2002

Annual Report on Asthma Deaths Among Individuals Aged 2-34 Years in Michigan

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A Joint Report

of the

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Summary

This is the 1st Annual Report of Asthma Deaths in Michigan among 2-34 year olds. Although the 32 deaths that occurred in 2002 are not a large number, the circumstances surrounding these deaths are dramatic. The deaths are particularly tragic because they are preventable.

The majority of the deaths were among males (59%), and African-Americans (56%). They were most likely to occur in Genesee, Oakland, Saginaw and Wayne counties. The deaths typically occurred prior to the deceased reaching the hospital.

The primary preventive action identified was physician and patient education on the need to prescribe and use inhaled steroids, including the provision of such education in emergency departments and notification of health care providers when asthmatics use excessive bronchodilator medication. Providing case managers for high-risk patients would also prevent deaths. Other interventions identified were the need to ensure insurance and regular medical care for individuals with asthma, access to specialists for those with severe asthma and prominent labeling of over-the-counter products that contain aspirin.

Plans over the coming year include the continuation of investigations into asthma deaths and dissemination of the information learned from these investigations.

Background

In response to a request for a proposal from the Centers for Disease Control and Prevention (CDC), the Michigan Department of Community Health (MDCH) in conjunction with Michigan State University (MSU) successfully competed to obtain funds to develop a rapid asthma death notification and investigation system for the State of Michigan. This system was limited, at the request of CDC, to investigations of asthma deaths among children and young adults ages 2-34. CDC selected this age group because of the increased likelihood that deaths ascribed to asthma in the ages 2-34 were truly caused by asthma. For individuals younger than the age of two or older than the age of 34 the number of other medical conditions that may present with symptoms similar to asthma increases. This report summarizes the first full year of investigations that cover asthma deaths occurring between January 1, 2002 and December 31, 2002.

Mortality from asthma in the United States has increased two-fold since the 1970's (1,2), although recent data suggest the asthma mortality rate has stabilized (3). Overuse of β-agonists (4,5) and under use of inhaled corticosteroids (6-8) have been associated with increased asthma mortality. Smoking, drinking, substance abuse (9) and family problems have been associated with increased asthma mortality, while the use of peak flow meters and a written action plan have been associated with decreased asthma mortality (10). Fatal asthma has also been associated with specific work exposures (11).

Mortality is not evenly distributed across the population. Studies have shown high rates of asthma mortality among African-Americans, low-income populations and populations with low educational levels (12). Reasons suggested for the racial disparity include differential access to care, exposure to environmental pollutants (13), and crowded conditions leading to increased exposure to allergens and infections (14).

Asthma mortality rates in Michigan are slightly higher than the United State's rate for all age groups except among adults 65 years or older. Overall asthma mortality rates in Michigan did not change significantly between 1990 and 2001with the exception of people ages 65 and older. Asthma mortality rates in this age group dropped significantly between 1990 and 2001, with the largest reduction in rates occurring between 1998 and 1999. The mortality rate in Michigan for asthma in African-Americans of all ages (48.5 per million) was over four times that of Caucasians (11.5 per million). This racial difference in asthma mortality rates was even greater in the 5-34 year old age group (African-American vs. Caucasian, 17.5 vs. 1.8/1,000,000, ages 5-14 and 24.2 vs. 4.0/1,000,000, ages 15-34).

During the years 1990 to 2001 in Michigan, there were a total of 1687 deaths where asthma was the underlying cause of death, 281 of these deaths occurred among the 2-34 year old age group. The annual number of deaths in the study age group has ranged from 5-40 per year. Deaths in the 2-34 age group were equally distributed between males (138 deaths or 49.1%) and females (143 deaths or 50.9% of asthma deaths). One hundred fifty-five (55.2%) of the deaths were among African-Americans and 123 (43.8%) were among whites.

Asthma deaths in Michigan were not evenly distributed throughout the year. The number of deaths increased in the summer and fall for children and young adults.

Asthma deaths should be considered preventable. Successful disease management techniques are available to provide good control over asthma symptoms and a high quality of life. However, failure to maintain control over the disease results in a higher risk of mortality. Investigation of the reasons why people are not able to obtain and maintain good control will allow us to identify preventable risk factors for asthma mortality and recommend ways to address these factors. Interventions that reduce these risk factors can prevent future deaths as well as improve management for all people with asthma.

Methods

Notification of Asthma Deaths

Division of Health Statistics and Vital Records (DHSVR) staff at MDCH entered information from the death certificate into the master electronic file on a quarterly basis, at which time they provided MDCH asthma staff with a transcript of information on all deaths with asthma as the underlying cause of death. The DHSVR transcript contained a limited set of data from the death certificate, including name, address, date of death, date of birth, sex, county of death, and county of residence. Based on this information, MDCH asthma staff identified asthma deaths that met study criteria:

- Asthma as underlying cause of death (ICD-9 code is 493)
- Between the ages of 2-34 years
- Residing in Michigan at time of death

Staff requested an administrative copy of the death certificates for asthma deaths meeting these criteria.

Data Collection

Upon receipt of the copy of the death certificate, a letter was sent to the next-of-kin listed on the death certificate to explain the project and to request an interview. Interviews were conducted with the next-of-kin using a standardized questionnaire. All medical records from the year prior to death, pharmacy records and, if applicable, emergency response records, medical examiner records and the autopsy report were requested and reviewed. After an interview with the next-of-kin and review of the records were completed, a one to two page summary of the circumstances surrounding the death for each of the individuals was prepared. In addition to the overall summary, a summary was prepared of each medical record and autopsy report reviewed.

Advisory Panel Review

Two advisory panels were convened; one for adults (reviewing deaths to individuals ages 19-34) and one for children (reviewing deaths for individuals ages 2-18). The advisory panels included allergists, asthma educators, emergency department physicians, family practitioners, internists, nurses, pediatricians, pharmacists, pulmonologists, respiratory technicians and social workers.

Members of the two panels are listed in Appendix I. Summaries of the data collected were shared with the appropriate Advisory Panels.

The Adult Mortality Review Panel met twice and the Child Mortality Review Panel met once to review completed investigations of 2002 asthma deaths. The advisory panels reviewed the summary materials for individual deaths and were asked to list causal factors and followup preventive activities that were suggested by each death. These conclusions are described in the Results section.

All medical records have been maintained in a confidential manner. Summaries shared with the advisory panels did not include personal identifiers on the individual who died, next-of-kin, their health care providers, health care systems or insurers. This project was reviewed by both the MDCH and the MSU Human Subjects Review Boards. MDCH Human Subjects Committee determined that this project was a surveillance activity and not human research. The MSU Human Subjects Review Board approved the project as human research. To provide further assurance of confidentiality this project was designated a Medical Research Project by the MDCH Medical Director under the provisions of MCL 333-2631-2635. This designation safeguards the confidential character of research studies conducted by MDCH and provides protection from release of the identifiable asthma mortality review materials for any purpose other than the research project.

Results

There were a total of 152 deaths where asthma was the underlying cause for all ages during 2002. Thirty-two (21.1%) of these deaths were among individuals ages 2-34 years. Twelve (37.5%) of the deaths were among children age 2-18 years and 20 (62.5%) among young adults 19-34.

Table 1: Sociodemographic Characteristics of Thirty-Two Asthma Deaths From Death Certificates, Ages 2-34 Years, Michigan, 2002

	Children (2-18 years)	Adults (19-34 years)	Total (2-34 years)
Number of Asthma Deaths	12 (37.5%)	20 (62.5%)	32
Average Age (years)	13.0	27.5	21.9
Sex			
Male	66.7%	55.0%	59.4%
Female	33.3%	45.0%	40.6%
Race/Ethnicity			
Caucasian, Non-Hispanic	41.7%	35.0%	37.5%
African-American	58.3%	55.0%	56.3%
Other	0%	10.0%	6.2%
Education Completed			
College Graduate	-	0%	-
Some College	-	30.0%	-
High School Graduate	-	40.0%	-
Grades 6-11	-	30.0%	-
Place of Death			
Hospital	100%	85.0%	90.6%
Home	0%	15.0%	9.4%
Autopsied	79.0%	85.0%	81.3%

Age

The average age of children who died was 13 years (range: 2-18 years). The average age of adults who died was 28 years (range: 19-34 years).

Gender

Nineteen (59.4%) of the individuals who died were males and 13 (40.6%) were females.

Race/Ethnicity

Eighteen (56.3%) of the individuals who died were African-Americans, 12 (37.5%) were Caucasian, one (3.1%) was Mexican-American and one (3.1%) was Vietnamese.

Education
Of the 20 adults in the study, none had completed college, six (30%) had 2-3 years of college, eight (40%) completed high school, and the remaining six (30%) completed grades 6 to 11 of school.

Place of Death
The death certificate information on place of death listed in Table 1 reflects where the 32 deaths were pronounced. Twenty-nine of the asthma deaths were pronounced dead in the hospital. However, all individuals were non responsive and in code status when emergency responders first reached the deceased. Of the five deaths that occurred among asthmatics admitted to the hospital, all were unresponsive and in a coma when admitted.

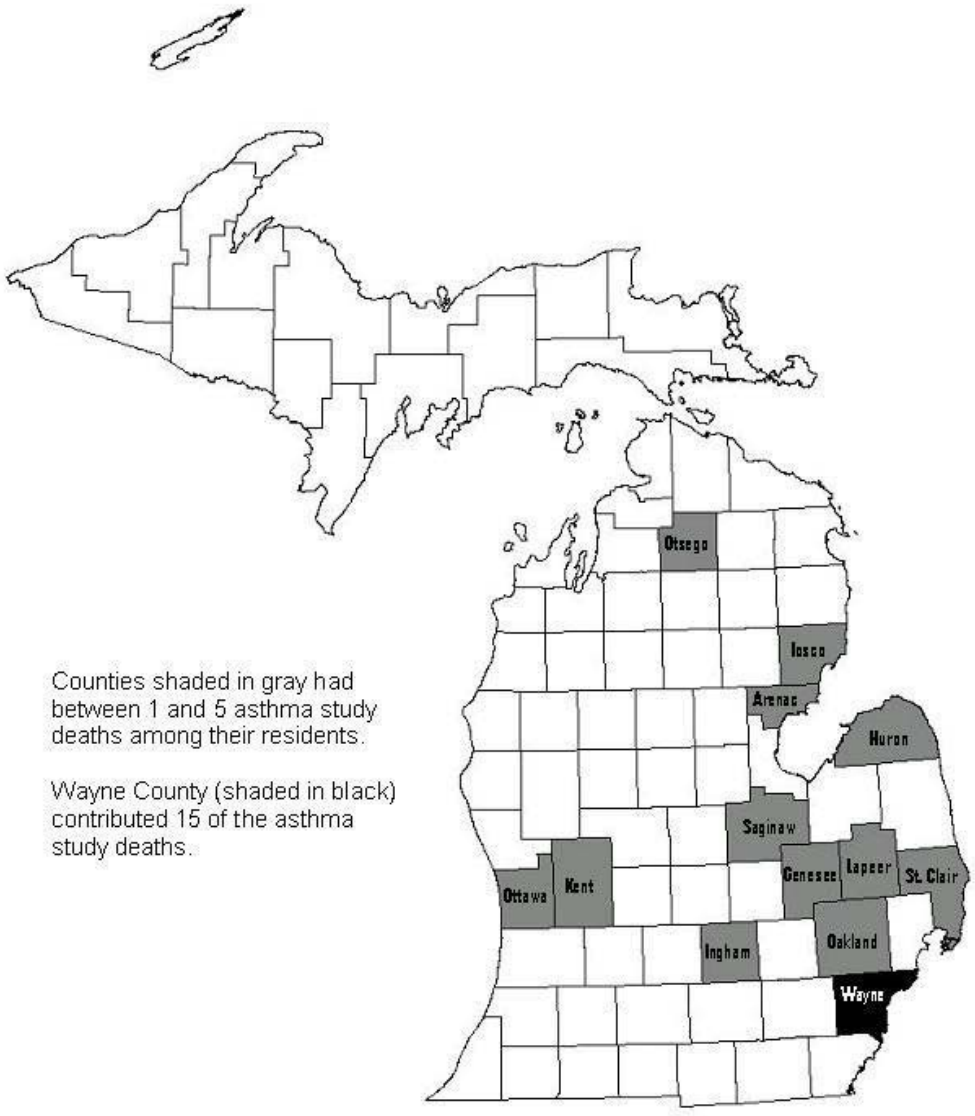
Autopsy
A high percentage of individuals, both children and adults, who died from asthma were autopsied (81.3%).

Location in State
Wayne County was the most common residence of the deceased (Figure 1). The other counties had between one and five residents who died of asthma during 2002 (Arenac, Genesee, Huron, Ingham, Iosco, Kent, Lapeer, Oakland, Otsego, Ottawa, Saginaw, and St. Clair). No study deaths occurred among residents of the Upper Peninsula.

Occupation/Industry
The occupation listed on the death certificates of adults were: homemaker/unemployed-4; clerk/clerical-3; student-2; salesperson-2; laborer-2; presser-1; machine operator-1; nurse assistant-1; truck driver-1; seat builder-1; welder-1; carpenter-1.

The industry listed on the death certificates of the adults were: automotive manufacturing-3; retail-2; auto parts-1; government-1; employment agency-1; wholesale distributing-1; cleaners-1; pharmacy-1; carpentry-1; medical-1; and private firm-1. No industry was listed for the four homemakers/unemployed and two students.

Figure 1: COUNTY OF RESIDENCE: Asthma Study Deaths, 2002



Investigations Completed

The average time between the death occurring and project staff being notified to commence the investigation was 3.5-3.7 months.

The major difficulty in completing the next-of-kin interviews involved locating the next-of-kin. We were unable to locate eight next-of-kin; five of the children's next-of-kin and three of the adult's next-of-kin. Another five next-of-kin declined to be interviewed; three of the children's next-of-kin and two of the adult's next-of-kin. Completion of next-of-kin interviews was more of a problem with the deaths among children because these interviews were to be done by Child Death Review team staff whose first priority was following up traumatic deaths in children.

Adult next-of-kin interviews were conducted by a single nurse whose first priority was conducting these interviews. An additional potential problem with using the Child Death Review team staff was their responsibility to identify child abuse and neglect, which could interfere with the next-of-kin being truthful in their responses.

Medical records were obtained on 92% (11 of 12) of children and 95% (19 of 20) of adults. In the absence of a next-of-kin interview, the medical records received were incomplete, because the health care providers(s) for the year prior to death would be unknown (see Table 2).

Table 2: Percent of Asthma Mortality Investigations Completed
Ages 2-34 Years, Michigan, 2002

	Children	Adults
Average Time Between Death and Notification	3.5 months	3.7 months
Next-of-kin Contacted	58%	85%
Interviews Completed	33%	75%
Medical Records Received (not including autopsy report)	92%	95%
Reviewed by Advisory Panel	25%*	90%

*The advisory panel met before the parents of the last (4th) child's next-of-kin interview was completed.

RISK FACTORS FOR ASTHMA MORTALITY

The denominators for the different risk factors listed below vary due to the availability of records or whether all of the next-of-kin interviews were completed. After each percentage is the number with a positive response and the denominator for that factor. Table 3 summarizes the risk factors.

Insurance

Eighty percent (8 of 10) of children and 76% (13 of 17) of adults where insurance status was known had medical insurance. Among the ten individuals with medical insurance where information about co-payment was known eight of ten had co-pays of $10 or less, one had a 20% co-pay and one had a $50-$75 co-pay. Five percent (1 of 20) next-of-kin or health care providers mentioned that co-pays or cost of referrals for specialists and testing interfered with the patient's management.

Co-morbidities

Thirty-three percent (6 of 18) of adults and 33% (3 of 9) of children were reported to have a co-morbid condition during their lives, such as Down's Syndrome, Crohn's disease, diabetes, autism, and hypertension, which complicated their asthma management.

Triggers

Thirty-eight percent (6 of 16) of adults who died of asthma were current smokers, which is a higher percentage than the general population of adults (31.4% of 18-24 year olds and 26.3% of 25-34 year olds) according to preliminary estimates from the 2002 Michigan Behavioral Risk Factor Survey. Twenty-five percent (1 of 4) of children smoked and 40% (2 of 5) were exposed to smoke at the home.

One hundred percent (4 of 4) of children and 50% (7 of 14) of adults had pets living in their homes at the time of their death.

Substance Abuse/Family Dysfunction

Twenty-six individuals were autopsied and had toxicology results. No illegal drug use or alcohol use at time of death were detected in toxicology tests. However, substance abuse issues were mentioned by the next-of-kin or a health care provider in 25% (4 of 16) of adult deaths, but none of the children's deaths. There appeared to be a lack of parental supervision or family dysfunction that interfered with asthma management in 60% (3 of 5) of the pediatric deaths.

Medical Care

Sixty-three percent (5 of 8) of children and 44% (7 of 16) of adults were taking an inhaled or oral corticosteroid at the time of their death.

Fifteen percent (2 of 13) of adults had a history of prior intubation in their lifetime. Twenty-five percent (1 of 4) of the children had been intubated prior to the time of their death. Eighty percent (4 of 5) of children and 55% (6 of 11) of adults had been previously admitted to the hospital for asthma. Eighty percent (4 of 5) of children and 80% (12 of 15) of adults had an emergency department visit for asthma in the year prior to their death.

Other aspects of medical care determined were: 38% (6 of 16) had seen an allergist; 38% (6 of 16) had seen a pulmonologist; 25% (1 of 4) of children had ever seen an allergist and 25% (1 of 4) had seen a pulmonologist. (The same child had seen both an allergist and a pulmonologist); 42% (5 of 12) of adults had seen an allergist and 42% (5 of 12) had seen a pulmonologist; 55% (6 of 11) of adults had seen either an allergist or pulmonologist (Four of the six had seen both types of specialist); 50% (2 of 4) of children and 25% (2 of 8) of adults had pulmonary function testing in their life; 75% (3 of 4) of children and 58% (7 of 12) of adults had a peak flow meter (only 2 of the children and none of the adults with a peak flow meter used it regularly); none of 14 adults or children had an asthma management plan.

Obesity

Forty-seven percent (8 of 17) of adults had a body mass index (BMI) of 30 or greater (obese), 18% (3 of 17) had a BMI of 25 to 29 (overweight), 35% (6 of 17) had a BMI less than 25 and for three individuals height and weight were not available (although one of the latter individuals was described as obese in their medical records).

Seven of the 11 (64%) children's body mass index (BMI) were at the 90 percentile or greater for their age, two (18%) were at the 85th percentile and two (18%) were at the 50th percentile. The BMI of one child was unknown.

Table 3: Characteristics of Asthma Management History Based on Deaths With Information Available Children (Ages 2-18) and Adults (Ages 19-34), Michigan, 2002

	Children	Adults	Total
Insurance Status			
Deceased Had Some Form of Health Insurance	80%	76%	78%
Insurance Had Co-Pays	67%	86%	80%
Co-pay Mentioned as Reason for Not Filling Medication, Seeing Specialist, or Getting Tests	17%	0%	5%
Deceased Had Co-Morbid Condition	33%	33%	33%
Significant Substance Abuse Noted by Family or Health Care Provider	0%	25%	24%
Exposure to Triggers			
Current Smoker	25%	38%	35%
Smoker in the Home	40%	69%	61%
Pets in the Home	100%	50%	61%
Routine Asthma Management			
Taking Inhaled or Oral Steroids	63%	44%	50%
Referred to Specialist	25%	55%	47%
Seen by Allergist	25%	42%	38%
Seen by Pulmonologist	25%	42%	38%
Ever Had Pulmonary Function Testing	50%	25%	33%
Had a Peak Flow Meter	75%	58%	63%
Regularly Used Peak Flow Meter	50%	0%	14%
Had a Nebulizer	100%	75%	83%
Asthma Management Plan	0%	0%	0%
Urgent Asthma Management			
Prior History of Intubation	25%	15%	18%
Previously Hospitalized for Asthma	80%	55%	63%
In Year Prior to Death	50%	29%	33%
Previous ED Visits	80%	80%	80%
Average Number of ED Visits Reported in Year Prior to Death	3.3	16	12.5
Family Dysfunction	60%	25%	33%

Weight			
Children		*Adults*	
≥ 90 percentile	64%	Obese (BMI 30+)	47%
85-90th percentile	18%	Overweight (BMI 25-29)	18%
50th percentile	18%	Not Overweight	35%

CAUSAL FACTORS

Causal factors were divided into sections based on the setting in which action is needed: physician-related factors, such as need for education or changes in practice behavior; patient-related factors, such compliance issues, need for education or trigger avoidance; and system-related factors, such as lack of health care, need for changes in health care or foster care systems. Table 4 provides causal factors identified for the 18 reviewed adult asthma deaths; Table 5 provides those factors for the three child deaths reviewed.

Among adults, the inadequate prescription of steroids by health care providers was the most important causal factor identified.

Some examples from the case studies illustrate this point:

- A man in his 20's used an albuteral inhaler approximately ten times a day. When he got "bad" he used his nebulizer. He did not take steroids because they would make him break out in hives. About three weeks before his death he was given an antibiotic for bronchitis.

- A female in her 20's called 911 because of breathing difficulty. She collapsed while she was on the phone. She had never been hospitalized for asthma. She had been seen by doctors three times in the year prior to her death. At an emergency department visit 11 months prior to her death she was given an antibiotic for tonsillitis. Her only medication for asthma was albuterol.

- A teenage female was using albuterol twice a day and a nebulizer when she had problems. She had been hospitalized for asthma as a toddler but not since that time. Her medical records one month before death indicated a plan to restart Vanceril and Accolate but her pharmacy had no records of a prescription for either of these medications.

Elimination of asthma triggers, follow-up with regular medical care, and use of steroids was the second most important causal factor.

Some examples from the case studies:

- A male in his 30s who died of asthma was reported to smoke two packs of cigarettes a day. His primary care physician told him on multiple occasions that he needed to stop smoking and drinking. The next-of-kin stated that the deceased did not follow his physician's advice about avoiding asthma triggers. The physician advised the patient to look for a new primary care provider due to the patient's non-compliance with his instructions.

- A female in her late 20s who died of asthma was reported by her next-of-kin to take less than the prescribed medication, especially steroids. She was reported to take the medications until she felt better and then save the rest for when she became sick again. She was also reported to use her son's nebulizer frequently.

- The next-of-kin of a female in her 20's who died from asthma reported that Crohn's disease was a bigger concern than her asthma during the patient's lifetime. She was reported to smoke three packs of cigarettes per day and did not want to get rid of her cat because of her children.

Lack of health insurance and lack of regular medical care with a primary care physician were the next two most important issues.

Lack of adequate health insurance was noted as a causal factor in 4 of the adult deaths. Some examples of how health insurance impacted the lives of the deceased:

- The next-of-kin of a female in her late 20s reported that her insurance company would not cover her asthma because it was a pre-existing condition. Furthermore, she was told she would need to spend more than $6,000 in six months time for medical costs before she would be eligible for Medicaid benefits. The next-of-kin reported that the deceased would get her asthma medication by paying cash when she could afford it and that she would take the asthma medication of her significant other's son who also has asthma. She went to the emergency department approximately 30 times in the year prior to her death but did not go to the doctor's office or clinic, even when told to by the emergency department physicians, because she could not afford to.

- A female in her 30s who died from asthma was referred to a "lung doctor" but her next-of-kin reported that the deceased did not go to the appointments because her insurance would not pay for the visit.

- A female in her 20s who died from asthma had no primary care physician. At an emergency department visit two months prior to her death she was given one week of free medications through social work secondary to the fact that she did not have insurance.

The need for specialist referral and pulmonary function testing for high-risk patients was listed as a causal factor by the panel in five deaths.

Some examples of the complexity of the cases are:

- A female in her 30s with a history of asthma, obesity, arthritis, and questionable Type II diabetes mellitus saw her primary care physician 11 times in the last year of her life, six of those times for asthma. According to her medical records, at her last asthma visit she was on albuterol, Azmacort, theophylline, Dolobid, ferrous sulfate, and Zantac. The patient missed her next two scheduled appointments. At a non-asthma visit 1 ½ months before her death, she was reported to have mild wheezes in her lungs. The medical records showed no referral to specialists and made no mention of peak flow meters or pulmonary function testing, despite this being a difficult case with significant co-morbidities.

- A male in his 20's with a history of severe steroid-dependent asthma, gastro-esophageal reflux, chronic lower back pain, osteopenia, and migraine headaches went to his primary care physician six times, the emergency department ten times and was admitted to the hospital eight times in the year prior to his death. His primary care physician followed him through his hospital stays. Although the patient had been to a specialist three years prior to his death, he was not continuously under a specialist care, despite the complex nature of his case. He did not have a pulmonary function test conducted in the last year of his life.

Table 4: Causal Factors for Asthma Mortality Based on 18 Deaths Reviewed Adults Ages 19-34, Michigan, 2002

Factor	Number of Deaths
Physician-Related Factors	
Inadequate Prescription of Steroids	11
Needed Referral or Inadequate Diagnosis for High Risk Patients	5
Patient-Related Factors	
Compliance	9
Inadequate Use of Steroids	8
Obesity	3
Lack of Prior Diagnosis	2
Depression	1
Allergic Reaction	1
Aspirin Sensitivity	1
Amount of Pain Medication	1
System-Related Factors	
Lack of Regular Medical Care	5
Lack of Health Insurance	4
Health Insurance Would Not Pay for Referral	1
Heat Exposure on the Job	1

Note: multiple causes are possible for each death.

Table 5: Causal Factors for Asthma Mortality Based on Three Deaths Reviewed Children Ages 2-18, Michigan, 2002

Causal Factor	Number of Deaths
Physician-Related Factors	
Inadequate Prescription of Steroids	2
Needed Referral or Inadequate Diagnosis for High Risk Patients	1
Patient–Related Factors	
Compliance: Trigger Avoidance; Pets; Bronchodilator Overuse	3
Aspirin Sensitivity	1
System-Related Factors	
Lack of Adequate Adult Supervision	1
Repeated Refill of Bronchodilators	1
No Regular Maintenance Health Care Visits	1

Inadequate prescription of steroids and patient compliance issues were also identified as causal factors in two of the three child asthma deaths reviewed by the panel. Other factors identified included need for referral of high-risk patients, and lack of adequate adult supervision (see Table 5).

The ingestion of aspirin in an aspirin sensitive individual was suspected to be the causal factor in one adult and one child death. In both cases, the deceased unknowingly used a product with aspirin in it.

The absence of deaths from certain risk factors was also an important finding. There were no asthma deaths related to care received in the hospital. There were no deaths where illegal drug usage was felt to be an important issue. Although peak flows meters were available but rarely used by the deceased, the lack of regular use of peak flow meters was felt by the Advisory Panel to be symptomatic of more important health care management deficiencies rather than a direct causal factor. Both the adult and child Advisory Panels felt that it was more important to put emphasis on steroid use rather than peak flow usage.

A secondary issue was the need to work with medical examiners to ensure that there was consensus about what constitutes a death with an underlying cause of asthma. The advisory panel questioned whether the death was caused by asthma in four cases.

RECOMMENDATIONS FROM ADVISORY PANELS (see Tables 6 and 7)

Adults

Suggested interventions involved education on the prescription and use of steroids for both health care providers and patients. Inclusion of education in the emergency departments for asthmatics on the prescription of steroids by health care providers and their use by patients was also strongly indicated. Referral to specialists was also indicated for five of the deceased.

System level changes that were suggested by the panels included the need for case managers for high-risk patients and the need for provisions for regular care for those without health insurance.

Two of the most troubling asthma deaths in adults were in two individuals who had never previously been diagnosed with asthma. A general public awareness campaign on asthma management that also emphasized diagnosis of recurrent/chronic respiratory symptoms might be useful in preventing similar deaths in the future. Finally, although a factor in only one adult death, adequate labeling of products that contain aspirin and patient education might have prevented this death.

Children

Like adults, education on the prescription and use of steroids for both health care providers and patients was the highest priority. The child panel suggested that pharmacies should notify practitioners of excessive bronchodilator use by their patients. Timely referral to a specialist was also indicated. Interventions specific to children included setting up a focus group of teenagers with asthma to better understand how to conduct asthma education in this age group; attention to foster care environment (i.e. presence of asthma triggers), and a school-based asthma plan.

Insurance issues were not noted to be a problem with children. Similar to adults, there was one death in a teenager where better labeling for products that contained aspirin might have prevented the death.

Table 6: Recommended Interventions for Asthma Mortality Based on 18 Deaths Reviewed Adults Ages 19-34, Michigan, 2002

Recommendation	Number of Deaths
Educate Health Care Providers	
Need for Inhaled Steroids	8
Need to Refer High Risk Patients to Specialists	3
Need for Pulmonary Function Tests	2
Educate Patients	
Need to Use Steroids	7
Provide Education in Emergency Department	3
Aspirin	1
System Level Changes	
Need for Case Management	5
Improve Insurance Coverage	5
Raise Public Awareness of Asthma	2
Regulation of Insurance Companies on Referrals to Specialist	1
Improve Labeling of Products Containing Aspirin	1
Medical Examiners	
Develop Clear Criteria for Identifying Asthma Deaths	4

Table 7: Recommended Interventions for Asthma Mortality Based on Three Deaths Reviewed Children Ages 2-18, Michigan, 2002

Recommendation	Number of Deaths
Educate Health Care Providers	
Steroids	2
Limitation of Refills for Bronchodilators Without a Physician Visit or Active Approval	2
Referrals	1
Educate Patients	
Severity of Asthma	2
Focus Group of Teenagers with Severe Asthma	1
Dangers of Aspirin Sensitivity	1
System Level Changes	
School Based Asthma Program	2
Pharmacist Notification of Excessive Bronchodilator Use	2
Case Manager/Child Protective Services – attention needed for foster care environment	1
Development and Dissemination of Generic Action Plan	1
Better Labeling of Aspirin Products	1

Discussion

Asthma is a chronic but manageable condition. This project is based on the premise that all asthma deaths are preventable with appropriate asthma management.

The 150 asthma deaths represent only a small percentage of the 87,000 deaths that occur each year in Michigan. However, asthma is a treatable condition and each asthma death is a tragedy that could have been prevented. There are also a larger number of near-fatal asthma attacks that require hospitalization and intubation. Although there is overlap between the risk factors for fatal asthma and near-fatal asthma there are differences (15,16). Table 8 summarizes the risk factors reported in the medical literature by different investigators for fatal and near-fatal asthma.

Table 8. Summary of Risk Factors For Fatal and Near-Fatal Asthma From Medical Literature

Risk Factors Reported With Fatal Asthma
Lack of Steroid Inhalers
African-American
Low Income
Lack of Peak Flow Meter
Blunted Perception of Shortness of Breath
Risk Factors Reported With Near-Fatal Asthma
Diagnosis of Asthma <5years
Stress
Hx Intubation
Hx Previous Hospital Admission
Hx Allergy and Atopy
Blunted Perception of Dyspnea
>90% on Steroids
Symptoms of Wakening Up at Night
Air Conditioning at Home

A program to investigate near-fatal asthma cases would be an inadequate substitute for a program to investigate asthma fatalities. Besides differences noted in the medical literature between fatal asthma and near-fatal asthma (Table 8) a program limited to the review of near-fatal asthma that used intubation as the criteria to initiate an investigation would miss 82% of the asthma deaths. A program limited to hospitalization in the past year as the criteria to initiate an investigation would miss 67% of the asthma deaths (Table 3). Despite the tragedy of the asthma death, and potential psychological discomfort to the next-of-kin, only through investigating such deaths will we be able to learn more about how to prevent them.

The primary causal factor identified in this first year of investigation was the inadequate prescription and use of steroids. The expert panels felt there was a need for both physician and patient education to increase the regular use of inhaled steroids. A number of the secondary recommendations were associated with the concern about lack of regular medical care, lack of referral to a specialist, the need for case managers for high risk patients, dependence on bronchodilators, and provision for patient education in emergency departments. Various methods to ensure improved use of steroid inhalers was recommended by the expert panels, including pharmacist notification of healthcare providers regarding over use of bronchodilators and forming focus groups of teenagers with asthma. Further work is needed to best ensure implementation of recommendations in this report. How to ensure adequate health insurance and regular medical care for people with asthma of all ages is a societal issue that goes beyond the narrower focus of this report, to identify the causes of death from asthma in Michigan.

It has been suggested by some researchers that asthma deaths can be divided into two types; 1) slow onset, late arrival for care and poor use of steroids because of psychological, social and

cultural factors; and 2) sudden onset of severe airway closure (17). The pathology on autopsy in the first type of death shows abundant sticky mucus plugging in the airways and in the second there are empty/dry airways suggesting sudden airway closure by a neural mechanism. Of the 26 deaths with autopsies, 19 showed mucus plugging, four were empty/dry, and for three the autopsy report did not address the airways. The second type of asthma death, sudden onset, is harder to prevent but review of Michigan deaths indicate that most of the asthma deaths were the slow onset type and accordingly were preventable.

Next Steps

Investigation of these deaths from asthma has identified a number of avenues to reduce asthma mortality. Action needs to occur at many levels, including health care providers, patients and system-level changes. The findings from these investigations will be shared with many asthma stakeholders who have the expertise and position to institute these recommendations. Plans to disseminate the information gathered from these investigations include:

- A presentation to the Michigan Department of Community Health and the Michigan Asthma Advisory Committee.

- Presentations to local asthma coalitions, local public health departments, and local Child Death Review Teams.

- Presentations to physician and allied health workers through grand rounds across the state.

- A presentation to the Family Independence Agency to explore ways to incorporate asthma review into their ongoing local Child Death Review.

- Development of physician education activity from the blinded case studies developed for panel review.

- Presentations at national meetings and shared with other state asthma programs.

- A meeting with the organization representing Medical Examiners to discuss criteria for recording a death as being secondary to asthma.

- A meeting with the organization representing Emergency Room Physicians to discuss providing prescriptions for inhaled steroids and asthma education in conjunction with Emergency Department visits.

Continued tracking of asthma deaths in Michigan is planned to identify risk factors that can be addressed to prevent such deaths. This tracking should also prove useful for evaluating intervention initiated to prevent asthma death.

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APPENDIX I

Members of Adult and Child Asthma Mortality Review Panels

Adult Asthma Mortality Review Panel Members

Panel

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Child Asthma Mortality Review Panel Members

Panel

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