

# Chapter 7

## The Health of Children in the Latinx Farmworker Community in the Eastern United States



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### 7.1 Introduction

Children in the Latinx farmworker community include two overlapping groups: children in the families of coresident adult farmworkers and children who work as hired farmworkers. While these children share some health influences and outcomes with other Latinx children in the United States (US) (e.g., they are members of a minority ethnic group and may face discrimination), they also face a distinct constellation of factors that distinguishes them from other Latinx children.

The health of both these groups of children can be set in the context of behaviors and exposures shaped by the social and physical environments in which they live (Fig. 7.1). Farmworker families have characteristics that set them apart from other families. In the southeastern US, they work seasonally in agriculture and may migrate to work, largely up and down the East Coast, following the crop seasons. Some farm work in Florida is becoming year-round as cyclical citrus production converts to year-round organic vegetable production, but elsewhere on the East Coast, work continues to be seasonal. Many families are of mixed documentation status, with members who are foreign-born (e.g., adults and older children) being more likely to lack documents to be in the US legally. Young children in farmworker families are now usually US citizens, which may give them better access to medical and social services than their parents or older siblings. As farmworkers, these families live in rural environments, which bring with them isolation and lower density of some resources and services. Housing for farmworkers is of notoriously poor qual-

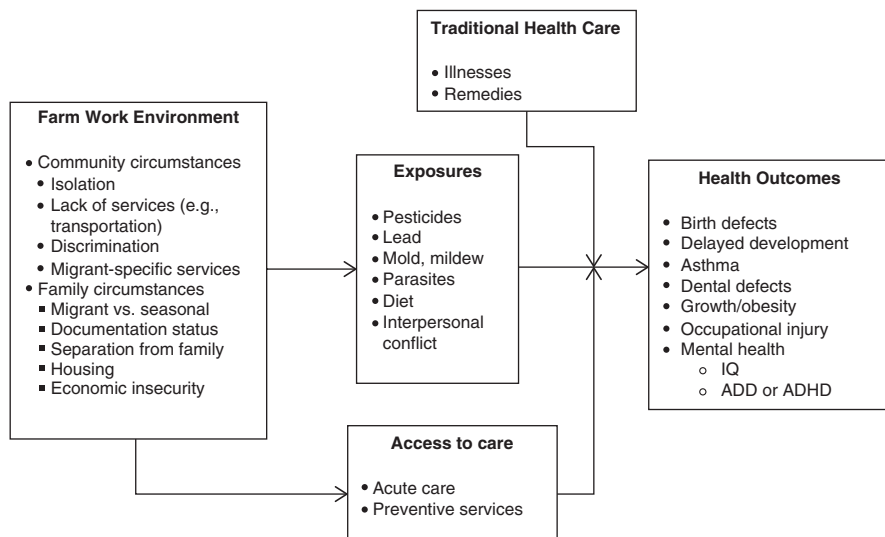
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**Fig. 7.1** Social ecology model of health for children in farmworker families

ity. Together, these environmental factors predict a number of exposures (e.g., pesticides, lead, low-quality diet) and limitations on access to healthcare that may lead to a pattern of health effects distinctive for children in the farmworker community.

The existing literature on the health of this child population is fragmentary, and it has not been drawn together previously. The literature pertaining to Latinx children in the western US and in states on the US-Mexico border (and, to some extent, in the Midwest) has greater time depth, reflecting the long-standing presence of Latinx farmworkers in those regions. For the eastern US, there are fewer studies, but a growing body of work shows the vulnerability of these children. This chapter will describe some work from other parts of the US, where appropriate, to highlight possible health issues for children in the eastern US.

The number of children in the Latinx farmworker community is hard to pinpoint. The National Agricultural Workers Survey (NAWS) data for 2015–2016 showed that more than half of workers interviewed were parents (Hernandez and Gabbard 2018). Of these parents, three-quarters were married or living as married; 14% were single; and 10% were separated, divorced, or widowed. Eighty percent of parents lived with all of their minor children, and 3% lived with only some of them. Two-thirds of workers with minor children in the household had one or two children, and the remainder had three or more. Of the households with minor children, 53% had children less than 6 years of age, 65% had children between 6 and 13 years of age, and 38% had children 14–17 years of age. Analyses of multiple years of NAWS data (2000–2009) showed that older children were more likely to have been foreign-born and younger ones to have been born in the US (Gabbard et al. 2014).

## 7.2 Children in Farmworker Families

### 7.2.1 Access to Healthcare

Children in the farmworker community have special needs for health services that set them apart from the general population (Council on Community Pediatrics 2013). In addition to high rates of poverty, inadequate availability of basics like housing and food exacerbates risk of health problems. The migratory lifestyle of some families and even the frequent moves typical of low-income families with unstable housing can prevent establishing a medical home for children's healthcare. Campbell-Montalvo and Castañeda (2019) characterize the situation of farmworkers as one of structural violence, as economic, political, and material factors conflate to create an environment hostile to farmworker families having access to the care they need. Farmworker parents often lack information on the workings of the US health system; even within a single family, children can have different eligibilities for accessing healthcare services. The state-by-state differences in the implementation of the Affordable Care Act provisions and its state of flux with legal challenges have made it even harder for families to understand available benefits.

It is impossible to know how many children access healthcare, but the number accessing migrant health centers nationally is known from the program grantee data at migrant health centers funded by the Health Resources and Services Administration (HRSA) (HRSA 2015). In 2015, 292,345 patients, about 35% of total patients in these clinics nationally, were children less than 18 years of age. Approximately 18,000 infants under the age of 1 and about 62,000 children ages 1–4 received care. A patient survey at migrant health centers showed that, for 2009 data, those patients received care comparable in quality and access to those at other community health centers (Hu et al. 2016). However, both migrant and community health center patients had limitations in aspects of primary care such as dental care and access to prescription medicines.

Historically, many farmworker parents have sought care for their children during return visits to Mexico. This has been the case, in particular, for families living near the border (e.g., Texas and California), where more than half of child healthcare has been obtained by returning to Mexico (Seid et al. 2003). Even recently, this desire to return to Mexico where care does not come with issues of documentation status attached has been expressed by farmworker families in Florida (Campbell-Montalvo and Castañeda 2019). Data collected in the early 2000s in eastern North Carolina found that health services used by farmworker families of children less than 13 years of age were need driven (Weathers et al. 2003). A more recent analysis of anticipatory guidance for children in farmworker families indicates the pattern still holds (Arcury et al. 2016). That is, children used health services when sick, rather than for well-child care. Younger children and girls were more likely to access care than older children and boys. Those visiting doctors were more likely to have insurance. Parents' documentation status did not predict whether or not children had insurance. Rather, parents who had been in the US for 5 or more years, had a family member

with WIC benefits, had a child of female gender, had a child with age less than 2 years, and were able to leave work for child's medical care all predicted having insurance, likely because the child was born in the US (Weathers et al. 2008a, b). Children of migrant workers have greater access to some federally funded migrant health services than children of seasonal (nonmigrant) workers. However, those who migrate are less likely than other children to have continuity of care. Because parents work long hours with limited benefits, they cannot take children to receive medical care without losing work time. Parents may not have transportation to take children to clinics and may not know where the clinics are, and the clinics themselves may have limited hours and services. This type of care is likely to lead to inconsistencies in immunizations (Lee et al. 1990) and in evaluating developmental problems. Even apparently low-cost medications or treatments may be beyond a family's resources (Weathers and Garrison 2004).

It is likely that the same factors found in earlier studies for unmet needs among children in farmworker families remain constant. Unmet needs for care were explored in the North Carolina sample (Weathers et al. 2004). Over half of the children had an unmet need, defined as whether or not the child's caretaker reported a time in the past year when the caretaker felt the child needed medical care, but the child did not receive it. Reasons for the last episode of unmet needs were lack of transportation (80% of episodes), not knowing where to obtain care (32%), inconvenient clinic schedule (10%), no permission to leave work (9%), and difficulty in making appointments (9%). In multivariate analyses of factors enabling healthcare, unmet need was associated with "good," "fair," or "poor" health status (compared to "excellent" or "very good") and with depending on others for transportation. After adjustment for sociodemographic variables, unmet need was associated with ages 3–6 years and with high pressure for parents to work. Children aged 3–6 were more than twice as likely to have unmet needs than children over 6–12 years. Those whose parents reported very high pressure to work were almost six times more likely to have unmet needs.

Solutions to these healthcare access issues for children in farmworker families are difficult to design, as the healthcare for low-income families in the US as a whole is in flux. While system-wide solutions may be scarce, there is evidence that government-sponsored programs for children in farmworker families, such as Migrant Education or Migrant Head Start, can serve as advocates and facilitators for greater access to care (Campbell-Montalvo and Castañeda 2019; Quandt et al. 2014).

### **7.2.2 Growth and Obesity**

The prevalence of overweight and obesity, defined as  $\geq 85$ th percentile and  $< 95$ th percentile of body mass index (BMI) for age and  $\geq 95$ th percentile of BMI, respectively, is high among children in farmworker families. A recent systematic review found that the prevalence of overweight ranged from 10% to 33% and obesity from 15% to 37% (Lim et al. 2017). These are in line with a recently published study

from California (Sadeghi et al. 2017), in which children 3–8 years of age had a prevalence of 19% for overweight and 26% for obesity. In the eastern US, almost identical prevalence figures were found for children ages 3–16 years of migrant farmworkers in Florida (overweight prevalence of 20% and obesity prevalence of 27%) (Rosado et al. 2013). Prevalence was about the same for overweight (20%) and slightly lower for obesity (22%) in slightly younger children (2.5–3.5 years) of migrant and seasonal farmworkers in North Carolina (Grzywacz et al. 2014). These investigators found that not only did these children show a propensity to overweight and obesity but they also experienced a very early adiposity rebound (Ip et al. 2017). That is, the increase children typically see in BMI in early childhood occurs for these children extremely early, predicting greater accumulation of body weight as children move toward adulthood.

The foundations of this excess overweight and obesity have been explored in a multiyear, prospective study in North Carolina. Diet quality of these young children was below optimum; in particular, their diets had excess added sugar and too few fruits, vegetables, and foods with whole grains (Quandt et al. 2016). Physical activity, as measured by accelerometers, was highly sedentary, with just a few minutes per day of moderate to vigorous activity, far below recommended levels (Grzywacz et al. 2014). This pattern of physical activity did not change during the 2 years these children were followed (Ip et al. 2016). Quandt et al. (2014) proposed the examination of the nutrition strategies of farmworker families with children to identify leverage points around child nutritional status (Fig. 7.2). Nutritional strategies include how families procure food, use food (preparation techniques, scheduling, and content of meals and snacks), and maintain food security (Quandt et al. 1998). The content of the nutritional strategies reflects *resources* such as the uncertain and uneven income schedules of farmworkers, government services, and assistance provided by members of social networks. Also reflected are *contextual factors* (e.g., food beliefs, parenting styles, personal experiences) and *environmental factors* (e.g., a migrant lifestyle, rural residence, housing, and cooking facilities).

Subsequent analyses examining these factors found a variety of child feeding styles practiced by parents. Those feeding styles that were somewhat disengaged (low in parent- or child-centered behaviors) were associated with poorer diet quality and higher child BMI (Ip et al. 2018). Part of parental lack of engagement with children appears due to mothers' experience of depressive symptoms. Almost a third of mothers had significant depressive symptomatology (Pulgar et al. 2016), and those with severe episodic or chronic symptoms were less likely to use a feeding style that was responsive to their children and more likely to feed children a low-quality diet (Marshall et al. 2018).

Beliefs parents hold that overexertion can be harmful to children's health and that sedentary behavior can help with learning complicate children getting sufficient physical activity (Grzywacz et al. 2016). In addition, environmental factors such as the lack of safe play spaces and play equipment in the neighborhoods in which farmworker families live likely promote sedentary activity for children (Arcury et al. 2015a, 2017).

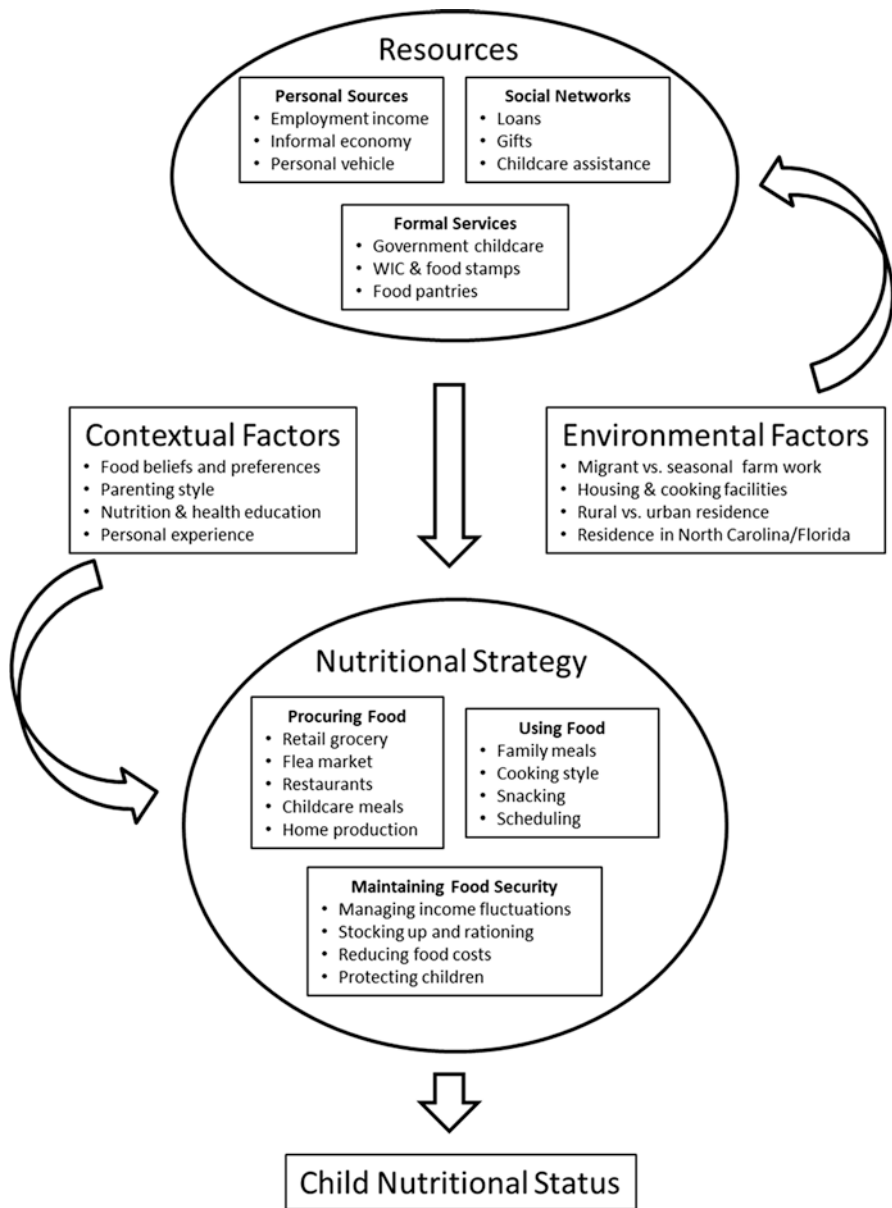


Fig. 7.2 Model of nutritional strategies of child feeding in farmworker families (Quandt et al. 2014)

Food insecurity has been documented among farmworker families with children in the eastern US, with half to two-thirds reporting lacking food security when asked retrospectively about the past year (Borre et al. 2010; Quandt et al. 2006). A more detailed analysis of food insecurity over a 2-year period showed that food insecurity for these families is largely a transient phenomenon, reflecting seasonality of work and income and documentation status, which may regulate families' access to such food safety net features as the Supplemental Nutrition Assistance Program (SNAP) (Ip et al. 2015). Food insecurity (and expectations of seasonal food insecurity) likely causes families to choose inexpensive low-quality foods and perhaps indulge children in food treats when money is available (Quandt et al. 2014).

Inappropriate levels of overweight and obesity and the dietary and physical activity patterns underlying them are likely tied to access to healthcare for children in farmworker families. An examination of the anticipatory guidance mothers reported receiving in North Carolina found that children with well-child visits annually were less likely to be obese than those who did not have such visits (14.8% obese vs. 35.5% obese) (Arcury et al. 2016). Almost all mothers reported receiving guidance on the child's weight, though much less often on dietary issues such as consuming sugar-sweetened beverages and the importance of family meals and physical activity issues such as limiting television watching and video game usage and increasing physical activity or exercise. It would appear that the lack of access to regular well-child visits may prevent parents from receiving such messages.

Further study of the role of programs such as Migrant Head Start in overweight and obesity of children in farmworker families is needed. Analyses from children in Michigan suggest that longer enrollment is associated with lower rates of obesity (Lee and Song 2015), which may reflect parental education provided by Head Start or the role of the on-site meal and physical activity programs.

### 7.2.3 Oral Health

Children in farmworker families are at risk of poor oral health due to a combination of factors, including ineffective oral hygiene and lack of access to dental services. Problems often start with caries in the primary dentition. Dental caries are caused by demineralization of teeth from bacteria-produced acid; dietary carbohydrates can encourage bacteria, and toothbrushing and dental sealants can protect the teeth.

Limited data are available on children in farmworker families in the eastern US. In a study of mothers of 79 children in North Carolina with an average age of 4.5 ( $\pm 2.9$ ) years, less than 20% reported their child's oral health was very good or excellent (Quandt et al. 2007). Pain, bleeding gums, and loss of permanent teeth were reported. Almost a quarter reported that they brushed their child's teeth never or only once per day. Three-quarters never flossed the child's teeth.

Carrion et al. (2011) reported a qualitative study of 40 farmworker parents in Florida drawn from a Migrant Head Start Center and a nonprofit migrant clinic sponsored by a religious organization. Quantitative data abstracted from the inter-

views showed that almost a third rated their children's teeth and two-thirds rated their own teeth as in fair to poor condition. About half said their children had never visited a dentist or had not visited in the past 2 years. Those who did see a dentist did so through the arrangements of the Head Start Center, which made appointments with local dentists, arranged payments, and provided transportation. Parents reported that seeing a dentist outside of the Head Start Center's program was expensive and required time off from work, during which they were not paid. They also had little knowledge of pediatric dentists who might accept Medicaid payments. These parents reported that the Head Start Center provided toothbrushes and toothpaste to the children, which they would not have had otherwise.

Programs to teach oral hygiene to parents have been developed and tested among farmworkers in the western US (Hoeft et al. 2015, 2016; Chang et al. 2018). In the eastern US, the East Coast Migrant Head Start Program (ECMHSP) has developed teaching materials for use with farmworker parents of infants and preschoolers. Cultural practices such as putting children to bed with bottles and belief that the primary dentition is unimportant obstruct the adoption of preventive practices (Hoeft et al. 2016). Dental care requirements for children in ECMHSP led to many of these children receiving preventive and restorative services, as reflected in Carrion et al.'s findings (2011).

The oral health of children can have both short- and long-term effects. In the short term, the experience of pain from caries and oral infections can reduce children's quality of life; oral health problems are one of the primary reasons for school absenteeism (Jackson et al. 2011). In the long term, functional aspects of the adult dentition can be compromised due to misaligned and lost teeth. There is also evidence that chronic oral health conditions like periodontitis lead to higher rates of heart disease (Dietrich et al. 2017).

One of the most important effects of childhood oral health problems is stigma and discrimination associated with appearance, which occur both in childhood and adulthood. Working with children in farmworker families in California, Horton and Barker (2010) show that farmworkers' poverty comes to be embodied in their visibly poor oral health. As children get older, their chances for employment and advancement are curtailed by the appearance of their teeth, and they often spend large sums trying to correct the problems of crooked or decayed teeth that result from inadequate early childhood dental care.

Being a noncitizen or naturalized citizen and lacking dental insurance are known to reduce the use of dental services by adults in the US (Wilson et al. 2016). Farmworker families are likely to lack employment-based dental insurance, but children may have some limited advantage because of their access to Migrant Head Start and, if born in the US, Medicaid insurance. Castañeda et al.'s (2010) ethnographic research with migrant farmworkers in Florida notes that, despite low dental health literacy, the real barriers to children receiving adequate dental services are structural. Although families are promised dental Medicaid assistance, this program promotes "false hope," as it is vastly underfunded. Because of the very low reimbursement rates, most dentists have begun to devote more time to providing charity care through free clinics and refuse to accept Medicaid patients in their private



practices. As these free clinics serve almost exclusively adults and are only one day, they cannot help children, who often need multiple visits to address their dental problems.

### **7.2.4 Vision**

Limited data exist about visual impairment and its treatment among children in farmworker families. One of the only studies of this was conducted in Georgia (Soares et al. 2019). Researchers screened 94 Latinx and 54 Haitian children, ages 4–17 years, at a migrant summer school during 2014 and 2015. Of these, 26% were found to have poor visual acuity (defined as less than 20/40 for ages less than 60 months, 20/30 for ages 60 months and older, or between-eye difference of at least two lines on the vision chart). Almost all (83%) of this poor visual acuity was resolved by correcting the refractive error. Most of the remaining problems were judged to be secondary to untreated amblyopia (“lazy eye”) in one or both eyes. All cases of amblyopia were found among the children.

The proportion of children with poor visual acuity in this study was significantly higher than that of African American and Latinx children in larger US studies of pediatric eye disease (Varma et al. 2006; Friedman et al. 2008). The proportion with reduced acuity due to amblyopia among the Latinx children appears to be high. Because amblyopia needs to be detected early in life so that treatment can be started, this study points to needs for early life screening, as well as continuing attention to detect problems that can arise during the school years.

### **7.2.5 Environmental Health**

Environmental exposures of children in farmworker families in the US contribute to their health disparities. Often the double jeopardy of living in impoverished environments (including living in dilapidated housing and near industrial chemicals) and inadequate public health information about detecting and preventing such exposures places these children at substantial risk. This risk is magnified in children, as their small body size, greater surface to volume ratio, higher energy need and respiratory rate, and lower ability to metabolize and eliminate environmental chemicals lead to higher exposures and doses of environmental toxins than adults would experience in the same environment (Roberts et al. 2012; Eskenazi et al. 2010; Marks et al. 2010). Children also differ from adults in that they have less mature metabolic processes, reproductive systems, and nervous systems, which may place them at greater risk of hazardous exposures. Children’s longer life expectancy means that they have longer latency periods to manifest effects of exposure. Finally, children are more vulnerable in that their emotional and behavioral immaturity may make them more susceptible to poor decision-making and, if hired farmworkers, less likely to challenge supervisor demands.

Current research on environmental health among farmworker children in the eastern US focuses on pesticides; older studies focused on lead exposure and parasites (Osband and Tobin 1972; Ungar et al. 1986). Research on the health effects of pesticides that link exposures to cognitive decline and neurological disease in adults has led recently to a focus on the role of pesticides in cognitive development of children. Despite a national focus on environmental factors as asthma triggers in housing of low-income populations, little research has been conducted on asthma among farmworkers' children in the eastern US.

### **7.2.5.1 Housing and Neighborhoods**

For young children who spend considerable time indoors, housing is their greatest source of environmental exposures. Historically, housing for the general population in the eastern US has been considered crowded (i.e., more than one person per room, excluding kitchens and bathrooms) (Housing Assistance Council 2000). Children live in more than 40% of the crowded units in states such as Florida, Kentucky, Maryland, New Jersey, New York, South Carolina, and Virginia, all states with large farmworker populations. It is important to consider all housing stock for children in farmworker families and not just camps on farms, as many families, particularly seasonal farmworker families, find housing in the local housing market and not on farms.

Beyond the housing units themselves, characteristics of the neighborhoods in which farmworker families live can present physical and mental health challenges. Arcury et al. (2014) assessed neighborhood characteristics of families with young children in North Carolina. About a third stated that the level of traffic on the street or road where they lived made it difficult to get out and walk, and this was strongly associated with stress experienced by the family and with lack of an outward orientation (e.g., to go out for social and recreational events). Other factors related to the location of farmworker family housing, such as time it took to drive to grocery stores, were also associated with family stress.

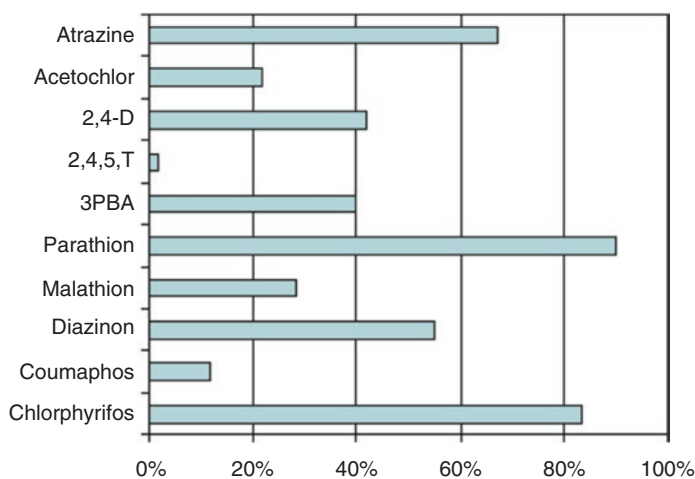
### **7.2.5.2 Pesticides**

Crowded and low-quality housing of farmworker families frequently leads to pesticide exposure. This exposure comes from two pathways. One is the take-home pathway, which includes pesticides adult farmworkers track into dwellings and automobiles on clothes, shoes, skin, tools, and farm products. If children go into pesticide-treated fields to play, they come in contact with pesticide residues. Those residues that get into housing are slow to break down, so they circulate in the air, contaminating toys, food, and other items young children may put into their mouths. A recent literature review noted there was convincing evidence of children of farmworkers receiving more take-home exposure than children of non-farmworkers (Hyland and Laribi 2017). Of the studies included, only two were conducted in the

eastern US, both in North Carolina, one using environmental samples (Quandt et al. 2004) and the other urinary metabolite biomarkers (Arcury et al. 2007). The second pathway is through the application of pesticides in housing and yards by landlords or family members to control pests. The poor condition of farmworker housing, like that of many economically disadvantaged families, often includes leaky pipes and inadequate food storage and trash disposal facilities, which attract pests. Holes in floors, walls, windows, and screens allow pests into homes (Quandt et al. 2015).

Pesticide exposure of children in farmworker communities is of concern because of the potential for developing a number of life-threatening conditions after cumulative exposure. While earlier established concerns have been for cancers, including childhood leukemia, brain cancer, and non-Hodgkin's lymphoma (Infante-Rivard and Weichenthal 2007), more recent longitudinal research among both farmworker and non-farmworker families has demonstrated the effect of pesticide exposure on child cognitive development. Bouchard et al. (2011) report that prenatal and postnatal exposure of children in a California farmworker community to organophosphate pesticides resulted in an average deficit of seven IQ points for children in the highest quintile of exposure, compared to the lowest quintile. Among non-farmworker families, similar effects of pesticides have been shown for children exposed prenatally and at early ages (Engel et al. 2011; Rauh et al. 2011).

Studies on pesticide exposure of farmworker children in the eastern US demonstrate that they are exposed to a wide variety of pesticides. A study of urinary metabolites collected in summer 2004 from 60 Latinx farmworker children aged 1–6 years in eastern North Carolina found metabolites of 13 of the 14 pesticides investigated (Arcury et al. 2007). These included metabolites of seven organophosphorus pesticides, of which those from parathion, chlorpyrifos, diazinon, and malathion were the most frequently found (Fig. 7.3). Other commonly found pesticide metabolites



**Fig. 7.3** Proportion of Latinx farmworker children aged 1–6 years with metabolites for specific pesticides in urine; North Carolina, summer 2004 (Arcury et al. 2007)

included evidence of pyrethroid insecticide 3PBA and the herbicides 2,4-D and acetochlor. The types of pesticides found demonstrate the role of drift or track-in as pathways in children's exposure. Chlorpyrifos was banned for indoor use in 2001. Parathion has no indoor use and is used in cotton, not in crops where farmworkers would work.

Urinary metabolites from organophosphate pesticides were analyzed from 16 children from ten Latinx farmworker families in western North Carolina (Arcury et al. 2005). In all cases, measurable dialkyl or dimethyl metabolites of organophosphorus pesticides were found. All but one child had at least one metabolite at or above the 50th percentile for total sample, age group, gender, and of Mexican Americans of the 1999–2000 cycle of the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention 2003; Barr et al. 2004). Ten of 16 children had at least one metabolite above the 90th percentile in comparison with the NHANES reference data.

Environmental wipe samples were collected from the floors, toys, and children's hands in 41 farmworker houses in western North Carolina with a child less than 7 years of age (Quandt et al. 2004). Samples were analyzed for eight pesticides known to be used in agriculture in the study area and 13 others commonly found in house dust throughout the US (Camann et al. 2000). The patterns of occurrence supported the idea of a pathway from floors to toys to children's hands. Pesticides were found in 95% of houses, with residential pesticides more common than agricultural.

All three studies tried to find predictors of exposure. In the western North Carolina studies (Quandt et al. 2004; Arcury et al. 2005), living adjacent to farm fields predicted the presence of agricultural pesticides and organophosphate metabolites; residing in a house judged hard to clean was a predictor of residential pesticides and organophosphate metabolites. In eastern North Carolina, boys, children in rental housing, and those with mothers working part-time had a greater number of pesticides detected (Arcury et al. 2007).

These studies suggest that pesticides are fairly ubiquitous in the environments where farmworker children live and play. Almost all children have some exposure. Detecting the exact predictors of pesticide exposure may take much more fine-detailed measurement, including timing of exposure relative to predictors. Health outcomes from pesticide exposure are equally inconclusive from studies in the eastern US. Beyond cognitive development studied in California (Bouchard et al. 2011), no studies have attempted to measure health effects of pesticides in farmworker children, either immediate or long-term effects. Based on existing research, it is impossible to know whether the levels of exposure observed in these children are dangerous. Except in the case of poisoning with very high amounts of pesticides, health effects known from epidemiologic and animal studies are the result of cumulative exposure over long periods of time. Nonetheless, these findings suggest that farmworker children live in an environment where cumulative exposure is likely and should be minimized.

In an effort to develop a method to decrease child pesticide exposure, a North Carolina team implemented a six-lesson, *promotora*-led behavior change intervention with 610 farmworker families of young children. *Promotoras* are lay health

advisors, who are members of the Latinx community. The home-delivered intervention was designed to increase parental knowledge of pesticide dangers for children, increase the use of integrated pest management strategies to reduce child exposures, and increase parental self-efficacy in preventing child pesticide exposure. Significant improvements in knowledge were observed, as well as significant improvements in practices related to take-home pesticide exposure and residential pest control (Quandt et al. 2013). Further data analyses showed that most of the improvement in behaviors was due to changes in pesticide knowledge rather than changes in self-efficacy or qualities of the *promotora* or the mother herself (Grzywacz et al. 2013). Although children in participating families were not tested for pesticide exposure, the study demonstrates that parents are interested in child health and willing to adopt measures that could protect their children from pesticide exposure.

### 7.3 Health of Hired Child Farmworkers

Much of the public has no knowledge that the fruits and vegetables piled in grocery store bins may have been harvested by hired children as young as 10 years old. That this is permissible under US labor laws is an even greater surprise for many (Fig. 7.4). Little is known about the characteristics of the Latinx child farmworkers in the US, even in the scientific community. The only nationally available data come from the National Agricultural Workers Survey (NAWS) and the Childhood

| <b>US farm job restrictions for children</b>   |  |
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| <b>Ages</b>  | <b>Rules under the Fair Labor Standards Act (1938)</b>   |
| 16+  | Any farm job, hazardous <sup>1</sup> or not, unlimited hours   |
| 14-15  | Any nonhazardous farm job outside school hours   |
| 12-13  | Any nonhazardous farm job outside school hours with parental permission or on same farm as parent(s)   |
| Under 12   | Any nonhazardous farm job outside school hours with parental permission but only where FLSA minimum wage requirements do not apply (i.e., small farms) |
| All ages   | No rules or restrictions for children working on a farm owned or operated by their parents   |
| <sup>1</sup> Hazardous tasks, as outlined in the Hazardous Occupation Orders in Agriculture, include working with and driving machinery, working with large animals, working from heights, working in confined spaces, driving passengers, working with toxic chemicals, and working with explosives |  |

Fig. 7.4 Job restrictions for children working in agriculture, by age (USDOL 2016)

Agricultural Injury Survey (CAIS). The only regional studies that have looked at various occupational health topics for hired adolescent farmworkers come from California, Washington, Oregon, Texas, and North Carolina. Comparison across studies is difficult; however, regional comparisons can help piece together a picture of child farmworkers in the US. This section focuses on hired child crop workers. Livestock workers are excluded, as evidence points to a majority of Latinx children working in crop agriculture. Each subsection compares national and regional research and includes information about the personal and work characteristics of hired child farmworkers and their exposures.

### ***7.3.1 What We Know About Child Farmworkers from National Data***

National estimates of hired child farmworkers are difficult to calculate. The NAWS collects data from farmworkers in crop agriculture. The sample includes interviews with youths aged 14–18 and asks farmworker parents about their younger dependent children who work on farms, though the information collected on child workers under 14 years old is very limited. Two recent reports drew from NAWS data to produce profiles and estimates of hired child workers. The estimates of child workers are disparate between these reports because one included 18-year-olds (Gabbard et al. 2014) in the estimate and the other was based on child workers 17 years old and under (United States Government Accountability Office (GAO) 2018). Gabbard et al. (2014) estimated that there were 84,000 youth 14–18 years old working on crop farms each year from 2004 to 2009 (6% of all crop workers) and 4000 children under 14 years old (Gabbard et al. 2014). The 2018 Government Accountability Office (GAO) report estimated that an average of 43,000 children 17 years old and under worked on crop farms between 2005 and 2008 (GAO 2018). The GAO report also calculated estimates from years 2009–2012 and 2013–2016, estimating 30,000 and 34,000 child workers 17 years old and under each year during those periods, respectively.

The CAIS also produces national estimates of hired youth from select years between 2001 and 2014 (CDC 2018a). The most recent estimate is from 2014 and suggests that 79,325 youth 17 years old and under were working as hired crop workers. The variation in these estimates from national datasets demonstrates the need for better methods for calculating numbers of child farmworkers in the US.

#### **7.3.1.1 National Demographics of Hired Child Farmworkers**

Both the 2014 and 2018 reports drawing from NAWS indicated that hired child workers were more often male than female and more often Latinx than white and were overwhelming likely to live below the national poverty level (Gabbard et al. 2014; GAO 2018). The 2014 report that included 18-year-olds indicated that 61%

were foreign-born and 74% had been in the US less than 2 years (Gabbard et al. 2014). This stands in contrast with the 2018 GAO report, which found that most Latinx workers 17 years old and under were US citizens. The 2018 report estimated the percentage of hired crop workers 17 years old and under by region from 2005 to 2016. Estimates show that there was a relatively even distribution of child workers in California, the Midwest, and Northwest regions, with fewer in the Southeast and Southwest.

### ***7.3.2 Regional Information About Hired Child Farmworkers***

Table 7.1 shows the limited scope of research examining the occupational safety and health among young hired Latinx workers from 2002 to 2018. Few of these studies were solely focused on hired Latinx child farmworkers, but some do distinguish between white youth working on family farms and hired Latinx children. Almost all existing research has obtained data through surveys, including face-to-face, telephone, and online surveys; many have recruited samples through high schools, largely from students in agricultural curricula or clubs like the Future Farmers of America. Additionally, the generalizability of results is restricted because multiple papers have been written on different aspects of the same parent study samples (Arcury et al. 2014, 2015b). Further, the age ranges of participants vary between studies, with many excluding workers under 13 years old and some including workers as old as 20.

#### **7.3.2.1 Non-eastern States**

Regional studies in California, Texas, and Washington have different sampling frames and should be compared with caution. However, for the studies that report demographic compositions of their samples, several trends can be observed. These trends are consistent with analyses of national data from the NAWS and CAIS (GAO 2018; Gabbard et al. 2014). First, it appears that the majority of Latinx and non-Latinx children hired for farm work are male, with figures across studies ranging between 60% and 70% male. Second, most of the young Latinx hired farmworkers 17 years old and under were born in the US, with sample percentages ranging between 56% and 85% US-born and the majority of foreign-born coming from Mexico. However, in studies that focused on migrant child farmworkers, participants were more likely to be foreign-born. Finally, although several studies do not report ages of samples in detail, children 16 years and older are slightly more likely to be represented in samples. This could indicate that older children are more likely than younger children to be hired for farm work.

**Table 7.1** Studies of hired child and youth farmworkers in the US, 2002–2018

| Authors                     | Site                | Topic  | Methods  |
|-----------------------------|---------------------|--|--|
| <i>National studies</i>     |                     |  |  |
| GAO report (2018)           | National            | Summaries of injury and fatality data and compliance strategies for working children                               | Review of NAWS, CAIS, CPS, and NASS data pertaining to children working in agriculture from 2003 to 2016 |
| Gabbard et al. (2014)       | National            | Profiles of youth, parents, and children of farmworkers in the US  | Review of NAWS and CAIS data from 2004 to 2009   |
| Westaby and Lee (2003)      | Ten selected states | Longitudinal examination of antecedents to youth injury in agricultural settings                                   | Survey, FFA students, $n = 3081$   |
| <i>Regional studies</i>     |                     |  |  |
| Arcury et al. (2019b)       | North Carolina      | Baseline characteristics of Latinx child farmworkers   | Survey, ages 10–17, $n = 202$  |
| Quandt et al. (2019)        | North Carolina      | Organization of work among Latinx child farmworkers  | In-depth interviews, ages 10–17, $n = 30$  |
| Arcury et al. (2015c)       | North Carolina      | Work safety culture among Latino youth farmworkers   | Survey, ages 10–17, $n = 87$   |
| Arcury et al. (2014)        | North Carolina      | Safety and injury characteristics of Latinx youth farmworkers  | Survey, ages 10–17, $n = 87$   |
| Kearney et al. (2015)       | North Carolina      | Work safety climate among Latino youth farmworkers   | Survey, ages 10–17, $n = 87$   |
| Perla et al. (2015)         | Washington          | Agricultural health and safety perspectives among Latinx youth   | Survey, ages 14–18, $n = 196$  |
| Bonauto et al. (2003)       | Washington          | Community-based telephone survey of work and injuries in teen agricultural workers                                 | Survey, ages 13–19, $n = 200$ (122 Latinx teens)   |
| Hennessy-Burt et al. (2013) | California          | Factors associated with agricultural work performed by adolescents from an immigrant worker population             | Survey, ages 11–18, $n = 101$  |
| McCurdy et al. (2012)       | California          | Agricultural injury among public high school students in agricultural sciences curriculum                          | Survey, mean age of 15, $n = 1783$   |
| McCurdy and Kwan (2012a)    | California          | Prospective agricultural injury experience among high school students enrolled in agricultural sciences curriculum | Survey, mean age of 15, $n = 946$  |
| McCurdy and Kwan (2012b)    | California          | Ethnic and gender differences in farm tasks and safety practices among high school students                        | Survey, mean age of 15, $n = 946$ (212 Latinx students)  |
| Peoples et al. (2010)       | California          | Health, occupational, and environmental risks of emancipated migrant farmworker youth                              | Focus groups, ages 13–22, $n = 29$   |

(continued)



**Table 7.1** (continued)

| Authors                   | Site   | Topic  | Methods   |
|---------------------------|--------|--|---|
| Salazar et al. (2004)     | Oregon | Latinx adolescent farmworkers' perceptions associated with pesticide exposure                            | Focus groups, ages 11–18, <i>n</i> = 33   |
| McCauley et al. (2002)    | Oregon | Pesticide knowledge and risk perception among adolescent Latinx farmworkers                              | Survey, ages 13–18, <i>n</i> = 102  |
| Shipp et al. (2013)       | Texas  | Occupational injury among adolescent farmworkers   | Survey, ages 13–19, <i>n</i> = 410  |
| Whitworth et al. (2010)   | Texas  | Relationship between neurotoxicity symptoms and injury among adolescent farmworkers                      | Survey, mean age of 15, <i>n</i> = 88   |
| Shipp et al. (2007a)      | Texas  | Pesticide training among adolescent farmworkers  | Survey, ages <14 to >18, high school students, grades 9–12, <i>n</i> = 324                            |
| Shipp et al. (2007b)      | Texas  | Lower back pain among farmworker high school students  | Survey, 14–18, <i>n</i> = 410   |
| Vela Acosta et al. (2007) | Texas  | Health risk behaviors and work injury among Latinx adolescents and farmworkers                           | Survey, ninth graders, <i>n</i> = 4914 ( <i>n</i> = 1347 with farm work experience)                   |
| Cooper et al. (2005)      | Texas  | Comparison of substance use, work, and injuries among migrant farmworkers vs. other rural Texas students | Survey, middle and high school students, <i>n</i> = 10,867 ( <i>n</i> = 545 from farmworker families) |

### 7.3.2.2 Eastern States

Those few eastern US studies that have collected information on nationality find trends observed in other regions that most Latinx child farmworkers 17 and under were born in the US. A 2014 study of 87 Latinx child farmworkers ages 10–17 in North Carolina found that 78% were born in the US (Arcury et al. 2014). These results are consistent with a larger North Carolina study with 202 Latinx child farmworkers ages 10–17, where 81% were US-born (Arcury et al. 2019b). Both studies found that the majority of foreign-born children were from Mexico, with a small percentage from Guatemala or another Central American country (Arcury et al. 2019b). Most Latinx child farmworkers in North Carolina are bilingual, with nearly all (99.5%) speaking Spanish and 84% speaking English (Arcury et al. 2019b). Boys make up the majority of child farmworkers, with both 2014 and 2019 studies having nearly identical gender ratios (62% boys vs. 38% girls).

North Carolina studies have found that the majority of child farmworkers are enrolled in school. Seventy-five percent (Arcury et al. 2014) and 95% of child farmworkers (Arcury et al. 2019b) reported current school enrollment. In the latter study, nearly one-quarter of those enrolled in school worked in farm work during the fall semester and nearly one-third worked during the spring semester. Of those who

worked during the school year, very few children (4%) reported that they had missed school days in order to do farm work. The majority of children in both studies reported working during summer vacation (Arcury et al. 2014, 2019b). A Texas study found that migrant farmworker students were more likely to work before school than nonmigrant students (Cooper et al. 2005).

### 7.3.3 Model of Risks Stemming from Organization of Work

Collectively, existing studies paint a picture of the elevated risk of performing agricultural work at a young age. Farm work in the US is organized in a way that places farmworkers at risk of injury and poor health outcomes, with children being especially vulnerable to such risks. The conceptual model of hired child farmworkers (Fig. 7.5) is helpful for delineating factors that influence health outcomes. Additionally, this framework helps extend analyses to compare the experiences of Latinx child farmworkers in the US, as many of the macro-level forces affecting risk are not specific to one region. In this model, child farmworker health is directly influenced by occupational, social, and environmental hazards. However, characteristics of the child and the work itself can buffer or exacerbate health outcomes from work hazards. Child characteristics that can protect against work hazards include both personal (e.g., gender, age, status, accompanied by adult family member) and developmental (e.g., physical, emotional, cognitive). Characteristics of the work environment include multilevel factors including the external context (economic, legal, political, technological, and legal forces), organizational context (manage-

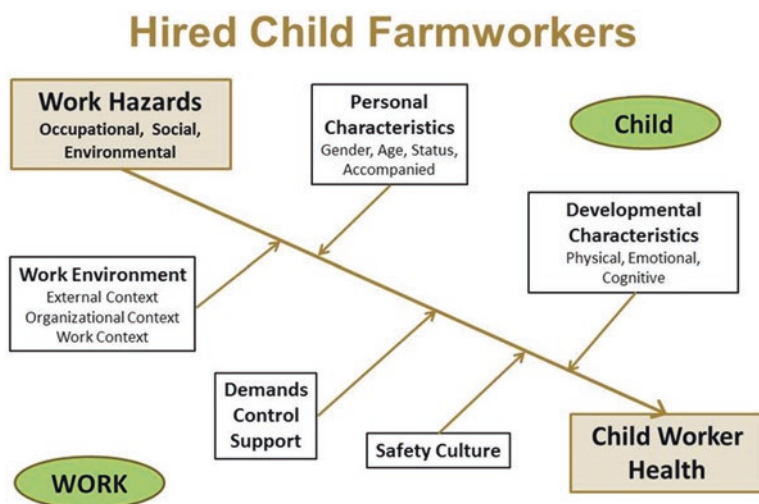


Fig. 7.5 Conceptual model of the organization of work for child farmworkers (Quandt et al. 2019)

ment structure, supervisory practices, production methods, and policies), and work context (job characteristics) (Sauter et al. 2002; Landsbergis et al. 2014). The work's demands, control, support (Karasek and Theorell 1990; Snyder et al. 2008), and safety culture can influence child workers' health outcomes, with high-demand jobs and low levels of control or support resulting in poor health.

### **7.3.4 *What Do We Know About the Work Child Farmworkers Perform***

Child farmworkers labor in a variety of farm operations, crops, and tasks. While existing research does not always distinguish between ethnicities, it reveals several ways in which Latinx children differ from their white counterparts. Latinx children are more likely to live below the poverty level, less likely to work on an operation owned or operated by their family members, and more likely to work in tasks related to planting, cultivating, and hand harvesting rather than tasks such as operating machinery.

#### **7.3.4.1 Nationally**

The reports drawing from NAWS data (Gabbard et al. 2014; GAO 2018) estimate that, of all hired crop workers surveyed (children and adults) between 2003 and 2016, more than one-third (39%) began working in US agriculture when they were 18 or younger. Seven percent reported beginning farm work before the age of 14 years, and 32% reported beginning between ages 14 and 18 years. Between 2004 and 2009, 85% of youths were employed directly by a grower, and the other 15% reported employment by a farm labor contractor (Gabbard et al. 2014). However, this has likely changed in the last 10 years, as farm consolidation continues to shift farm labor employment to contractor arrangements, particularly in crop agriculture. In a study of 410 high school farmworkers in Texas, a little over one-third reported working for a small owner or grower, and a little under one-quarter reported working for a contractor only; over one-quarter reported working for a combination of employers or other arrangements (Shipp et al. 2013). Such results should be interpreted with caution, as a qualitative study in North Carolina highlighted that child workers may not fully understand the arrangements of their employment (Quandt et al. 2019).

From 2004 to 2009, the largest group of 14- to 18-year olds were working in vegetable crops (30%), with a little over a quarter (27%) working in horticulture and less than a quarter (24%) working in fruits and nuts. Field crops and miscellaneous made up the remainder (Gabbard et al. 2014). Over one-half of youth crop workers (55%) performed preharvest and harvest tasks, while 45% performed postharvest, technical, or other tasks (Gabbard et al. 2014). Almost 90% of 14- to 18-year olds

from 2004 to 2009 were paid by the hour, with the rest being paid piece rate. Average wages were very low, around \$7.25 per hour; and the majority of youth who had worked in the previous year made less than \$10,000 from farm work.

### 7.3.4.2 Regionally

A California sample of 946 rural students working in agriculture included 212 Latinx students (McCurdy and Kwan 2012a). Latinx students were more likely to work in hand harvesting of crops and were less likely to perform hazardous tasks involving chemicals and machinery, respectively, than white males (McCurdy and Kwan 2012b). Another California study consisting of 101 Latinx farmworkers between 11 and 18 found that participants worked in melons, tomatoes, cotton, and nuts and completed tasks including hoeing, packing, and picking (Hennessy-Burt et al. 2013). Fifteen percent of the sample started farmwork at age 14 or younger, and youth with lower acculturation levels were four times more likely to begin working at a younger age (Hennessy-Burt et al. 2013).

In Washington, a 2003 study of 200 Latinx and white teenage agricultural workers found that Latinx teens were less likely to work or live on a farm owned by a family member (Bonauto et al. 2003). Forty-four percent of the Latinx teens reported that they had started working in agriculture when they were 12 years of age or younger (Bonauto et al. 2003). Consistent with what was observed in California and national findings, other studies in Washington and Oregon found that most Latinx teen farmworkers performed the tasks for harvesting crops (Perla et al. 2015; Salazar et al. 2004; McCauley et al. 2002).

Texas research with 410 high school student farmworkers aged 14–18 reported that students worked in a wide variety of crops, but those most commonly reported were cotton, corn, melons, and peanuts. In contrast to other regional studies where harvesting was the main task, Texas participants reported cutting, clearing, cleaning, and hoeing more frequently (Shipp et al. 2013).

In a sample of 202 Latinx child farmworkers aged 10–17 in North Carolina, over half reported 2 or less years working in agriculture, and a little over one-third reported 3 or more years of experience (Arcury et al. 2019b). These children worked in a variety of crops and farm labor tasks. Across two separate studies with samples of 87 and 202 Latinx child workers, topping tobacco was the most common job that child workers occupied (Arcury et al. 2014, 2019b). Picking blueberries, harvesting sweet potatoes, and working in tomatoes were also common jobs for children. Most of the tasks across crops involved activities required for the growth, maintenance, and eventual harvest of crops including planting, weeding, and picking; fewer involved driving vehicles or operating machinery (Arcury et al. 2014, 2019b).

Over three-fourths (77%) of child farmworkers in the 2019 North Carolina study were paid directly, and nearly a quarter of child farmworkers' pay was given to their parents (23%), with younger children's pay more likely to go to parents. Workers were usually paid cash rather than by check. A third of child workers reported being paid at piece rate, while two-thirds were paid by the hour. The majority who were

paid at an hourly rate received between \$8 and \$9; however, some workers reported unpaid work time waiting for crops to dry or equipment repair or time spent traveling from field to field (Arcury et al. 2019b).

### 7.3.4.3 Critical Aspects of Organization of Work for Child Farmworkers

As is evident from national and regional studies cited above, the organization of work poses several threats to the health and safety of child farmworkers; Quandt et al. (2019) document many of these in qualitative data from child farmworkers in North Carolina. First, work is largely based on the crew leader system, with children being supervised by a crew leader who is tasked by a grower with completing field-work, often on a deadline and for a set amount of money. Such a situation may make children pressured to work more quickly than safely. Indeed, in a 2014 study, 38% of Latinx child farmworkers reported that their supervisors were only interested in doing the job fast and cheaply (Arcury et al. 2015c). With pressure to get the work finished, heat stress or reentering fields treated with pesticides too soon may occur. Some of these demands may be countered by support from coworkers and family; Quandt et al. (2019) found this support to be more common for younger children than for teen workers.

North Carolina studies have demonstrated low levels of work safety culture and poor levels of safety climate (Arcury et al. 2015c; Kearney et al. 2015). Using qualitative data, Arcury et al. (2019a) present a conflicted view of work safety culture for child farmworkers. These children are told by their families to work safely; indeed, family members often teach the children in the fields how to perform their tasks in a safe manner and ensure that children are wearing the proper personal protective equipment for the job. Yet children see their coworkers and their supervisors placing a much lower value on working safely, not wearing appropriate personal protective equipment, and taking risks. While some of the children attribute any suggestion of working safely to altruism of the supervisors, others see this behavior as more pragmatic: supervisors do not want to get into trouble, and they want to keep production levels high. Supervisors provide little safety training; most provided is simply in the context of training a child to do a task. In a few cases, children were told to watch a safety video and then sign a paper indicating they had watched it.

### 7.3.5 *Exposures and Health Outcomes for Child Farmworkers*

While there is a substantial body of literature examining the health and exposures of adult farmworkers, little to no research has documented the health of child farmworkers. Translating research on adults to child populations requires some consideration of the differences between children and adults and how these may influence outcomes from workplace exposures (see Sect. 7.2.5). These differences between adults and children raise concern about the appropriateness of children working

where they are exposed to environmental hazards, including pesticides, nicotine, and heat, and social hazards such as discrimination and interpersonal violence.

### 7.3.5.1 Injuries and Fatalities

#### Nationally

The Childhood Agricultural Injury Survey (CAIS) collects injury and demographic data for youth less than 20 years old who live on, work on, or visit farms. Data are available from years 2001, 2004, 2006, 2009, 2012, and 2014 (CDC 2018b). While recent reports show a downward trend for nonfatal injuries from 2001 to 2014 for all youth, rates are still extremely high, with about 33 children injured in agriculture-related incidents every day (CDC 2018c). The CAIS does not include injuries to contract laborers, so actual numbers, especially for Latinx child workers, are likely higher.

Fatality rates for children living and working on farms are also high. From 2003 to 2016, 237 children died in agriculture-related child incidents, which accounted for 52% of work-related child fatalities across all industries (GAO 2018). In 2015, young agricultural workers were 44.8 times more likely to be fatally injured, when compared to all other industries combined (CDC 2018c). Within the broad North American industry classification of agriculture, forestry, and fishing and hunting, 60% of child fatalities from 2003 to 2016 were in crop production, 28% in animal production and aquaculture, and the rest in forestry and fishing (GAO 2018).

#### Regionally

Calculated injury rates are difficult to compare across studies due to different definitions of injuries and uses of self-report. A California study calculated a cumulative 1-year injury incidence of 2.4% for the 212 Latinx teen farmworkers in the sample (McCurdy et al. 2012). In Texas, severe back pain was reported by 15.7% of a sample of 410 largely migrant Latinx youth farmworkers (Shipp et al. 2007b). In this sample, the estimated rate of nonfatal injuries was 27.0/100 full time equivalents (FTE) for the most severe injury types, and this rate increased to 73.6/100 FTE when broadening the injury definition (Shipp et al. 2013). The estimated rate for severe injury in Texas is similar to that found in Washington (20.8/100 FTE) in a sample of 122 Latinx teen farmworkers (Bonauto et al. 2003). Whitworth and colleagues found a positive association between reported neurotoxicity symptoms and injury among adolescent farmworkers in Texas (Whitworth et al. 2010). Another Texas study found that migrant farmworker students were more likely to report work-related injuries than nonmigrant students (Cooper et al. 2005). A 2014 survey of 87 Latino youth farmworkers in North Carolina found that 54% reported a musculoskeletal injury, 60.9% reported a traumatic injury, and 72.4% reported a dermatological injury in the previous year (Arcury et al. 2014).

### 7.3.5.2 Pesticides

Agricultural workers are exposed to a wide variety of toxic chemicals including herbicides, insecticides, and other pesticides which can have both immediate and long-term health effects. Acute poisoning, characterized by vomiting, diarrhea, and excessive salivation, can result from encountering concentrated chemicals in the fields or during mixing and loading. Chronic exposure to pesticides occurs through contact with pesticide residues on plants, soil, or tools that are transferred to the skin. The long-term effects of chronic exposure are increasingly understood to include cancer, neurodegenerative disease, and reproductive problems (see Sect. 7.2.5.2). Child farmworkers may be exposed to pesticides through direct contact from mixing or applying, drift from nearby spraying, and chemical residues in the fields on plants or brought home on clothes by themselves or family members.

In NAWS data from 2003 to 2016, 14% of 16-year-olds and 8% of 17-year-olds reported that they had mixed, loaded, or applied pesticides in the previous year (GAO 2018). California research found that nearly a quarter of Latinx boys reported mixing or applying chemicals, with a median age at initiation of 14 (McCurdy and Kwan 2012b). A 2002 Oregon study had similar results; 22% of 102 Latinx adolescents reported mixing or applying chemicals in their current job (McCauley et al. 2002). Twenty-two percent of Latinx child farmworkers in North Carolina reported working within view of fertilizer or pesticide applications in the previous week, and 12% worked in an area where pesticides had been applied in the previous week (Arcury et al. 2014). They may also be at risk of exposure to chemical residues brought into the home from parents; 18% of farmworker parents in the NAWS with dependent children reported working with pesticides in the previous 12 months (Gabbard et al. 2014). Children 16 and 17 years of age are legally permitted to apply pesticides.

Pesticide safety knowledge can help workers protect themselves from pesticide exposure. Federal law mandates Worker Protection Standard (WPS) training, which includes pesticide safety, for all agricultural workers (Environmental Protection Agency 2018). Unfortunately, pesticide safety training, knowledge, and behaviors appear to be low among Latinx children working in agriculture. In Oregon, only 32% of adolescent farmworkers reported that they had received safety training; only half wore protective clothing or equipment when working; and low pesticide knowledge was associated with low use of protective measures (McCauley et al. 2002). In Texas, only 21% of adolescent farmworkers reported ever receiving pesticide safety training (Shipp et al. 2007a). In focus group interviews with 33 migrant farmworker youth in Washington, researchers noted that youth were only vaguely aware of the dangers of pesticide exposure, but were also aware that workplace constraints sometimes limited their ability to enact safe practices (Salazar et al. 2004). Training levels in North Carolina studies were significantly lower. Arcury and colleagues found that only 6% of 87 youth farmworkers reported receiving pesticide training in the previous year and 8% reported ever receiving pesticide training. Further, youth reported a negative work safety climate and culture, which were associated with increased pesticide exposure risk (Arcury et al. 2015c; Kearney et al. 2015).

### 7.3.5.3 Tobacco and Nicotine

Child farmworkers in the eastern US are distinct from workers in most other regions because they are likely to work in tobacco production. North Carolina is the leading tobacco-producing state, followed by Kentucky, Virginia, and Tennessee (Statista 2019). Tobacco production is particularly dangerous, compared to other crops, yet limited research is available documenting the health effects of child involvement in the US.

In North Carolina, 46% of a 2013 sample of 87 child farmworkers and 57% of a 2017 sample of 202 child farmworkers stated that they had worked in tobacco in the last week that they worked in agriculture (Arcury et al. 2014, 2019b). The most common job reported for child tobacco workers was topping tobacco (50% of entire sample), while only 4% reported working in the task of barning harvested tobacco. Topping tobacco involves inspecting individual plants to break off the flower that grows on top, removing “suckers” (*retoños*) that grow at the joint between the main stem and secondary leaf stems and applying a growth regulatory chemical. This task results in contact with the leaves and can lead to green tobacco sickness (GTS). GTS is acute nicotine poisoning that occurs when nicotine is absorbed through the skin (Arcury et al. 2003; Quandt et al. 2001). The differential diagnosis for GTS is nausea or vomiting and headache or dizziness within 24 h of working in tobacco (Arcury et al. 2001a). Contact with plants wet from dew, rain, and perspiration, as well as working in wet clothes, increases risk of GTS, as water on the plants contains high amounts of nicotine (Arcury et al. 2001b; Gehlbach et al. 1975). Two Human Rights Watch reports interviewed child tobacco workers in four states and found that most reported experiencing symptoms consistent with GTS (Human Rights Watch 2014, 2015). In a study of adult tobacco workers in North Carolina, workers with four or less years of experience were more likely to experience GTS than those with 5 or more years (Arcury et al. 2001a). This is a cause for concern among child tobacco workers, as they are unexperienced, have a lower tolerance to nicotine, and may not know how to work safely with tobacco plants.

Workers generally recover from GTS within a few hours to a few days. Long-term effects of work-related nicotine poisoning are unknown; however, evidence from adolescent smoking studies shows that childhood nicotine exposure has detrimental effects on long-term brain development (Goriounova and Mansvelder 2012; Dwyer et al. 2009). Adolescent nicotine exposure affects gene expression and neuron structure, which can lead to functional and structural cognition changes including attention deficit and lower impulse control (Goriounova and Mansvelder 2012). Studies from rodent models have demonstrated that brain changes during sensitive maturational periods are due to nicotine rather than other chemicals found in cigarettes (Dwyer et al. 2009).

An examination of global tobacco production that compared child labor in the US, Kazakhstan, and Malawi highlights the fact that, although the US has ratified the International Labor Organization’s (ILO) Convention Number 182 (one of the eight fundamental conventions of the ILO, which seeks to eliminate some of the worst forms of child labor such as slavery and work that, by its nature, is likely to



harm the health, safety, and morals of children), it has not passed any laws (e.g., age restrictions) that would protect child tobacco workers (Ramos 2018). Human Rights Watch (Human Rights Watch 2014, 2015) and others have called for federal regulations to prohibit children under 18 from engaging in hazardous work on tobacco farms in the US, but there has been no action.

#### 7.3.5.4 Heat

Much of the work that hired child farmworkers do in the US occurs during the hottest months, regardless of region. Crop workers are at increased risk of heat-related illnesses including heat rash, heat cramps, heat exhaustion, and heat stroke, which can be life threatening. Symptoms vary, but commonly include nausea, dizziness, headache, and fainting. A national review of heat-related fatalities from 1992 to 2006 found that the fatality rate for crop workers was 20 times greater than US civilian workers (CDC 2008). Nineteen percent of crop worker fatalities during that timeframe occurred in North Carolina (CDC 2008).

A substantial amount of research has documented heat-related illness fatalities among adult farmworkers in the US and specifically in North Carolina; however, child workers are absent from these analyses. In a survey of 300 North Carolina farmworkers, 94% reported working in extreme heat; of those, 40% reported heat-related symptoms (Mirabelli et al. 2010). These results are consistent with a later study in which 35.6% of farmworkers surveyed reported heat-related symptoms; associated factors were working in wet clothes and shoes, harvesting and topping tobacco, and spending after-work time in an extremely hot house (Arcury et al. 2015b). Another North Carolina study reported heat-related illness prevalence of 72% among workers reporting one heat-related illness symptom and 27% among those reporting three or more symptoms (Kearney et al. 2016). Child workers may be at greater risk than adults of heat-related illness due to their inexperience in maintaining hydration during physical activity and their susceptibility to pressure from supervisors and coworkers to continue working in dangerous conditions (Quandt et al. 2019).

#### 7.3.5.5 Social Exposures

In addition to environmental hazards, child farmworkers are also at risk of detrimental social exposures such as interpersonal violence and discrimination. Several aspects of the organization of farm work increase risk of interpersonal violence and discrimination. Farm work fields are generally isolated in rural environments away from regulatory or law enforcement entities. Workers may be susceptible to violence and discrimination perpetrated by employers or local residents because they fear retaliation, loss of job, or, in some cases, deportation, if they complain. Ten percent of a sample of 87 youth farmworkers in North Carolina experienced some level of sexual harassment, and this was likely underreported (Arcury et al. 2014).

Another qualitative study with 30 child farmworkers in North Carolina described a work environment with little oversight and few protections from potential violence, harassment, and discrimination (Quandt et al. 2019). Several other qualitative studies of adult farmworkers in California and Oregon have reported high levels of sexual harassment in the fields (Castañeda and Zavella 2003; Murphy et al. 2015; Waugh 2010). A Human Rights Watch report describes the myriad ways in which immigrant farmworkers are vulnerable to sexual violence and sexual harassment (Human Rights Watch 2012) (see also Chap. 6). With limited studies and the sensitive nature of the topic, it is difficult to quantify this problem. Any amount of sexual violence and discrimination in workplaces is unacceptable; it is particularly egregious for vulnerable children to be subjected to these environments.

## 7.4 Conclusions

Children in farmworker families, whether employed as hired farmworkers themselves or not, face significant health threats. Like many children in low-income families, they lack adequate access to healthcare. The situation may be worse for these children because of issues with documentation status, restriction placed on access to government safety net programs for immigrants, and fear of deportation in an uncertain political climate. Limited parental resources, whether housing or access to healthy food, link to health threats.

Hired child farmworkers constitute a hidden population within the larger farmworker population. They are at risk due to their immaturity: their bodies, particularly the brain and nervous system, are still developing; and they may not have sufficient experience to make good decisions about health and safety. Policies to protect child workers are weaker in agriculture than in other industries.

The research base for Latinx children in farmworker families in the eastern US is thinner than in other parts of the US that have a longer history of Latinx farmworkers. There have been two significant advances in the last 10 years. These have been the research focused on overweight and obesity among children in farmworker families and the research on health risks of Latinx hired child farmworkers. The last 10 years has also seen considerable attention by journalists and advocacy groups (e.g., Human Rights Watch, Association of Farmworker Opportunity Programs) to the situation of hired child farmworkers (Human Rights Watch 2014, 2015; Association of Farmworker Opportunity Programs 2019). Additional research studies are needed to identify and design prevention programs for health and safety risks.

## 7.5 Recommendations

Research should be conducted to better document conditions of children in the farmworker community. Future research should prioritize the perspectives of farmworker communities and ensure that they have a voice in how the research proceeds

from beginning to end (see Chap. 8). These children are often unseen, because of their rural residence and the hidden nature of farmworker residences, and fail to access services for multiple reasons, including parents' fear generated by immigration tensions. In the eastern US, a larger proportion of farmworkers, and, consequently, children in farmworker communities, live in the southern states. These states, on the whole, have a history of denying services to minority residents, passing anti-union legislation, and providing more limited social and health programs. These factors make the research and policy needs of these children all the more imperative.

For children in farmworker families, these research recommendations include the following:

- Documenting the numbers of such children and their personal and health characteristics.
- Evaluating evidence-based interventions, including those to (1) reduce overweight and obesity and (2) increase access to healthcare, particularly at early ages.

For child farmworkers, research recommendations include the following:

- Implementing surveillance systems to document the personal and work characteristics of hired child labor. While such data are currently collected in the NAWS, data are inconsistent across ages, with very little collected on the youngest workers.
- Implementing surveillance systems to record occupational illness, injury, and death data from hired child labor. Such data could be collected in the NAWS, though more focused studies on children are necessary, and would likely require a greater emphasis on finding minors.
- Conducting focused research on the impact of hired farm work on children, including examination of the educational and health impact of such work. Prospective data collection is essential to be able to establish causality of farm work on such outcomes.

Beyond research, policy regarding children in the farmworker community must be changed. For children in farmworker families, greater access to the full range of state and federal health services is crucial. These include medical, nutritional, dental, and educational services. While many of these children are US citizens and therefore should have full access to services, greater implementation of outreach to ensure the use of services is needed to achieve equity with other citizen children. In particular, children should have full access to well-child medical and dental care and to the anticipatory guidance provided at such healthcare visits. Policy changes to increase the portability of Medicaid and other state-based insurance systems from one state to another are important for children in the eastern US whose families migrate. Likewise, policy changes are needed to extend programs for migrant farmworkers (e.g., Migrant Education and Migrant Head Start) to seasonal farmworkers as they settle out of the migrant stream.

For child farmworkers, the need for policy change is clear. The rationale is outdated for exempting agriculture from the child labor provisions of the Fair Labor Standards Act that are applied to all other industries. These hired child farmworkers

are not working on their parents' farms. They are working in much the same conditions and often alongside adult farmworkers. Policies should be implemented at the federal level to protect these children by (1) eliminating all work in agriculture until age 16 and (2) prohibiting hazardous work until age 18. This will bring child labor in agriculture to the standard enforced for all other industries in the US. Many children go to the fields to work out of the necessity to supplement the low wages of their farmworker parents. Raising the federal minimum wage and eliminating the exemption of overtime pay for agricultural workers would increase the incomes of farmworker parents and reduce the need of children to work alongside their parents.

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