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Current State of Child Health in Rural America: How Context Shapes Children's Health

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Abstract

Purpose—Children's health is influenced by the context in which they live. We provide a descriptive essay on the status of children in rural America to highlight features of the rural environment that may affect health.

Description—We compiled information concerning components of the rural environment that may contribute to health outcomes. Areas addressed include the economic characteristics, provider availability, uniquely rural health risks, health services use, and health outcomes among rural children.

Assessment—Nearly 12 million children live in the rural US. Rural counties are economically disadvantaged, leading to higher rates of poverty among rural versus urban children. Rural and urban children are approximately equally likely to be insured, but Medicaid insures a higher proportion of children in rural areas. While generally similar in health, rural children are more likely to be overweight or obese than urban children. Rural parents are less likely to report that their children received preventive medical or oral health visits than urban parents. Rural children are more likely to die than their urban peers, largely due to unintentional injury.

Conclusion—Improving rural children's health will require both increased public health surveillance and research that creates solutions appropriate for rural environments, where health care professionals may be in short supply. Most importantly, solutions must be multi-sectoral, engaging education, economic development, and other community perspectives as well as health care.

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Keywords

children's health; epidemiology; health disparities; rural; social determinants of health

Children's health and life prospects are entwined with the context in which they develop. The descriptive essay presented below explores the rural context in America and notes some of the implications of this context for children's health. Our perspective emerges from multiple theoretical stances, including Andersen's behavioral model^{1,2} and Stokols' social ecological approach,³ which posit that health outcomes are influenced by contextual as well as individual characteristics. Contextual factors include local demographic, economic, social, and belief structures, as well as local implementation of health policy; the availability, organization and quality of local institutions and infrastructure; and finally, environmental factors. In the sections that follow, we discuss definitions of rurality, how the rural economy affects the status of children, children's health, risk factors in the rural environment, and health services use among rural children.¹

Context: Rural Defined

"Rural" has multiple definitions, set to meet varying policy and research needs.⁴ Lack of uniformity hampers efforts to summarize research on rural children. When citing prior research, this essay specifies the unit at which "rural" is measured, when provided by the authors of the work cited. Whenever possible, we base our presentation on national or nationally representative data. Given the variations in rural environments across the US, however, research relevant to risks faced by rural children is often highly geographically specific.

Rurality is most often measured at the county level, since county boundaries, unlike Census tracts, ZIP Code Tabulation Areas (ZCTAs) or other small area measures, coincide with a unit of government and are relatively unchanging over time. The largest dichotomous measure is the metropolitan/nonmetropolitan definition of the Office of Management and Budget, which categorizes counties as metropolitan or urban if they contain a population cluster with more than 50,000 persons, and nonmetropolitan or rural if they do not. The term "micropolitan" is sometimes used for rural counties that contain a town with between 10,000 and 50,000 residents. Because a single urban area of more than 50,000 residents within a county leads to a metropolitan classification for all residents, county-based definitions undercount rural populations in states where counties encompass large geographic areas. For example, the Grand Canyon and most of California's Central Valley both fall in metropolitan counties.⁵ Unless noted otherwise, we use the terms "large" rural and "small" rural to refer to population size and not to geographic size. Thus, large rural counties contain at least one cluster of 10,000–50,000 residents, whereas small rural counties have only clusters with fewer than 10,000 people.

¹Any differences noted between rural and urban children were statistically significant in the source document from which the information was drawn; other observations are characterized as "similar."

Based on the nonmetropolitan county definition, rural America contained 11.8 million children ages 0 – 17 years in 2010, principally non-Hispanic white (hereafter, white 71.8%), Hispanic (11.9%), non-Hispanic black (hereafter, black 9.4%), Asian (0.9%) and “other” (6.1%).⁶ Reflecting changing American demographics, the *absolute number* of both white and black rural children declined between 2000 and 2010, while other populations increased.⁶

Economic Characteristics of Rural America

Rural counties are economically diverse. While nearly all farming and mining counties are nonmetropolitan (91.6% and 88.3%, respectively), these categories make up only 25.1% of all rural counties (Table 1).⁷ Among counties with a specialized economic base, manufacturing is the leading type for both urban and rural counties. Rural counties are over-represented in the adverse sociodemographic indicators tracked by the Economic Research Service of the US Department of Agriculture. The majority of persistent child poverty counties (82%), low employment counties (86.1%), and low education counties (80.2%) are rural.

Poverty is particularly acute among rural children. Of the 100 US counties with the highest childhood poverty rates, 95 are rural counties, and 66 are counties in which white residents are in the minority.⁷ Measured at the county level, 25.2% of rural and 21.1% of urban children lived below the Federal Poverty Level (FPL) in 2014.⁸ More than half of rural African American children (51.1%) live in poverty, versus 37.2% of similar urban children; comparable values for non-Hispanic white children were 19.5% and 11.4%, respectively.⁸ The 2011–2012 National Survey of Children’s Health found that 41.8% of children in urban ZCTAs were low income, at or below 199% of the FPL, versus 54.0% of children in both large rural ZCTAs (areas in and around towns of 10,000 – 50,000 persons) and smaller rural ZCTAs.⁹ An estimated 29% of rural children are served by 1 of the 4 federal child nutrition programs (school lunch, school breakfast, Women Infants and Children and the Child and Adult Day Care Food Program).¹⁰ Persistent child poverty counties, in which the rates of children in poverty have exceeded 20% for the past 30 years, are concentrated in central Appalachia, the Deep South, the US-Mexican border, the Southwest, the Central Valley of California, and the American Indian reservations of the Northern Plains (Figure 1).

Rural and urban children are approximately equally likely to be insured, but from different sources: Medicaid insures a higher proportion of children in rural versus urban areas (urban ZCTAs, 34.9%, large rural ZCTAs 44.3%, small rural ZCTAs 46.8%).⁹ Overall, between 5.6% and 6.1% of rural children lack any insurance coverage, but this proportion markedly increases for vulnerable subgroups, reaching 22.0% uninsured among children in Hispanic households in large rural ZCTAs. Parents from rural counties are less likely than urban parents to report that their child’s insurance covers dental care.¹¹

Provider availability is lower in rural counties, both in areas specifically designated as health professional shortage areas (HPSAs) and in general. Only 15.1% of the nation’s 2,054 rural counties are *not* whole or part-county HPSAs, versus 22.8% of urban counties.¹² In urban non-HPSA counties, there is an average of 976 patients per physician; in urban HPSA

counties, this increases to 1,590 patients for each physician. In rural, non-HSPA counties, the ratio is 1,286 persons per physician, increasing to 1,845 in rural HPSAs.¹³ Directly relevant to rural children, 56.6% of rural counties lack even a single pediatrician.¹²

Compared to urban counties, rural counties have fewer generalist dentists (22 per 100,000 persons in rural versus 30 per 100,000 in urban counties).^{13, 14} Suggestive of greater future disparities, 42% of rural dentists were age 56 or older, versus 38% of urban dentists.¹⁴ Ancillary health care providers, such as physical, occupational or speech therapists, mental health and substance use counselors, and medical social workers, are also in short supply in rural areas.^{15,16}

Health Status Among Rural Children

It is difficult to build a comprehensive picture of rural child health and development from previous research. While prevalence patterns for various health conditions and associated outcomes have been described for rural children in the aggregate, information stratified by child age, gender, ethnicity, or geographic location is frequently difficult to locate or unavailable. Conversely, detailed studies of morbidity, mortality, access to and utilization of services, and treatment or service costs tend to be limited in scope. Our presentation focuses on national assessments of children's health status, for the broadest possible picture.

Children living in rural and urban counties had similar parentally reported health status in 2010¹⁷ and 2011,¹⁸ although rural children were more likely to have missed one or more days of school in the preceding year. Only a small proportion of parents responding to the 2011–2012 National Survey of Children's Health rated their child's overall health as less than "excellent" or "very good," with insignificant differences across residence: 15.8% in urban ZCTAs, 15.3% in large rural ZCTAs, 15.7% in small rural ZCTAs (urban and large rural significantly different).⁹ The proportion of parents describing their child's oral health as less than "excellent" or "very good" also did not differ significantly with residence, estimated at 28.2% in urban ZCTAs, 28.9% in large rural ZCTAs, and 30.2% in small rural ZCTAs.⁹ Despite parental perceptions of good oral health status, children in rural areas, especially children of seasonal or migrant farmworkers, experience disproportionately high rates of dental caries and other oral problems as well as low rates of utilization of dental services.^{19–21} The overall rate of disability, defined as vision, hearing, cognitive, ambulatory, self-care, or independent living difficulty, is higher among rural (6.3%) than among urban children (5.0%).²²

Rural children are more likely to be classified as overweight (BMI greater than the 85th percentile) or obese (BMI > 95th percentile) than are urban children, even after controlling for reported dietary patterns and exercise.^{23–26} More than a third of rural children aged 10–17 (35.5% large rural, 38.2% small rural ZCTAs), versus 30.5% of urban children, were obese in 2011–2012.⁹ Food availability may play a part in geographic disparities, as rural communities are less likely to have access to grocery stores.²⁷

Studies using the Strengths and Difficulties Questionnaire²⁸ found no parentally reported differences between rural and urban children in the prevalence of behavioral health issues.

^{29, 30} Similarly, analysis using the National Survey of American Families failed to find differential prevalence of mental health problems.³¹ On the other hand, a survey using the 2005–2006 National Survey of Children with Special Health Care needs found a slightly higher prevalence of mental health problems among rural versus urban children (5.8% and 5.3%, respectively).³²

Evidence on rural disparities in behavioral health risks, such as being in a fight, experiencing dating violence, or engaging in drug use, is mixed. One study found no difference between rural and urban children in violence-related behavior, although rural teens were more likely to report tobacco use than their urban peers.³³ An analysis using the 2002 through 2004 National Survey of Drug Use found rural adolescents more likely to report alcohol and cocaine use than their urban peers, with no differences across other drug types.³⁴ Related to higher alcohol use, rural adolescents were also more likely to report binge drinking, heavy drinking and driving under the influence.³³ Rural girls (ages 15–19) are more likely to report having had sex in the past 3 months (2006–2010 data).³⁵ Birth rates per 1,000 for this age group are higher for rural teens (42.0 in micropolitan counties and 45.3/1,000 in other rural counties) than for teens in metropolitan counties (range 24.2 in fringe counties through 37.1 in small metropolitan areas).³⁵

Of the 2.9 million rural children estimated to have behavioral problems through the Strengths and Difficulties Questionnaire, 68% lived in counties that were mental health HPSAs.²⁹ Addressing potential sources of resilience and stress, rural children have slightly different family patterns than urban children. While 64.1% of children in urban counties lived with 2 biological parents, this decreased to 62.4% in large rural counties, 61.0% in mid-sized rural counties, and 61.8% in small rural counties.²⁹

All cause mortality rates, adjusted for local socioeconomic deprivation, are higher among rural than among urban children, across both males and females and all major racial/ethnic categories.³⁶ Rural residence is associated with reduced risk of death due to homicide, but increased risk of death from unintentional injury or suicide.^{37, 38} Further, disparities in suicide rates between urban and rural youth have increased steadily since the mid 1990s.³⁸ Research has linked mortality rates to socioeconomic deprivation, which is disproportionately present in rural communities.

Risk Factors

The home environment for rural children presents a mixed picture. Housing quality, as ascertained through the American Housing Survey (AHS), was more likely to be classified as moderately or severely inadequate for rural than for urban children (Table 2). Rural households were also more likely to have lacked running water at least once during the preceding 3 months or to heat with a kerosene space heater. Rural children were also more likely to live in a household where one or more residents smoke cigarettes inside the home. Rural and urban households with children did not differ in 2 inexpensive childhood safety measures, use of electrical outlet covers and safe storage of chemicals and pesticides, but rural households were more likely to lack a working carbon monoxide detector. Absence of carbon monoxide detectors is problematic among rural residents, who experience

disproportionately high hospital utilization³⁹ and death⁴⁰ rates due to carbon monoxide poisoning, often associated with kerosene heating. Research among rural parents has found that poverty was associated with failure to install safety devices, such as smoke detectors.⁴¹

More positively, parental assessments suggest higher perceptions of neighborhood safety in rural areas. This was particularly true among low income families, with 77.9% of parents below the FPL in large rural areas, and 83.6% of similar parents in small rural areas, reporting that their children are always or usually safe, versus only 72.9% of poor urban parents.⁹ Rural parents were less likely to report violent disagreements than parents in urban counties (odds ratio 0.86; 95% confidence interval: 0.77–0.95), even after adjustment for other family characteristics.⁴²

Uniquely Rural Injury Risk Factors

Rural children experience greater injury risk, with increasing remoteness being associated with higher risk, greater injury severity, higher treatment costs, and poorer outcomes which can include prolonged morbidity, lasting disability or death.⁴³ Approximately 12.9% of the 2-year deficit in life expectancy between rural and urban residents is attributable to deaths under age 25.⁴⁴ More troubling, the rural/urban mortality ratio among children age 1–14 has been increasing, from 1.20 in 1990–1992 to 1.41 in 2005–2009; the pattern is similar among persons aged 15–24 years.⁴⁵

Rural children experience a higher risk for motor vehicle crash injury; studies regarding bicycle and pedestrian risk were less consistent.⁴³ Rural areas frequently lack access to public transportation. Rural families travel further for services, exposing rural children to high risk for injury from motor vehicle crashes.^{46, 47} Firearm fatalities were similar across rural and urban children, but with different etiologies: rural children are more likely to die from suicide or unintentional injury, while urban children are more likely to experience homicide.⁴⁷

Rural adolescents in small rural area ZCTAs are more likely to work outside the home than those in urban areas.⁹ Although farming is no longer the dominant economic activity across rural areas, it remains a large and well-studied source of youth injuries. More than 26,000 non-fatal injuries were estimated to have occurred annually among children living, working at or visiting farms during 2000–2006, with approximately 14% resulting in hospitalization and an average of 84 fatal accidents per year.⁴⁸ Among all injuries, 29.3% or an estimated 7,795 injuries per year, occurred while the youth was working.⁴⁸ While most working injuries involved youth aged 15–19, work injuries occurred among children as young as 5–9 years of age.⁴⁸

Within children living on farms, injury was more likely when the child performed agricultural work, carried out chores recommended for older children, and worked close to a full-time work week.⁴⁹ Rural youth may drive tractors that lack rollover protective structures or work with power take off shafts (exposed rotating devices linked to additional equipment), and they experience exposure to dust and noise.^{50, 51} Children do not have to be engaged in agricultural work to be exposed, as children who play near or during farm

operations can also be injured, with the rate of such injuries being highest among children younger than 5 years.⁵² Within minority farm children, American Indian children were more likely than others to be injured, with an estimated injury rate of 7.86 per 1000, compared to 5.15/1000 among black children and 5.5 among Hispanic youth.⁵³

Pesticide exposure, with uncertain long-term effects,⁵⁴ is more common among children in agricultural families, and particularly among children of farm workers.⁵⁵ While farm workers recognize the importance of protecting their children's health and most avoid holding young children while wearing work clothes, many do not employ other practices to reduce contamination, such as washing hands after work or removing shoes/boots on entering the home.⁵⁶ Fears of pesticide or chemical contamination frequently lead farm working families, especially Hispanics, to purchase and use bottled water for domestic purposes rather than consume cheaper water from wells or town municipal supplies.^{57, 58}

Health Services Use Among Rural Children

While rural and urban children have similar health status, health care use differs. Rural parents are less likely than urban parents to report that their child had a preventive health care visit or a preventive dental care visit.⁹ Lower use of preventive care may translate into higher use of inappropriate services, such as emergency department visits for conditions that could be managed in primary care settings, including dental caries and complex chronic diseases. For example, among children with asthma, residence in a rural areas was associated with increased emergency department visits (adjusted rate ratio compared to urban, 1.25, CI: 1.19–1.33, $P < .001$).⁵⁹

The prevalence of behavioral health problems among rural children has been found to be similar^{29–31} or to be only slightly higher³² than among their urban peers. However, research has found lower utilization of behavioral health services among rural children. An analysis of children with attention deficit hyperactivity disorder found that the odds of a visit to a mental health professional were 2.17 higher among urban than rural youth.⁶⁰ Among youth with psychiatric diagnoses visiting hospital emergency departments, rural residence and lack of health insurance were both associated with hospitalization after controlling for clinical need, suggesting the lack of effective outpatient treatment.⁶¹

Looking Forward and Recommendations

Rural children live in an environment characterized by economic deprivation and adverse long-term trends. These trends include demographic changes in the rural population, anticipated declines in provider availability, and the poor prospects for those rural settings in greatest need, the “persistent poverty” counties. Countering these adverse trends, increasing financial access to care through the Affordable Care Act and innovative approaches to maximize the effectiveness of health care providers already in place may bolster outcomes for young rural residents.

By extending health insurance coverage more broadly across rural children and adults, the Affordable Care Act may serve to make medical, dental, rehabilitative, mental or behavioral health practice economically feasible in more rural communities. However, even with more

families fully covered by health insurance, some rural counties may not be able to attract new providers. Counties that lack broad economic resources or natural amenities such as lakes or mountains are less likely to grow through in-migration.⁶² The problems of maintaining an adequate infrastructure for children and of retaining health care providers may be particularly acute among the nation's "persistent child poverty" rural counties. Despite federal efforts to spur economic development, these regions have not made meaningful economic progress in decades.

What can be done to address problems experienced by rural children? First, improved surveillance is needed. Problems cannot be defined nor effective policy solutions documented without adequate information. At present, very little information about the health and behavior of rural children is provided in a form that allows assessment of rural/urban differences. For example, the CDC-published reports summarizing findings from the Youth Risk Behavior Surveillance survey, the most comprehensive assessment of youth behavior available, do not separately address rural children and their needs.⁶³ Within the constraints needed for data privacy, research and information dissemination need to switch from a solely individualistic perspective to include a contextual focus. Increasing attention must be given to the social determinants of health at the community level, including residence, when reporting on childhood outcomes. The role of the environment in promoting healthy behaviors (exercise, purchase of nutritious food) and in facilitating or impairing access to care deserves recognition.

Second, information is needed about approaches that improve health in all stages of childhood—newborns, toddlers, school age and adolescents—in rural areas. Research suggests that the traditional approaches to service provision, which assume provider availability, may fail in rural locales. Public health may serve a different role in under-resourced rural communities, one in which the assurance function is more prominent. A longitudinal study of the transfer of Early Periodic Screening Diagnosis and Treatment services from the public health agency to private medical providers in a southern state found that urban counties were more likely to be successful in this transition, while rural children fell behind.⁶⁴ In rural settings, non-traditional providers and cross-disciplinary approaches may be key. School health clinics, for example, may be more important in rural than urban settings,⁶⁵ successful program elements should be identified and disseminated. Cross-disciplinary approaches to services may also have greater effects for rural children. An evaluation of Wisconsin Medicaid claims found that a policy change allowing fluoride varnish, a dental caries preventative, to be applied by medical practitioners was associated with a greater increase in claims in rural than in urban counties.⁶⁶

Emerging technologies, from mobile vans through telehealth and other electronic mechanisms, also offer promise of improving access to care for rural children. At present, however, availability of telemedicine remains low. As of 2013, only about a third of rural hospitals (34.0%) had any telemedicine applications in place; of those, only 2.5% focused on pediatric or obstetric populations.⁶⁷ Even successful projects are hampered by a lack of consistent funding models,⁶⁸ suggesting that telemedicine has not yet been integrated into routine care. Given the long horizon for technological solutions, communities will need to continue to focus on innovative ways for recruiting clinicians to serve rural children.

Finally, while surveillance and research are needed, action is needed even more urgently. Childhood is brief. Communities of practice that do not typically engage one another, such as education and economic development and public health and the health care sector, need to develop modes of working cooperatively to improve the determinants of health and health outcomes. A collaborative, “no silos” commitment to rural children is essential.

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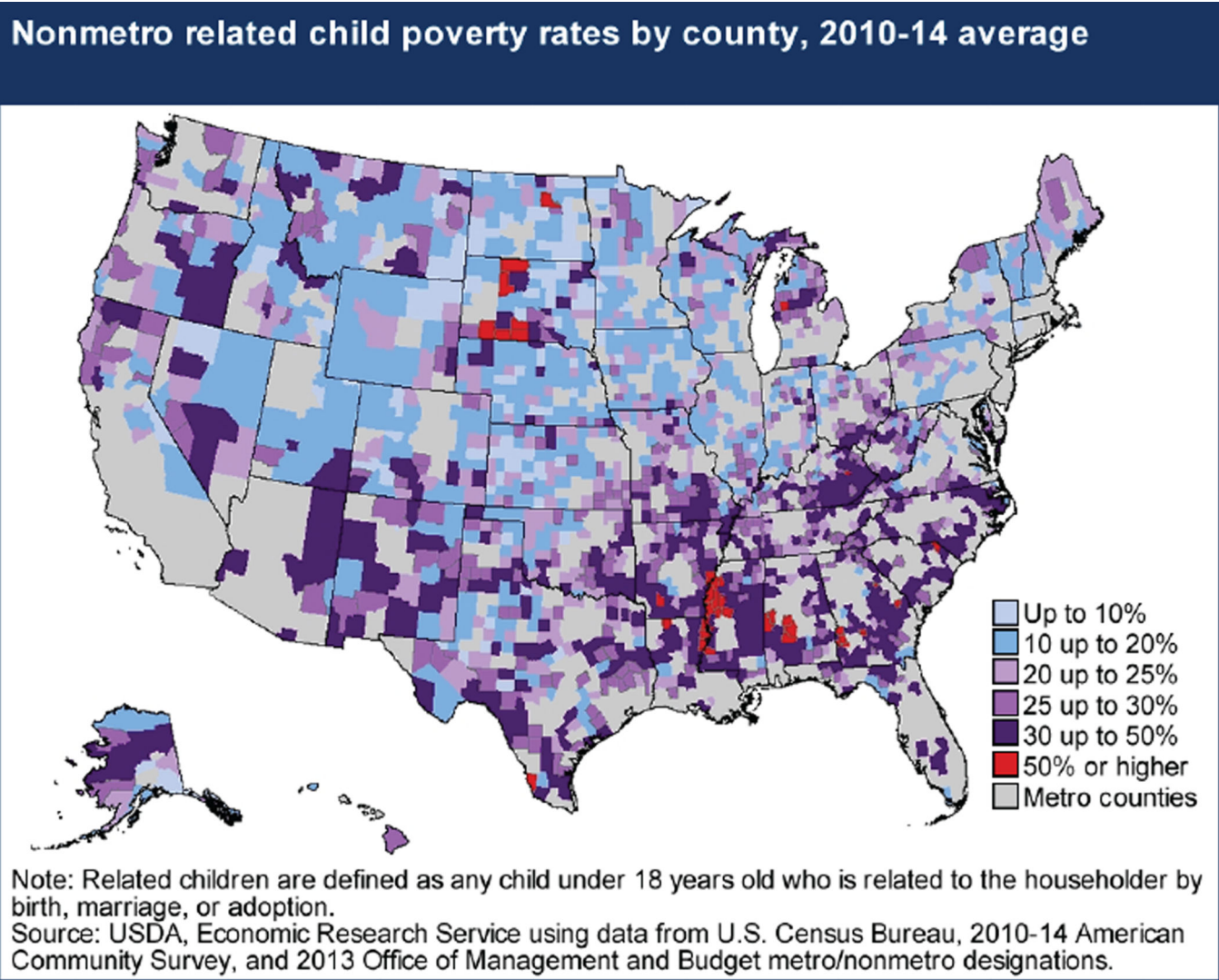


Figure 1.
Persistent Child Poverty Counties (from Farrigan⁸)

Table 1
County Typologies, as Defined by the US Department of Agriculture,⁷ by Rurality

	Rural Counties		Urban Counties		Total	
	n	%	n	%	n	%
Total, all US	1,976	100.0	1,166	100.0	3,142	100.0%
Counties, by economic type (2010 – 2012)						
Farming-dependent (25% income or 16% employment)	391	19.8	53	4.5	440	14.2
Mining-dependent (13% income or 8% employment)	183	9.3	36	3.1	128	7.0
Manufacturing-dependent (23% income or 16% employment)	351	17.8	155	13.3	905	16.2
Federal-State Government-dependent (14% income or 9% employment)	238	12.0	167	14.3	381	13.0
Recreation (multiple criteria) ^a	228	11.5	104	8.9	340	10.6
Non-specialized (all other)	585	29.6	651	55.8	948	39.6
Counties, by policy type (2008 – 2012) (not mutually exclusive)						
Low education (20% of residents age 25–64 less than high school education)	367	18.6	100	8.6	467	14.9
Low employment (<65% of person 21–64 employed)	720	36.4	186	16.0	906	28.8
Persistent poverty (20% residents in poverty, 1980 – 2007–11)	301	15.2	52	4.5	353	11.2
Persistent child poverty (20% of children living in poverty, 1980 – 2007–11)	558	28.2	150	12.9	708	22.5

^a Recreation: weighted index combining income, employment and seasonal housing.

Housing Characteristics and Parental Home Safety Practices in Homes With at Least One Child, American Housing Survey,⁶⁹ 2011

Table 2

	Rural		Urban		P val
	%	SE	%	SE	
Housing quality					
Household was without running water for 6 hours or more at least once in past 3 months	5.2	0.5	4.1	0.2	.0001
Reported use of kerosene space heater during winter months	2.8	0.3	1.2	0.1	<.0001
No working carbon monoxide detector inside the home	57.7	1.1	52.0	0.4	<.0001
Home safety practices					
A member of the household smokes inside the house	15.3	0.7	8.7	0.2	<.0010
Some or all chemicals, pesticides, cleaning supplies and medicines are not stored out of the reach of young children	18.7	1.1	19.5	0.5	.7689
Some or all outlets lack child tamper-resistant outlet covers	67.7	1.5	66.9	0.6	.9643

Source: American Housing Survey; Authors' analysis