private dentists for oral care.

### Body Mass Index-for-Age

BMI-for-age is calculated for children aged 2 years and older. Overweight is defined as a BMI-for-age greater than the 95th percentile with at risk for overweight as percentiles between the 85th and 95th percentile (*Bright Futures*, 2002). In this itinerant sample, 22% of the children were at risk for overweight and 26% were categorized as overweight. Thirty percent of the carnival children and 16% of the migrant children were at risk for overweight. Seventeen percent of the carnival children and 33% of the migrant farmworker children were categorized as overweight. These group values were not significantly different ( $\chi^2 = 4.18, p > .05$ ).

NHANES statistics for BMI-for-age for children aged 6 to 11 years show that 15% are at risk for overweight and 16% are overweight, and 22% of

**Figure 2**  
**Comparison of *Healthy People 2010* Goal, NHANES 1999-2002, Total Itinerant Sample, Carnival Children, and Migrant Children: Percentage of Children With BMI-for-Age Percentiles, 6 to 11 Years**



Mexican American children are overweight (CDC, 2005d). In the itinerant sample aged 6 to 11 years ( $n = 44$ ), 18% were at risk for overweight and 34% were overweight. Both sample groups aged 6 to 11 years were equally (18%) at risk for overweight. Twenty-three percent of carnival children and 41% of migrant children were categorized as overweight. In children aged 6 to 11 years old the two group comparisons of BMI-for-age percentiles for being normal or underweight, at risk for overweight, or overweight found no significant differences between groups ( $\chi^2 = 1.63, p > .05$ ). See Figure 2.

### Weight/Height-for-Age

Children younger than age 2 years old are classified as overweight if their weight/height-for-age percentile is greater than the 95th percentile (CDC, 2004). Thirty infants and toddlers were in this age group (carnival  $n = 16$ ,

migrant  $n = 14$ ). The incidence of overweight was higher among the carnival group (38%) than for the migrant group (7%). Mean percentiles were significantly different for the two groups ( $t = 2.73, p = .014$ ).

## Discussion

The majority of migrant farmworker families carried their children's immunization card with them. Although their home was Texas or Mexico, most of the cards originated from the Ohio Department of Health indicating that the migrant families tended to wait for these services until harvest season. Anecdotes from nurse practitioners attending a national conference who work with migrant farmworker families have reported that the mothers of these itinerant children are very conscientious about securing health care for their children. This can be validated by the higher rate of influenza administration to the migrant children compared to the carnival children as well as the appropriate receipt of hepatitis A vaccine for this higher risk population. The low accessibility to immunization records by the carnival families can be reasoned two ways. First, the child in a family-run carnival that travels to a limited number of states and operates for fewer calendar months than migrant families are never far from home and may not need to carry their immunization records. Those families would not need to obtain well-child care or vaccinations while on the road as they maintain reasonable proximity to their medical home. Second, parents who did not present with an immunization record may be fearful that they will be judged as neglectful parents if their child is not obtaining recommended health care. The majority of those without records were young mothers who reported using public health agencies for preventive care. Although the majority of carnival parents without records voiced the opinion that their child was UTD in immunizations this might have been the socially desirable answer to the nurse practitioner. The high rates of carnival immunization compliance rates are based on those parents who presented records, and it can be speculated that these numbers overestimate compliance, thus creating bias. In this itinerant population, almost half of the children received extra immunizations, mostly extra polio vaccine. This rate was even higher in the migrant farmworkers' children, which was surprising because they had higher rates of carrying their immunization record, making it unlikely that language prevented the communication of immunization need. These extra immunizations that were administered represent a misuse of resources.

Immunization rates for these two itinerant samples were also compared to the available national rates that consider the child aged 19 to 35 months. Calculations of differences in proportions for the various immunization categories, reinforced the exploratory nature of this small age-specific sample size (Cohen, 1988). The national rates that were used for comparison are from the NIS (CDC, 2005b). The NIS data are not without errors and bias. The NIS assumes that immunization coverage among children whose provider did not elect to respond is similar to those who did; thus, norms may be over- or underestimated (CDC, 2005b). The *Healthy People 2010* goal is a 90% immunization rate for the 4:3:1:3:3 series (4 diphtheria tetanus & attenuated pertussis (DTaP), 3 polio, 1 measles, mumps and rubella (MMR), 3 haemophilus influenza, 3 hepatitis B) and 80% for the 4:3:1 series (4 DTaP, 3 polio, 1 MMR) (CDC, 2005b; USDHHS, 2002). The immunization rate for those two samples that presented with records for verification met this criterion for all, except that carnival children received fewer than four doses of DTaP, and both groups received fewer immunizations than required for the conglomerate evaluation of 4:3:1:3:3 and in 4:3:1. These numbers followed patterns with those reported in the 2004 NIS and, in most cases, exceeded those reported from the national survey (CDC, 2005b). These figures on adherence to the recommended immunization guidelines established by the AAP and the CDC would suggest that migrant farmworker children have access to preventive health care in regard to pediatric vaccinations, as did those carnival children presenting with records.

In an optimal situation, a WCE accompanies the administration of immunizations as it provides an opportunity for anticipatory guidance, education on parenting, and surveillance of emerging growth patterns. The WCE also provides education on the necessity of the next set of immunizations, which encourages adherence to the recommended vaccination schedule. WCE's occurred significantly more often for migrant children than for children of carnival workers. This would suggest that the migrant farmworker children were invested in a health care program that Ohio made possible for them. The migrant farmworkers recruited in this study migrated from one location to a second and resided there for approximately 6 months. These workers also tended to return to the same location yearly, and this consecutive mobility pattern yielded greater knowledge about the available community resources. They took advantage of federal, state, local and charitable organizations to procure needed services. The migrant farmworker children were often enrolled in Head Start or in public school, which provided day care and an opportunity for the mothers to work in the



field; therefore, children needed to have the mandated vaccinations and physical examination. On the other hand, carnival children have limited time in one location to capitalize on local health and educational resources.

The mean percentage of untreated caries in primary or permanent teeth serves as an indicator for dental health and the amount of dental services that a child receives or does not receive (Lewit & Kerrebrock, 1998). In 6 out of 10 dental health screening measures, the itinerant population showed worse oral health than national values. The disparity between the oral health of these sampled itinerant children compared to national values and the goals of national objectives requires our attention. In examining the dental health of these two itinerant samples, we noted that the migrant children had greater numbers of caries in the primary teeth from ages 2 to 5 years than carnival children and NHANES values, but they also showed evidence of having received dental services. The differences between the two groups diminish when health of permanent teeth was examined. The Texas Migrant Council (TMC) is involved in Head Start enrollment in the Ohio migrant camps, and it can be speculated that this connection led to information on health care resources, which resulted in better health care indicators (TMC, 2005). The carnival children who have greater mobility than the migrant children are not enrolled in Head Start or nursery schools as they are in different towns and cities every week.

*Healthy People 2010* has as one target goal a 5% rate of overweight in children aged 6 to 11 years (USDHHS, 2002). The NHANES estimates that 16% of all children 6 to 11 years are overweight and 15% are at risk for overweight (CDC, 2005d). Latino children are disproportionately overweight (22%) (CDC, 2005d). The rate of overweight children 6 to 11 years of age in this sample of Latino migrant worker children (41%) and carnival children (23%) is alarming. Twice as many migrants reported that their child's play space was unsafe or dangerous compared to carnival parents. The lack of a safe, play-friendly physical environment on the migrant camp and large amounts of unsupervised time after school is a deterrent to school-aged children engaging in physical activity. Migrant parents (23%) responded positively when being asked whether lard was used in food preparation. More carnival parents believed that their child ate a balanced meal daily than did migrant parents (86% vs. 29%) yet stated that children ate too many sweets and soda pop, probably because they are accessible at carnivals and fairs. These factors all contribute to the BMI findings of these two itinerant samples.

It is noteworthy to discuss the findings of rates of overweight in the cohort of infants and toddlers younger than 2 years old. Although a small

sample size (carnival  $n = 16$  vs. migrant  $n = 14$ ) was obtained in this age category, 5 times as many carnival children were overweight compared to the migrant children. Contributions to carnival infant and toddler overweight are the lower rates of WCEs that provide anticipatory guidance and limited floor play space in the carnival residential accommodations. This is compared to the migrant families' greater affiliation with health care and more open play space available in their homes.

The data in this dissertation study showed that preschool programs provide a path for access to health care that has positively influenced the health indicators of migrant children. These preschool programs are not available to the carnival worker children because of their greater mobility. Once both groups of children are enrolled in the school system, however, health indicators worsen, as seen in higher BMI-for age percentiles and lower oral health. Program initiatives such as school-based health clinics might be able to eliminate these disparities.

The first research question explored whether these itinerant samples would have lower levels of health indicators compared to available national and community levels, and this was not always true. Both samples had highly commendable rates of recommended childhood immunization adherence; however, validation of carnival children's immunizations was limited because of lack of records. Immunizations are not clinically significant problems for these families. Overweight was a major health concern for both groups, especially for infants and toddlers in the carnival group and migrant farmworker children aged 6 to 11 years. NAPNAP has begun the Healthy Eating and Activity Together (HEAT) initiative to help curb the increasing rates of overweight children, and these guidelines can serve to provide a foundation from which to start intervention (NAPNAP, 2006). The second research question explored measures of health status indicating better access to health care, and in terms of WCE and dental exams, the children of migrant farmworkers did have higher levels compared to the children of carnival workers in these two indicators.

This exploratory descriptive study yielded valuable health status information on an invisible and vulnerable population of children that are away from their medical home for months at a time. Limitations of the study include small sample size for the age group comparisons and the fact that those who chose to participate in the study may not be a representative sample of their population. Another limitation is that the research study was unable to examine other important factors that contribute to health indicators and health outcomes. Research has demonstrated that social determinants such as lower levels of parental education, lower socioeconomic status, inadequate

and unsafe housing, racism, and living in close proximity to environmental hazards contributes to a poorer health outcome and creates disparities in health status (IOM, 2003). Little information has been published about the health of migrant children, and none is available about the children of traveling outdoor amusement companies. From these data gathered, it is evident that migrant families have been successful in locating and securing access to health care and have made it a priority for their young children. The Head Start programs in which the young children are enrolled provide a vehicle from which health care information can be disseminated about charitable, state, and federal resource initiatives.

Parental conversations with the first author addressed the hardships faced by the carnival families in securing preventive health care for their children and also in securing prescription renewals through Medicaid for chronic conditions. With the current health care distribution system, barriers arise as these families cross state lines following the next carnival location. Preventive health care when on the road is difficult because of a lack of knowledge of local community resources, hours of operation, locations, and services offered; unreliable transportation; and lack of public transportation from carnival sites. State and local communities gain significant economic benefit from the services of these itinerant families and should make it simpler for them to access comprehensive, affordable, and logistically and linguistically competent health care services while they are in the area (Community Health Services Committee [CHSC], 2005). Migrant farmworker families in Ohio have been somewhat effective in using the existing programs established to meet their needs. These two samples of itinerant children share similarities with children of other service and entertainment industries. Nursing research can generate knowledge and improve nursing practice to vulnerable populations of children. Combined with public health initiatives and the facilitation of the establishment of a medical home, the rising incidence of overweight children can be reduced and preventive health care made more available to these invisible populations.

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