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The School Nurse Survey of Asthma Prevalence in Wyoming Public School Children

The Environmental Council of the States'
National Childhood Asthma Prevention Campaign
Pilot Project - Part I

The School Nurse Survey of Asthma Prevalence in Wyoming Public School Children

by

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We wish to thank the many dedicated school nurses throughout Wyoming.

This report would not have been possible without their hard work and cooperation.

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Summary of Findings

- **Over 76% of Wyoming public schools responded to this survey. The results of this survey include information from 67,298 students.**
- **The overall prevalence of asthma in Wyoming public school children is 6.92%**
- **Asthma prevalence in Wyoming school districts ranges from 0.42% to 15.21%.**
- **Asthma prevalence ranges from 2.11% to 10.89% when school district data is aggregated by county.**
- **The asthma prevalence for counties with fewer than 10% of families with children under 18 below the poverty level is only 6.02% while the prevalence for counties with 15% or more of families with children below the poverty level is 8.68%.**
- **The asthma prevalence for school districts with fewer than 25% of students eligible for free or reduced lunches is 5.69% while the prevalence for school districts with the highest percentages of students eligible for free or reduced lunches, ≥50% of students, is higher at 11.02%.**
- **The asthma prevalence for urban areas is significantly higher than that of rural areas (RR=1.4, 95% C.I. 1.3-1.5).**
- **Asthma prevalence differs by type of school. The high school prevalence is the highest at 8.82% and significantly higher than that of combined schools, those with larger combinations of grade levels, at 4.62% (RR=1.91, 95%C.I. 1.74 – 2.10).**
- **The most often-used asthma medication at school is the as-needed bronchodilator or rescue inhaler, used by 41.4% of children with asthma.**

Background

From 1979 to 1994, asthma in the U.S. increased by 102%, and today approximately 14.9 million Americans have asthma (1). Pediatric asthma prevalence is especially concerning. According to the American Lung Association of Texas, "the most rapid increase in cases of asthma has occurred in children under five"(2). The National Health Interview Survey reports that children ages 5 to 17 have the highest asthma prevalence with 91.9 cases per 1,000 (3).

Costs associated with asthma have a large impact on the U.S. economy. In 2002, health care costs for asthma totaled $9.4 billion with inpatient hospital care accounting for nearly half of that sum. Indirect costs, which include $500 million lost wages, 1.4 billion lost school days and costs associated with mortality, added up to $4.6 billion for a total asthma cost of $14 billion for one year (3).

Wyoming, a frontier-rural state of 494,000 people in the Western U.S., bears a portion of this economic impact. In 1998, total asthma costs for the state were estimated at $19.6 million with $11.1 million in direct health care costs and $8.4 million in indirect costs (4). Currently there is no continuous, comprehensive asthma surveillance in the state. In 2002 and 2004, the optional Childhood Asthma module was added to the Behavioral Risk Factor Surveillance System (BRFSS) in Wyoming. However, the absence of sustained funding for the addition of this BRFSS module currently makes it an uncertain continual source of asthma prevalence data for children in Wyoming.

In addition, because there are no tertiary care centers in the state, many Wyoming children are treated in out-of-state hospitals, making the Wyoming Hospital Discharge Database inadequate for determining the number of asthma hospitalizations. These problems are amplified by the lack of access to healthcare in Wyoming. Wyoming is the ninth largest U.S. state in area, and with three interstate highways only running along the southern and eastern state borders, people often incur substantial losses of time and money with each medical appointment. In addition, Wyoming ranks 48th out of 50 U.S. states in total physicians with 17.3 per 10,000 Wyoming residents and only 43 licensed pediatricians and one pediatric specialist in the state (5,6). In 2001, 13.4% of Wyoming children under the age of 18 were living below federal poverty level (FPL), 38% were living at less than 200% of FPL and 7.5% were uninsured (7). The high asthma rates, limited healthcare access and associated costs clearly indicate that asthma in Wyoming requires further study.

National Childhood Asthma Prevention Campaign Pilot Project

In September 2003, The Environmental Council of the States (ECOS) awarded funding to three states for projects related to asthma in children. The Wyoming Department of Health, one of the three grant recipients, was funded to conduct a one-year, three-part project addressing childhood asthma and environmental factors in Wyoming. The objectives of the project were:

1. To determine the prevalence of asthma in children ages 5 to 19 in each public school in Wyoming.

2. To work with the Department of Environmental Quality to measure particulate matter (PM) outdoor air pollution at four Wyoming schools and study associations with asthma exacerbations in the children at those schools.

3. To develop a web site to provide information on asthma, asthma management and air pollution to parents, school nurses and staff and other health professionals.

The School Nurse Survey of Asthma Prevalence in Wyoming Public School Children addresses the first objective of the project.

Methods

The School Nurse Survey of Asthma Prevalence in Wyoming Public School Children was developed using methodology similar to that used for Connecticut's *Survey of the Prevalence of Asthma Among School Age Children* (8). The forms used in the Connecticut study were reviewed and revised by Scott Seys, Deputy State Epidemiologist, Wyoming Department of Health and pediatrician Dr. Gary Melinkovich, Wyoming Department of Health Staff Physician.

A letter explaining the purpose of the survey (Appendix A), instructions for completion (Appendix B) and a one-page survey form (Appendix C) were sent to the school nurse at each of Wyoming's 379 public schools in November 2003. In addition to providing basic information about their school, nurses were asked to identify the number of students at their school with an asthma diagnosis, and of those, the number taking various prescription medications while at school. Medication questions were added regarding the use of daily oral leukotriene inhibitors and daily oral anti-inflammatory medications. All of the medication questions were included in an attempt to assess the severity of asthma in Wyoming public school children.

Schools that did not respond were reminded twice by mail, with a post card and with a repeat mailing of the survey and instructions, and once by phone. Overall, 75.9% of Wyoming public schools responded.

Data were analyzed in Microsoft Excel 2000 and in Epi Info 3.2.2.

Results

Prevalence

Because most school nurses in Wyoming serve two or more schools , the overall response rate of 75.9% is excellent and reflects the nurses' high level of dedication. Table 1 shows the percentage of response and asthma prevalence by school district, and Table 2 shows the percentage of response and asthma prevalence by county. Asthma prevalence is reported as asthma cases per 100 children or the percentage of children with asthma, for each school district and county. Prevalence for individual schools is not reported because, in many cases, the numbers are too small to report. Only three school districts failed to respond, however, sufficient data was collected from other districts to provide reliable prevalence values for each county.

Overall Asthma Prevalence in Wyoming Public School Children
6.92%

School Districts

Asthma prevalence in Wyoming school districts ranges from 0.42% to 15.21%. The lowest prevalence for school districts is seen in Carbon County School District #1 (0.42%) and in Sublette County School District #1 (0.73%). The highest school district prevalence is seen in Fremont County School District #5 (15.21%) and in Fremont County School District #38 (13.27%).

Counties

When the data are aggregated by county, asthma prevalence ranges from 2.11% to 10.89%. The lowest prevalence for counties is seen in Sublette County (2.11%) and in Lincoln County (2.13%). The highest county prevalence is seen in Hot Springs County (10.89%).

Table 1: Prevalence and Response by School District					
School District	**# of Schools Responding**	**# of Schools in District**	**Response (%)**	**Total # Students Included**	**Prevalence (%)**
Albany County #1	9	19	47.4	2,733	9.26
Big Horn County #1	0	8	0.0	*	*
Big Horn County #2	3	3	100.0	654	8.41
Big Horn County #3	3	3	100.0	506	2.17
Big Horn County #4	4	4	100.0	360	7.78
Campbell County #1	13	20	65.0	4,379	8.97
Carbon County #1	8	9	88.9	1,670	0.42
Carbon County #2	10	10	100.0	693	8.23
Converse County #1	2	8	25.0	864	6.94
Converse County #2	3	4	75.0	738	7.18
Crook County #1	10	10	100.0	1,103	3.72
Fremont County #1	9	9	100.0	2,080	7.79
Fremont County #2	0	2	0.0	*	*
Fremont County #6	3	3	100.0	355	15.21
Fremont County #14	3	3	100.0	576	11.81
Fremont County #21	1	2	50.0	302	7.95
Fremont County #24	3	3	100.0	299	4.35
Fremont County #25	5	5	100.0	2,109	10.24
Fremont County #38	1	1	100.0	211	13.27
Goshen County #1	3	9	33.3	1,286	6.92
Hot Springs County #1	4	4	100.0	689	10.89
Johnson County #1	5	7	71.4	528	4.36
Laramie County #1	24	32	75.0	11,417	9.83
Laramie County #2	5	6	83.3	691	4.49

Table 1 (Page 2 of 2): Prevalence and Response by School District					
School District	**# of Schools Responding**	**# of Schools in District**	**Response (%)**	**Total # Students Included**	**Prevalence (%)**
Lincoln County #1	0	4	0.0	*	*
Lincoln County #2	5	5	100.0	2442	2.13
Natrona County #1	30	35	85.7	9263	6.41
Niobrara County #1	3	5	75.0	398	7.29
Park County #1	7	7	100.0	1665	7.03
Park County #6	7	7	100.0	2122	4.14
Park County #16	1	1	100.0	130	6.15
Platte County #1	8	11	72.7	781	2.94
Platte County #2	3	3	100.0	265	5.28
Sheridan County #1	7	7	100.0	867	4.61
Sheridan County #2	7	12	58.3	1271	5.66
Sheridan County #3	4	4	100.0	94	5.32
Sublette County #1	4	4	100.0	684	0.73
Sublette County #2	4	4	100.0	500	4.00
Sweetwater County #1	8	19	42.1	2,221	6.08
Sweetwater County #2	6	11	54.5	2221	5.35
Teton County #1	9	9	100.0	1867	3.54
Uinta County #1	7	7	100.0	2287	6.54
Uinta County #4	4	4	100.0	2981	3.50
Uinta County #6	4	4	100.0	658	6.91
Washakie County #1	5	5	100.0	695	7.12
Washakie County #2	3	3	100.0	1320	8.33
Weston County #1	4	5	80.0	96	7.57
Weston County #7	3	3	100.0	263	6.08

Table 2: Prevalence and Response by County					
School District	**# of Schools Responding**	**# of Schools in District**	**Response (%)**	**Total # Students Included**	**Prevalence (%)**
Albany County	9	19	47.4	2,733	9.84
Big Horn County	10	18	55.6	1,520	6.18
Campbell County	13	20	65.0	4,379	8.97
Carbon County	18	19	94.7	2,363	2.71
Converse County	5	12	41.7	1,602	7.05
Crook County	10	10	100.0	1,103	3.72
Fremont County	25	28	89.3	5,932	9.52
Goshen County	3	9	33.3	1,286	6.92
Hot Springs County	4	4	100.0	689	10.89
Johnson County	5	7	71.4	528	4.36
Laramie County	29	38	76.3	12,108	9.52
Lincoln County	5	9	55.6	2,442	2.13
Natrona County	30	35	85.7	9,263	6.41
Niobrara County	3	5	75.0	398	7.29
Park County	15	15	100.0	3,917	5.36
Platte County	11	14	78.6	1,046	3.54
Sheridan County	19	23	82.6	2,232	5.24
Sublette County	8	8	100.0	1,184	2.11
Sweetwater County	14	30	46.7	2,221	6.24
Teton County	9	9	100.0	1,867	3.54
Uinta County	15	15	100.0	5,926	6.14
Washakie County	8	8	100.0	2,015	7.20
Weston County	7	8	87.5	359	7.21

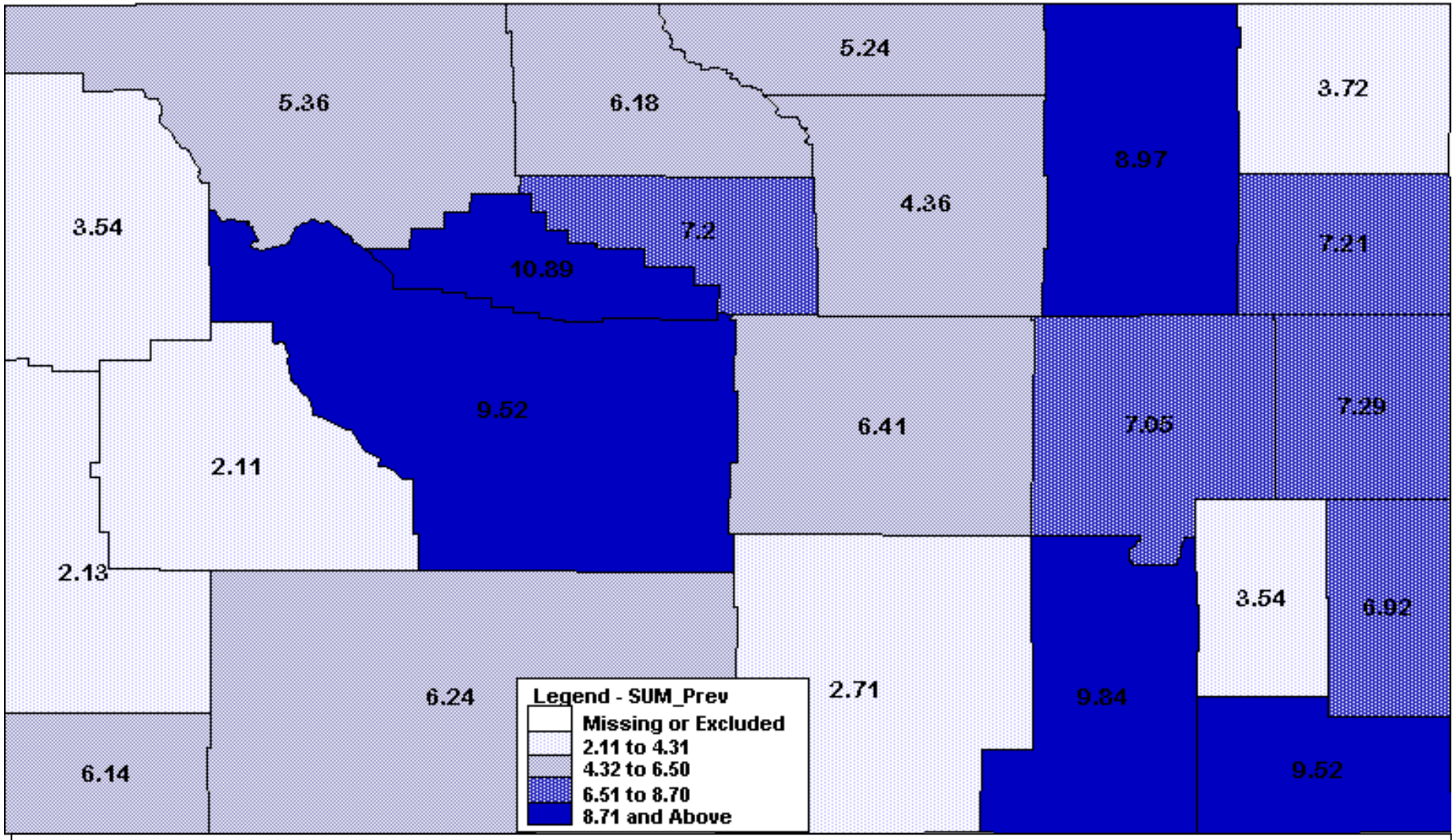


Figure 1: Asthma Prevalence in Wyoming Public School Children by County 2003 -2004

Low Income Areas

Counties with fewer than 10% of families with children under 18 below the poverty level together had the lowest asthma prevalence (6.02%) while counties with 15% or more of families with children below the poverty level had a higher overall asthma prevalence of 8.68% as shown in Figure 2.

Similarly, school districts with fewer than 25% of students eligible for free or reduced lunches had the lowest asthma prevalence (5.69%) while school districts with the highest percentages of students eligible for free or reduced lunches, $\geq$50% of students, also had the highest asthma prevalence (11.02%). These results are shown in Figure 3.

Urban and Rural Areas

While much of Wyoming is rural, the U.S. Census Bureau delineates several communities in Wyoming as urban areas and urban clusters. A complete list can be found in Appendix D. An urban area is defined as a "densely settled territory" and in general has a minimum population density of 1,000 people per square mile. An urban cluster is also a "densely settled territory" with between 2,500 and 50,000 people (12). The asthma prevalence for urban areas is significantly higher than that of rural areas.(RR=1.4, 95% C.I. 1.3-1.5). The asthma prevalence for urban areas is 7.42% compared to 5.33% for rural areas.

Figure 2: Percentage of Asthma in Wyoming Public School Children by Percentage of Familes in the County with Children Under 18 Below the Poverty Level

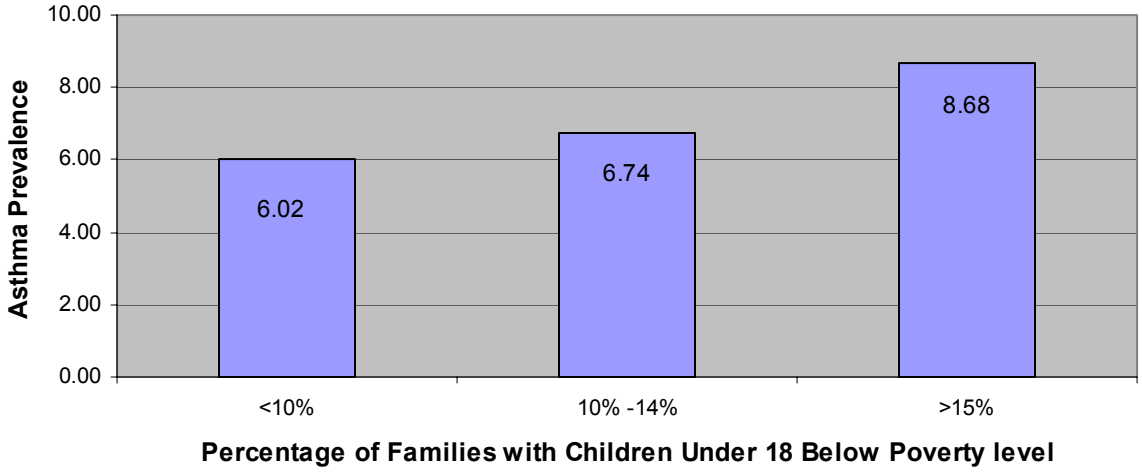
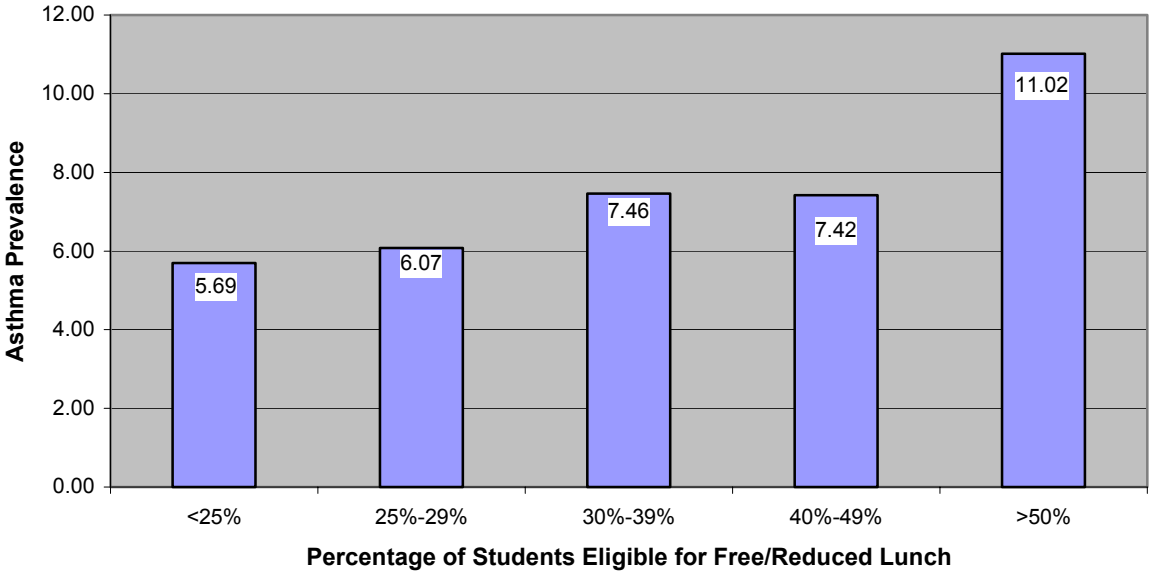


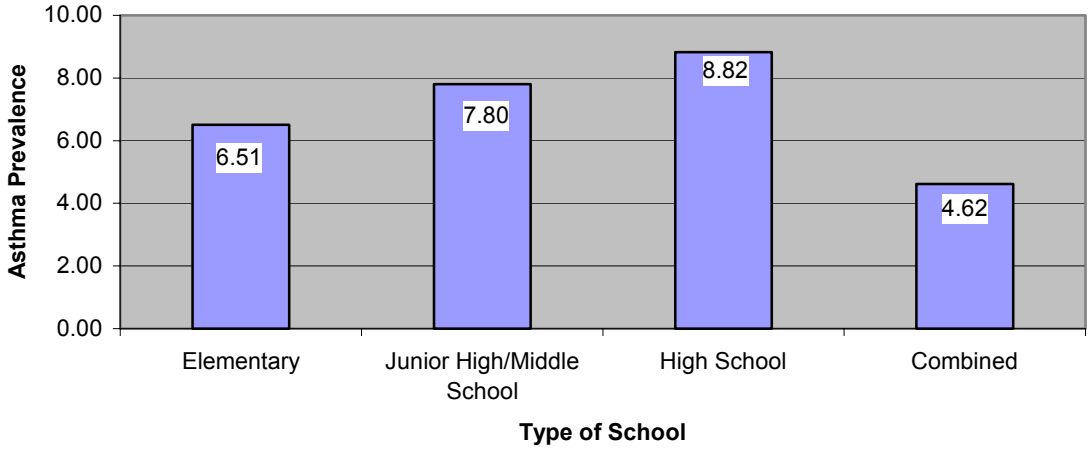
Figure 3: Percentage of Asthma in Wyoming Public School Children by District Percentage of Students Eligible for Free/Reduced Lunch



Type of School

Asthma prevalence also differs by type of school. As shown in Figure 4, prevalence for elementary schools is 6.51% while the junior high/middle school prevalence is higher at 7.8% and the high school prevalence is the highest at 8.82%. The high school prevalence is significantly higher than that of combined schools, those with a large range of grade levels, at 4.62% (RR=1.91, 95%C.I. 1.74 – 2.10).

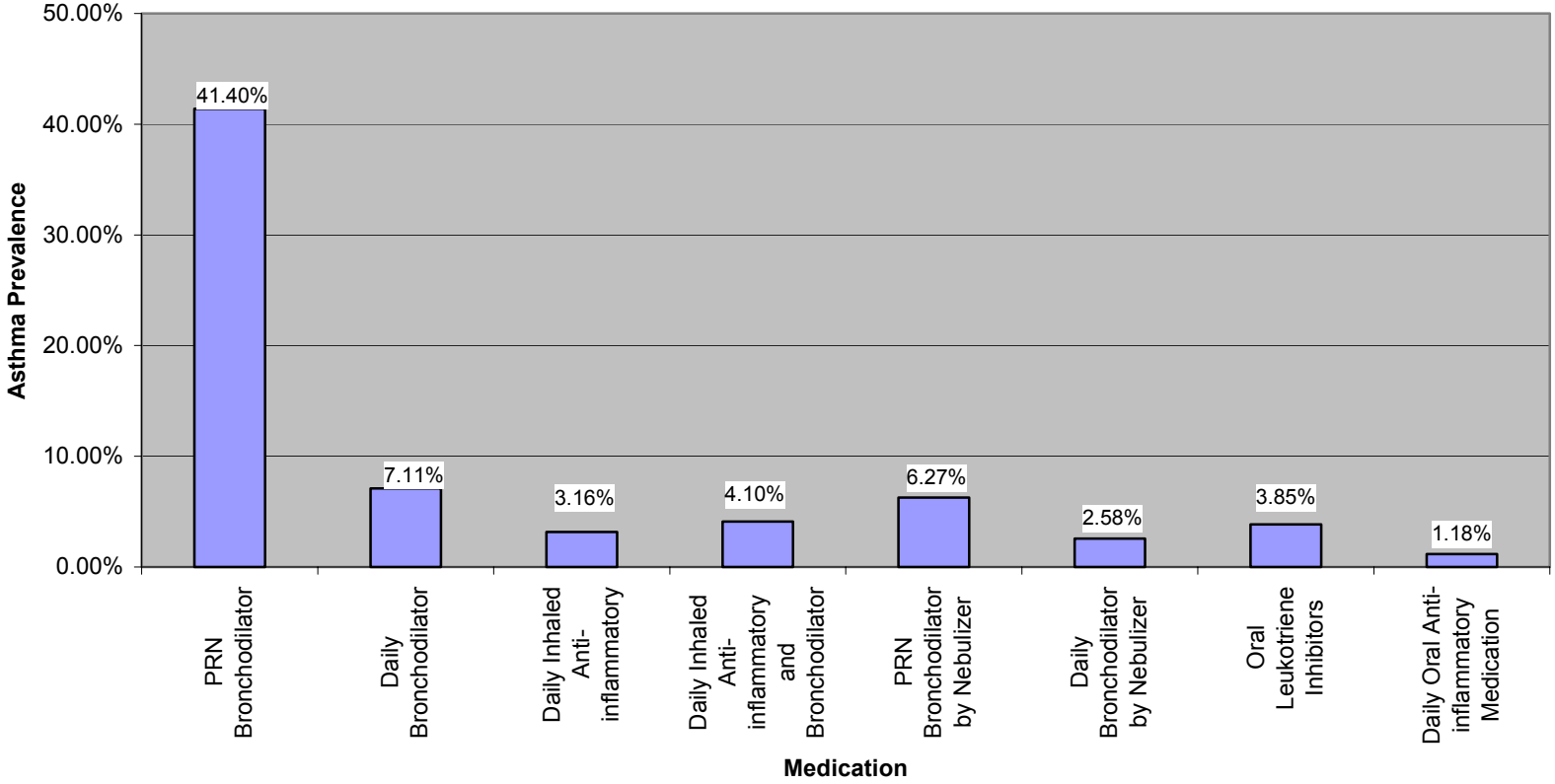
Figure 4: Percentage of Asthma in Wyoming Public School Children by Type of School



Asthma Medications

School nurses were also asked to note the number of children with an asthma diagnosis who took particular medications at school in an attempt to examine asthma severity and asthma management. The results are shown in Figure 5.

Figure 5: Percentage of Wyoming Public School Children With Asthma who Take Asthma Medications at School



Discussion

The school nurse survey is a useful tool for measuring current asthma. In 2002 and 2004, a question on children with current asthma was added to the Wyoming Behavioral Risk Factor Surveillance System (BRFSS). The 2002 BRFSS results indicated 6.9% of Wyoming children had current asthma (9). The results of the school nurse survey were identical with 6.92% of Wyoming public school children reported to have asthma.

While it is impossible to identify all of the variables that account for the broad differences in asthma prevalence between school districts and between counties with this survey, some factors appear to stand out. Fremont County School Districts #15 and #38 have the highest asthma prevalence in the state, and Fremont County has the highest percentage of families with children under the age of 18 below the poverty level (20.4%). In addition, nearly 20% of county residents are Native American, which is the largest Native American population in Wyoming, and much of the Wind River Indian Reservation is located in the county. Fremont County has the third highest county asthma prevalence (9.52%).

When the data are aggregated by percentage of families with children below the poverty level, counties with fewer than 10% of families below the poverty level have the lowest prevalence (6%) while counties with 15% or more of families with children living below the poverty level have the highest prevalence (8.7%). Similarly, when school districts are grouped by the percentage of students eligible for free or reduced lunches, asthma prevalence increases as the percentage of eligible children increases. Links between poverty and asthma prevalence were also found in Connecticut's *Survey of the Prevalence of Asthma Among School Age Children* where prevalence in the poorest school districts were nearly double that of the wealthiest school districts (8).

However, poverty alone cannot explain the differences. For example, Hot Springs County has the highest asthma prevalence of 10.89%, but only 13.6% of families with children under the age of 18 in the county live below the poverty level. It is also important to note that because poverty information was not collected at the individual level, inferences about poverty as a causal factor for asthma cannot be made (10). This information can, however, be used to generate hypotheses for future asthma studies.

The location and the type of school may also be important factors. Asthma prevalence for schools in urban areas is significantly higher than that of schools in rural areas. As a group, combined schools, which house different combinations of students in Kindergarten through 12th grade, have the lowest asthma prevalence (4.6%) while the high school prevalence is highest at 8.82%. On one hand, older high school students would be expected to have higher asthma prevalence values because they have had more time to be diagnosed. However, this result is particularly surprising because many school nurses at the high school level noted concerns about the possibility of incorrectly reporting asthma among high school students on their surveys. According to the nurses, older students often do not report chronic medical conditions, preferring to manage their care without assistance from the school nurse. Therefore, it is possible that many students in this age group who have an asthma diagnosis are missed, and asthma prevalence for high school students may actually be higher than reported.

It is interesting to note that the most often-used asthma medication at school was the as-needed bronchodilator or rescue inhaler. Because the survey did not address the use of asthma medications at home, it is impossible to make inferences about asthma severity or asthma management based on these results.

While this survey is limited to providing basic information on asthma rates and medication use among Wyoming public school children, the results also highlight great disparities across school districts and counties. More research is needed to identify the factors that explain asthma in Wyoming and to direct targeted intervention efforts. If the highest school district asthma prevalence values could be reduced to the overall state prevalence of 6.9%, approximately 20% of asthma in Wyoming's children could be prevented.

Asthma is a chronic disease that falls under the Lifetime of Health priority set by the Wyoming Department of Health in the *Strategic Plan 2003-2006*(11). Under this plan, agency activities are planned by determining how to improve negative trends, "turn the curve", for our customers. Unfortunately, only minimal asthma data currently exist making it nearly impossible to even determine asthma trends in Wyoming. The implementation of a comprehensive asthma surveillance system in Wyoming is a necessary next step in identifying the risk factors for asthma and the reasons for large differences in asthma prevalence rates between school districts and counties. Data from an asthma surveillance system could be used to implement programs aimed at reducing and managing asthma in Wyoming especially in areas with vulnerable populations and with the highest rates of asthma prevalence. Ongoing surveillance will also aid in the identification of increases in asthma prevalence in areas where prevalence is currently low, allowing for more proactive asthma management in the future. Then Wyoming citizens with asthma can truly move toward achieving their maximum health potential.

Recommendations

1. The State of Wyoming should establish and implement an asthma program, which includes a surveillance system for tracking asthma in all Wyoming residents, asthma research and targeted interventions.

2. The asthma program should be funded by consistent and stable funding sources, should include adequate staffing and should become institutionalized within the Wyoming Department of Health.

3. The State of Wyoming should facilitate the formation of an asthma coalition with collaboration from partners from all sectors to address asthma at the community level.

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Appendices

Appendix A

Designated Urban Areas/Clusters in Wyoming

Urban Areas	Urban Clusters
Casper	Buffalo
Cheyenne	Cody
	Douglas
	Evanston
	Gillette
	Green River
	Jackson
	Kemmerer
	Lander
	Laramie
	Newcastle
	Powell
	Rawlins
	Riverton
	Rock Springs
	Sheridan
	Thermopolis
	Torrington
	Wheatland
	Worland

Designated by the U.S. Census Bureau for the 2000 Census.

Appendix B

Dear School Nurse:

The Wyoming Department of Health, Maternal & Child Health section was awarded funding from the Environmental Council of States to establish a baseline prevalence of pediatric asthma, to investigate associations between particulate matter air pollution and asthma exacerbations and to develop a web-based asthma resource for clinicians, parents and children with asthma. The prevalence study will be conducted in the form of a school nurse survey.

Currently there is no comprehensive asthma surveillance in our state and no source of data for asthma prevalence among children. However, the Behavioral Risk Factor Surveillance System (BRFSS) reports that Wyoming has the seventh highest rate of self-reported adult asthma among U.S. states, and asthma rates in children are thought to be even higher.

We are asking school nurses to participate in this survey because they understand the significance of pediatric asthma and can provide data for most children ages 5 to 19 in the state. The survey is a one-page form that can usually be completed in about 15 minutes with data that is generally readily available. The first question, which asks for the total number of students diagnosed with asthma or reactive airway disease, will help determine the prevalence of asthma in Wyoming school children. If possible, only include children who report having a diagnosis of asthma or reactive airway disease by a doctor, nurse practitioner or physician assistant. The questions about in-school medications will provide information about asthma severity. No record reviews are required, and no personal identifying information should be included.

When you are finished, please return the survey in the enclosed, postage-paid envelope. If you have any questions, feel free to call me at (307) 777-7949 or Angi Crotsenberg at (307) 777-8787.

To ensure the accuracy of the data, we hope to receive completed surveys from every Wyoming school. The information gathered will be used to better quantify the scope of pediatric asthma in Wyoming and to direct future intervention strategies. The final report will be shared with school nurses, school administrators, public health officials, researchers, health care providers, state officials, parents and other interested parties.

Thank you for your assistance in this important public health endeavor. Best wishes for a healthy and productive school year.

Sincerely,

Erin Croughwell, MPH
MCH Epidemiologist

Appendix C

SURVEY OF ASTHMA PREVALENCE IN WYOMING SCHOOL CHILDREN
INSTRUCTIONS

1. Please return the one-page survey with all totals tabulated and filled in on the front side. If possible, please only include children who report having a diagnosis of asthma or reactive airway disease by a doctor, nurse practitioner or physician assistant. You should be able to complete the form in approximately 15 minutes.

2. Please call or e-mail if you have any questions.
   Angi Crotsenberg - (307) 777-8787 mchint@state.wy.us
   Erin Croughwell - (307) 777-7949 ecroug@state.wy.us

3. Please mail the completed survey in the enclosed envelope to:

   Erin Croughwell
   Maternal Child Health
   4020 House Ave.
   Cheyenne, WY 82001

Thank you for your assistance in conducting this important survey.

Appendix D

SURVEY OF ASTHMA PREVALENCE IN WYOMING SCHOOL CHILDREN
Individual School Survey – Fall 2003

School District_____

Name of School_____ Total #of students*_____

Check the boxes for all grades present in your school:

Grades Served	K	1	2	3	4	5	6	7	8	9	10	11	12

Name of School Nurse Completing Survey_____

Phone_____ E-mail_____

***Only include children in Kindergarten through 12th grade. Do not include preschoolers in count.**

Please note: Questions about prescriptions only refer to in-school medications. Only include children in kindergarten through 12th grade. Do not include preschoolers in count.

F. Total # students diagnosed with Asthma or Reactive Airway Disease (RAD).	F. _____
G. Of the students in F, total # with a prescription for only PRN bronchodilators (non-nebulizer).	G. _____
H. Of the students in F, total # with a prescription for daily bronchodilators (non-nebulizer).	H. _____
I. Of the students in F, total # with a prescription for daily inhaled anti-inflammatory medication.	I. _____
J. Of the students in F, total # with a prescription for daily anti-inflammatory medication AND a bronchodilator (non-nebulizer).	J. _____
K. Of the students in F, total # with a prescription for PRN bronchodilators by nebulizer.	K. _____
L. Of the students in F, total # with a prescription for daily bronchodilators by nebulizer.	L. _____
M. Of the students in F, total # with a prescription for daily oral leukotriene inhibitors (Singulair, Accolate).	M. _____
N. Of the students in F, total # with a prescription for daily oral anti-inflammatory medication (steroids).	N. _____

Please return this survey by November 21, 2003 to the Erin Croughwell, Maternal Child Health, 4020 House Ave., Cheyenne, WY 82001. Thank you for your assistance in conducting this important survey. This information will be used to improve the lives of Wyoming children with