2009 Mississippi Asthma Mortality Review

Report & Recommendations

2009 Mississippi Asthma Mortality Review Panel Members:

Jennifer Cofer, MPH, CHES, AE-C, American Lung Association in Mississippi Executive Director
Juanita Graham, RN, MSN, MS State Department of Health, Chief Nurse
Lesley Guyot, MPH, CHES, American Lung Association in MS Asthma Coalition Coordinator
Gailen Marshall, MD, PhD, University of MS Medical Center, Professor of Medicine and Pediatrics
Steven Pearson, PharmD, CDE, CDM, Southwest MS Regional Medical Center, Pharmacist
Jodi Rankin, RN, MSN, MS State Department of Health, Bureau Director, School & Community Health
Sitesh Roy, MD, FAAP, FAAAAI, University of MS Medical Center, Associate Professor of Medicine & Pediatrics
Cathleen Shephard, RRT, AE-C, Oktibbeha County Hospital

Background

Asthma is a chronic pulmonary condition characterized by intermittent episodes of reversible airway obstruction and hyperreactivity precipitated by environmental triggers.[1] Hallmark signs and symptoms include difficulty breathing, coughing and wheezing. At the present time there is no known cure for asthma, but it can be controlled with appropriate pharmacologic therapy and management practices. Studies have shown higher asthma mortality rates among African Americans, low-income populations, and populations with low education levels.[2] Reasons for these differences may include differential access to care, exposure to environmental factors, innate differences in immune function, and increased exposure to allergens and infections.[3-5] Increased asthma mortality has also been associated with overuse of β_2-agonists and underuse of inhaled corticosteroids.[6-8]

Nationally, asthma prevalence, rates of hospitalization for asthma, and deaths from asthma vary by race. African Americans have a higher prevalence of current asthma among children (age 0-17 years) and adults (age ≥ 18 years) (15.7% and 10.1%, respectively) as compared to white children and adults (7.8% and 8.7%, respectively).[9] African Americans are three times more likely to be hospitalized for asthma (33.5 per 10,000 population compared to 10.0 per 10,000 population) and are two times more likely to die of asthma (27.4 deaths per million population compared to 12.8 deaths per million population) than whites.[10] In Mississippi, current asthma prevalence in 2008 was higher among African-American children compared to white children of the same age (14.2% vs. 7.2%, $P<0.05$). The difference in current asthma prevalence between African-American and white adults was not statistically significant (8.3% among African-Americans vs. 6.3% among whites, $P>0.05$). Asthma hospitalization rates in 2007 were twice as high among African Americans compared to whites (22 vs. 10 per 10,000 population) and asthma emergency department discharge rates were more than four times higher among African Americans (87 vs. 20 per 10,000). In 2008, the asthma mortality rate among white Mississippians was 0.8 per 100,000 population compared to 2.7 per 100,000 population among African-American Mississippians.[11] These measures represent the most recent years of data available at the time of this report.

The documented racial disparity in asthma mortality in Mississippi and the fact that effective asthma management should prevent deaths due to asthma prompted the design and implementation of this study. To the best of our knowledge, no prior systematic investigation of asthma deaths has been conducted in Mississippi. The data collection tools used in this study were based on tools used during an investigation of pediatric deaths from asthma in Georgia.[12] Following data collection, a review panel of experts, including physicians, nurses, pharmacists, respiratory therapists, asthma educators, and community advocates was convened to review

each case and provide recommendations to prevent future asthma deaths in Mississippi. This report details those recommendations and describes study methods and results. This study was approved by the Mississippi State Department of Health (MSDH) Institutional Review Board (IRB) on April 16, 2009. The IRB number for this study is 012709.

Purpose

The purpose of this study is to determine the adequacy of local systems of care and community resources for people with asthma in Mississippi. This study will result in a set of actionable recommendations to prevent future asthma deaths in Mississippi.

Methods

Study Design and Inclusion Criteria

This review is a retrospective, cross-sectional analysis of asthma deaths from January 1, 2003 – August 31, 2007. Cases were included for review based on three criteria: (1) Mississippi resident at time of death; (2) age between 5 and 34 years; and (3) asthma as underlying cause of death as designated by ICD-10 codes J45 or J46. During the study period, there were a total of 177 asthma deaths in Mississippi. Thirty of these met the study inclusion criteria.

Data Collection

All data collection was completed between May 1, 2009 and August 31, 2009.

Death records – Certificates of Death were obtained from the MSDH Vital Statistics Department. Records were used to identify: (1) primary caregiver; and (2) location of patient death (i.e., hospital, ED, home), so that additional medical records/sources of patient-related information could be identified and reviewed.

Medical record extraction – the MSDH solicited medical records for all cases from (1) hospitals known to have provided emergency or inpatient services to cases prior to death; (2) primary care providers (PCP) known to have provided recent medical care to cases; (3) specialty care providers known to have provided recent medical care to cases; (4) medical examiner records for all cases; and (5) autopsy reports (as applicable).

Records were solicited by letter and follow-up phone call, as necessary. The MSDH used a standard form to extract data from medical records. One extraction form per case was completed. The form included information on asthma diagnosis, asthma care immediately and

during the three years prior to death, prescriptions (quick-relief medications and controller medications), environmental exposures, and co-morbidities relevant to each case.

Caregiver interviews – an MSDH outreach worker or a Registered Respiratory Therapist (RRT) conducted structured interviews with a primary caregiver of each case. Caregivers included parents, spouses, and other relatives. Caregivers were identified through medical records (listed as "next of kin") and by referral (in several cases, the person listed as "next of kin" declined to do an interview but suggested another caregiver who was willing to participate). When possible, interviews were scheduled with the caregiver who was with the case at the time of their fatal asthma episode and living at the same address as the case at the time of death, in order to assess environmental asthma triggers in the case's home.

Informed consent was obtained prior to each interview, and each respondent was provided with a copy of the consent document describing the study and the voluntary nature of their participation. Following informed consent, the MSDH outreach worker administered a standard questionnaire designed to collect a narrative account of events immediately preceding and during the fatal attack as well as questions to assess past disease severity and control, asthma management practices, medication use, medical encounters within the three years prior to the fatal episode, insurance coverage, environmental asthma triggers, environmental exposures, and co-morbidities. Caregiver interviews and medical record extraction were completed by an MSDH outreach worker (RRT) and Certified Asthma Educator (AE-C).

Mortality Review Panel – following medical record extraction and caregiver interviews, a review panel was convened to formally assess each case and to develop recommendations for prevention of future asthma deaths in Mississippi based on case review. The review panel included eight members: two physicians (both asthma/allergy specialists); two nurses (a pediatric Registered Nurse (RN) and an adult RN); a pharmacist; a respiratory therapist; a community asthma coalition coordinator; and the Executive Director of the American Lung Association in Mississippi. The panel, which was facilitated by the MSDH, met on September 14, 2009. Prior to the panel meeting, panelists reviewed descriptive case summaries by race, sex, geography, medication use, and exposure to environmental triggers, based on the medical record extraction and caregiver interviews. During the panel meeting, panelists completed a case assessment for each case. Case assessments included a structured form delineating categorical issues within five groupings: (1) gaps in care; (2) quality of care; (3) barriers to care; (4) environmental issues; and (5) social issues. The panel reached consensus on issues present for each case. Qualitative rationale for each issue identified by the panel was included in the case assessment.

Data Analysis

Categorical data from medical record extraction and caregiver interviews were analyzed using descriptive statistics. Qualitative analysis was used to identify recurrent themes within caregiver interviews. Qualitative themes were triangulated to supporting documentation from medical records (e.g., a caregiver report regarding the timeline of emergency response services during the fatal attack was corroborated with emergency medical services (EMS) and Emergency Department (ED) records regarding time of arrival). Stata version 11 and NVivo version 8 were used for quantitative and qualitative data analyses.

Using case assessments, the panelists compiled a list of recommended actions to prevent future asthma deaths in Mississippi. The final recommendations of the panel are structured around the recurrent themes emerging from this analysis.

Results

Of the 30 identified deaths during the study period, 27 had at least one data source. For the remaining three cases, coroner reports and medical records were either missing or held by the hospital due to pending litigation or primary caregivers could not be located. Therefore, case summaries were created for 27 cases. Descriptive statistics were calculated for all 27 cases. Following data collection and case summation, the Mortality Review Panel convened to review 14 of the 27 cases. Cases were chosen for review based on data completeness. All cases with a caregiver interview (n=12) were reviewed by the panel, due to the extensive qualitative data collected through the interview protocol. Eleven of the 12 cases with a caregiver interview had at least one additional data source (medical record (ED, hospital, and/or primary care), coroner's report, and/or autopsy report), used to corroborate qualitative data collected during the caregiver interview. Two cases without caregiver interviews were chosen for panel review because both were residents of a state facility and had extensively documented medical histories, making the quality of their data on par with the cases whose data included caregiver interviews. The thirteen cases not reviewed by the panel had significant gaps in data preventing comprehensive review. A comprehensive case assessment was completed by the panel for each of the 14 cases reviewed. The case assessment process yielded five categories: (1) gaps in care; (2) quality of care; (3) barriers to care; (4) environmental issues; and (5) social issues of qualitative case data that served as the basis for the panel recommendations in this report.

Descriptive Results

The distribution of cases by year, age, sex, and race is displayed in (Table 1). Twenty of the 27 deaths included in the study (74%) occurred among the 18-35-year-old age group. The majority of deaths included in the study occurred in 2005 and 2006. Deaths occurred fairly equally among males (13 of 27) and females (14 of 27). Deaths due to asthma occurred disproportionately among African Americans (26 of 27) compared to whites. The geographic distribution of cases (by county of residence) is displayed in Table 2. Seven of the 27 deaths occurred among residents of Hinds County as it includes Jackson, the capital city and most populous area in the state.

Record extraction yielded descriptive results for all 27 cases in the following categories: (1) Insurance Status; (2) Co-morbidities; (3) Body Mass Index (BMI); (4) Medication Use; and (5) Environmental Triggers.

Insurance Status

Of the 27 cases reviewed, nine were insured, 10 were not insured, and insurance status for the remaining eight was unknown (Figure 1). Of the nine insured cases, five used public insurance (four Medicaid, one Medicare), two used private insurance, and the type of insurance was not known for the remaining two cases.

Co-morbidities

Eighteen of the 27 cases had one or more co-morbid conditions, five had no co-morbid conditions, and co-morbid conditions were unknown among the remaining four cases. Specific co-morbidities, and the number of cases with each condition, are listed in Table 3. Note that obesity is included as a co-morbid condition. Obesity was the most frequent co-morbid condition experienced by cases, followed by eczema, seizures, hypertension, cerebral palsy, congestive heart failure, and profound mental retardation (Table 3).

Body Mass Index

Body Mass Index (BMI) was calculated using weight and height (kg/m^2) extracted from medical records. Overweight and obese categories were classified using separate formulas for children and adults in order to account for growth and development factors in children.[13] Three cases classified as obese did not include height and weight information but had a documented diagnosis of obesity included in their medical records. Among the 27 cases reviewed, seven (26%) were obese, three (11%) were overweight, six (22%) were healthy weight, and 11 (41%)

did not have available data to calculate BMI. The BMI distribution stratified by children (age 0-17 years) and adults (age 18 and above) is displayed in Figure 2.

Medication Use

Of the 27 reviewed cases, 13 used a quick-relief medication only; six used a quick-relief medication and a controller medication; six used no medication; and for two cases, medication use was unknown (Figure 3).

Environmental Triggers

Fourteen of the 27 cases had identified environmental asthma triggers. One case had no triggers and data were not available for fourteen cases. Specific environmental triggers, and the number of cases exposed to each, are listed in (Table 4). Pollen, dust, and environmental tobacco smoke were the three most common triggers.

Qualitative Results

Qualitative results from the 14 cases with sufficient data for review by the Mortality Review Panel were grouped into five categories: (1) Gaps in care; (2) Quality of care; (3) Barriers to care; (4) Environmental issues; (5) Social issues. An overview of recurring themes within each category is presented in Table 5, followed by detailed explanations of each issue along with case illustrations, when applicable.

Gaps in Care

Lack of specialist care: The panel identified 12 of 14 cases in need of but not receiving specialist care. The panel identified multiple factors related to this lack of access, including failure of referral from acute care (hospital or ED) or primary care to specialist care; failure on the patients' part to seek specialist care even when referred, possibly due to lack of perceived importance of specialist care or cost/insurance concerns; and lack of specialist care in certain Mississippi regions (e.g., the Delta region; specialist care in Mississippi is concentrated in the Jackson metropolitan area).

> Illustrative case: Case 8, a 35-year-old African-American female, made multiple visits to her primary care doctor for a month before her fatal episode due to asthma symptoms. On the day before she died, she went to both the ED and her primary care physician's office for asthma treatment. During this period, the case was frequently unable to

move without severe shortness of breath. The case had used both long-term control and quick-relief medications, but continued to have asthma symptoms every day. Case reported to family that she was "accused" by her healthcare providers of being noncompliant with her medication regimen. However, her family reported that she took her medications regularly. On the day of her death, the emergency medical services (EMS) team found her in respiratory distress with an empty albuterol metered dose inhaler (MDI). Presumably, the case had used all of her medication trying to relieve her acute asthma symptoms. Based on the National Asthma Education and Prevention Program, Guidelines for the Diagnosis and Management of Asthma (NAEPP Guidelines), specialist care for this case was clearly indicated based on severity and control measures.[14] However, this case had never seen a specialist prior to her death.

Lack of primary care: The panel identified 7 of 14 cases in need of, but not receiving, primary care. For these cases, asthma treatment was provided solely in the acute care setting (ED or inpatient). Six of the seven cases used only a quick-relief medication or no medication at all. One of the seven was prescribed long-term control medication at discharge from an ED visit prior to death, but it is unknown whether he filled the prescription. Consistent primary care is a core component of effective asthma care included in the NAEPP Guidelines.[14] In addition, there is a large body of literature documenting the importance of primary care in asthma management.[14-19] Primary care has also been shown to increase appropriate referrals to specialists, which may be particularly important for persons with severe asthma and/or co-morbid conditions.

Illustrative case: Case 11, a 30-year-old African-American female, had asthma and several co-morbid conditions including hypertension, chronic heart failure, obesity, and eczema. The case did not have a primary care provider and used albuterol to treat her asthma. The week before her fatal asthma episode, the case complained of being tired but did not have other obvious asthma symptoms. On the day before her death, the case visited with relatives and stayed up late. The next day, the case was found dead at home by her sister. Her body temperature was cool when her sister found her.

Lack of access to medications: The panel identified 6 of 14 cases with lack of access to medications. Factors influencing lack of access to medications included lack of insurance; insufficient insurance (prohibitive co-pays, or restrictions on types of medications and number of medications paid for); lack of patient/caregiver knowledge regarding the importance of

medications, particularly long-term control medications; and failure by healthcare providers to prescribe medications according to the NAEPP Guidelines.[14]

> Illustrative case: Case 9, a 27-year-old African-American female, was diagnosed with asthma at age 11 years. At the time of death, she was not taking any asthma medications. She complained of asthma symptoms for about three weeks prior to the fatal episode. The day before she died, the case called her primary care doctor and got a prescription for asthma medication (type unknown). The case began having severe asthma symptoms while at her aunt's house and collapsed. After her death, the asthma medications were found unopened in her room.

Lack of insurance: Six of the 14 reviewed cases did not have insurance. The panel identified this problem related to multiple recurring themes, including lack of access to primary/specialty care, lack of access to medications, and lack of patient-specific asthma action plan (AAP).

> Illustrative case: Case 14, a 22-year-old African-American male, had inconsistent insurance coverage, both as a child and as an adult. His mother reported that when he was a child and she had insurance, she was able to get a nebulizer which improved control of the case's asthma. The case did not have insurance coverage when he died. His job had a three-month waiting period for insurance eligibility. At the time of his death, he was within weeks of becoming eligible. At the time of death, the case lived with his girlfriend and her children in a house that was severely damaged by Hurricane Katrina, exposing him to asthma triggers including mold, sewage backup, cockroaches, mice and rats, and dust from demolition and construction going on around the house. A week before he died, the case went to the ED for asthma symptoms and was prescribed prednisone, but it is unknown if he filled or took the medication. He was not taking any other asthma medications or seeing a primary care doctor.

Quality of Care

No patient-specific asthma action plan (AAP): none of the 14 reviewed cases had a patient-specific AAP. AAPs, which include patient-specific instructions to manage asthma both on a daily basis and in case of an acute episode, are recommended by the NAEPP Guidelines and associated with a lower risk of mortality.[14]

Lack of symptom tracking/peak flow monitoring: 13 of the 14 reviewed cases did not do symptom tracking or peak flow monitoring, self-management tools recommended by the NAEPP Guidelines.[14] Factors influencing lack of symptom tracking/peak flow monitoring included lack of primary/specialty care; failure of health care providers to teach symptom/peak flow monitoring; cost of peak flow meters (which are not covered by most insurance companies); and lack of patient education and/or perceived importance of symptom tracking/peak flow monitoring. One case, a child had a peak flow monitor; however, his family reported that he used it as a toy.

Lack of asthma education provided: the panel identified 12 of 14 reviewed cases who needed, but did not receive, asthma education regarding basic disease information, medication use, environmental trigger control, and/or how to respond to an asthma emergency. Factors contributing to lack of asthma education included lack of primary/specialty care, patient/caregiver literacy and/or health literacy, and lack of reimbursement for asthma education in Mississippi (as there is currently no incentive for providers to give patient education).

Lack of long-term control medication: the panel identified 9 of 14 reviewed cases as needing but not taking long-term control medication. Factors influencing lack of long-term control medication include lack of insurance or insufficient insurance; lack of primary/specialty care; failure of health care providers to prescribe long-term control medications; and lack of patients' perceived importance of taking long-term control medication.

> Illustrative case: Case 3, a 17-year-old white female, had asthma symptoms throughout childhood and adolescence. Her sister reported that the patient needed to use nebulized albuterol every morning before getting up. Albuterol use this frequently is a risk factor for death and an indicator that the case's asthma was not under control and in need of long-term control therapy.[20]

Lack of referral: the panel identified eight of 14 reviewed cases needing referral from primary to specialty care but were not referred, and four cases needing referral from hospital/ED to primary care but were not referred. Factors influencing lack of referral included lack of on-site referral resources (e.g., lack of hospital-associated clinics for hospital/EDs to refer patients); lack of primary care physician education regarding when specialist care for asthma is indicated; culture of reluctance to refer to specialists among primary care physicians;

lack of time for facilitated referral in hospitals and EDs; and lack of primary/specialty care in some communities.

Barriers to Care

Lack of knowledge about disease – The panel identified 11 of 14 reviewed cases (or caregivers of cases) with lack of knowledge about asthma that contributed in some way to their death. Factors related to lack of knowledge included lack of primary/specialty care; lack of patient education; lack of literacy and/or health literacy; and lack of patient-specific AAPs.

> Illustrative case: Case 4, a five-year-old African-American female, started wheezing and feeling tired the morning of the day before she died. Early in the afternoon, the case vomited. Her mother (a nurse) gave her four nebulizer treatments of quick-relief medication (Xopenex) during the afternoon and evening. The next morning, case's symptoms still had not resolved. The case's mother prepared another nebulizer treatment while the case got ready for church. Before she could take the treatment, the case collapsed and died in the ED less than an hour later. If the case had had an AAP with instructions for recognizing and responding to late-stage emergency asthma symptoms, or had the case's mother known that failure of quick-relief medication to reverse symptoms indicates the need to seek urgent medical care, this death may have been prevented.

Lack of adherence to medications – the panel identified six of the 14 reviewed cases who did not follow prescribed medication regimens for various reasons, including failure to fill the prescription (due to cost, or lack of insurance, or lack of time, or lack of perceived importance of the prescription); possible incorrect administration of the medication; and/or overuse of quick-relief medications due to lack of knowledge regarding the purpose of these drugs.

Literacy – low literacy and/or health literacy was identified by the panel as a problem contributing to death in five of the 14 reviewed cases. Low literacy levels were identified by the panel as playing an important role in lack of adherence to medications, in terms of patients being unable to understand the instructions for properly administering asthma medications.

Environmental Issues

Exposure to environmental asthma triggers – the panel identified six of the 14 reviewed cases with exposure to allergens in their home/school/work setting, five with tobacco smoke exposure, and seven with exposure to one or more indoor triggers in their home setting. Acute asthma episodes can be brought on by exposure to asthma triggers, but triggers are different for each patient. Including patient-specific triggers and strategies for avoiding/reducing them on an AAP is recommended by the NAEPP Guidelines.[14]

Illustrative case: Case 14, a 22-year-old African-American male, experienced asthma symptoms for at least a week before his death. His symptoms, which included wheezing, coughing, and chest tightness, were bad enough that he went to the ED; however even after his ED visit he had trouble making it through work because of shortness of breath. During this period and several months prior, case was living in his girlfriend's house which was severely damaged by Hurricane Katrina. Around the time of his death, he was working on the house to try to make it livable. During this process, he was exposed to mold and mildew; cockroaches; mice and rats; sewage; and dust and construction debris. The panel concluded that exposure to these triggers likely contributed to the case's death.

Lack of Education and AAP to control triggers – the panel identified 10 of the 14 reviewed cases as in need of but not using a patient-specific AAP to control triggers and eight of the 14 reviewed cases in need of education regarding control of their environmental triggers. These two recurring themes are combined together given that the NAEPP Guidelines consider development of a patient-specific AAP to control triggers a centerpiece of asthma education.[14]

Social Issues

Co-morbid conditions – 11 of the 14 reviewed cases had co-morbid conditions (e.g., obesity, hypertension, chronic heart failure, cerebral palsy) that the panel concluded played a role in their death. Although in most cases the co-morbid conditions did not directly lead to the fatal asthma episode, the panel considered several characteristics of co-morbid conditions noteworthy: (1) physiologic interaction: some conditions, such as obesity, can make asthma worse; (2) health care coordination: a patient with multiple co-morbid conditions may require multiple health care providers, and care of some conditions may take precedence over others; (3) access to healthcare: if patients require care and medications for multiple conditions, they may be forced to care for some conditions at the expense of others due to cost of care,

insurance issues (limits to how many prescriptions they can fill per month, etc.), and time constraints; and (4) stress: stress is a documented asthma trigger, and stress levels are likely higher among patients (and their caregivers) attempting to manage multiple conditions.

> Illustrative case: Case 7, a 30-year-old African-American male, had cerebral palsy, seizures, and profound retardation in addition to asthma. This case lived in a residential state-run facility. Twelve hours before his fatal episode, this case was released from the hospital with diagnoses of atypical pneumonia, hypoxemia, asthma, and respiratory failure with mechanical ventilation. A week earlier, the case was hospitalized for asthma following unsuccessful treatment at the state facility, where he respiratory arrested and was successfully resuscitated. Despite his recent acute exacerbations, on the night of his death a nurse at the state facility reported seeing him happy and laughing, but that ten minutes later she found him unresponsive without pulse or respirations. The panel concluded that the extent of the co-morbid conditions present for this case contributed to his death by obscuring the severity of the asthma symptoms immediately preceding his fatal episode.

Single-parent household – five of the 14 cases reviewed were either single parents or children living in single parent households. The panel concluded that the demands and stress associated with single parenthood or childhood with a single parent may have contributed to death due to asthma.

> Illustrative case: Case 8, a 32-year-old African-American female, was disabled due asthma. She had problems every day with her breathing. She was a single mother, and to get her five-year-old daughter ready for school she had to sit down. Helping her daughter get ready for school gave the case such difficulty breathing that she couldn't bring her daughter to school and had to hire a special bus to pick her up. The case died during the night, and in the morning the case's daughter called her aunt at work and said she could not wake her mother. Her aunt told her to call 911, and the child did so.

Employment status – four of the 14 reviewed cases were jobless when they died, one knew she was going to lose her job in the next three months, and two worked multiple jobs. The panel concluded that joblessness and multiple jobs may have contributed to death in several ways: (1) lack of employer-based insurance coverage; (2) lack of primary/specialty care, due to lack of insurance coverage or lack of time due to multiple jobs; and (3) stress associated with both employment scenarios.

Recommendations

Based on the recurrent themes identified through qualitative analysis of the 14 reviewed cases and the categorical results from descriptive analysis of all 27 summarized cases, the panel drafted a set of recommendations to address problems contributing to death from asthma in Mississippi. Discussion of these recommendations are below.

Improve Asthma Education: based on the above themes, the panel concluded that all 14 of the reviewed cases would have benefited from general asthma education; that 12 would have benefited from environmental trigger control education; and that seven would have benefited from medication device demonstration education. The panel noted that improving patient education will require (1) continuation of current asthma education efforts; (2) training for healthcare providers; and (3) changes in reimbursement policies for asthma education.

Recommendations

1. Develop and implement increased educational opportunities for PCPs about asthma management, focusing on the role of long-term control medications. The training should help providers appropriately identify patients in need of long-term control medications according to the NAEPP Guidelines. The training should also teach providers how to teach patients about the importance of taking their long-term control medications. One possibility for this training is to develop an online course with free continuing medical education (CME) hours.

2. Implement policy for reimbursement of asthma education. Currently, no Mississippi payers reimburse asthma education, making it impossible for most providers to dedicate the time necessary to educate patients in accordance with the NAEPP Guidelines. Policy could be legislated statewide (the way reimbursement for diabetes education in Mississippi was implemented) or negotiated with individual payers (in other states, for instance Michigan, one or more employer-based plans have instituted policies for reimbursement of asthma education).

3. Provide training for respiratory therapy students on identification of environmental asthma triggers. This could be implemented by the American Lung Association or MSDH in partnership with the community colleges with allied health programs.

4. Develop a formal training program with appropriate continuing education hours for caregivers in state facilities. Two of the 27 total cases included in this study were persons with profound mental retardation living in a state facility. Current asthma education efforts in Mississippi exclude this group.

Improve Referrals: the panel concluded that eight of the 14 reviewed cases would have benefited from primary care; 12 of the 14 would have benefited from specialist care; four of the 14 needed referral to care for co-morbid conditions; and that six of the 14 needed referral to psychosocial services. Although multiple factors contribute to lack of access to care (e.g., lack of insurance, insufficient insurance, lack of availability of services in some regions), the factor that the panel identified as feasible to address was healthcare provider referral. For most of the cases reviewed, it is difficult to know whether providers ever made a referral, as the data collected focused on care the patient received (a provider may have made a referral that a patient did not keep). Nonetheless, among the cases were several examples of patients without other obvious barriers to care – they had insurance, were seeing a PCP or using a hospital/ED regularly, and were, according to caregiver interviews, engaged in the care of their disease – and therefore the panel concluded that improving referrals is a viable solution to the problem of insufficient care among persons who died due to asthma. According to the 2007 NAEPP Guidelines,

> Referral to an asthma specialist for consultation or co-management of the patient is recommended if there are difficulties in achieving or maintaining control of asthma; if additional education is needed to improve adherence; if the patient requires step four care or higher (step three care or higher in children 0-4 years of age). Referral should be considered if the patient requires step three care (step two care for children 0-4 years of age) or if additional testing for the role of allergy is indicated.[14]

Recommendations

1. Create a list of specialty providers by region, including contact information and the types of insurance they accept and whether or not they are currently taking new patients, and disseminate it to PCPs. The Asthma Coalition of Mississippi (ACM), which has a regional coalition in each of the nine Mississippi public health districts, could lead the dissemination effort. The list could also serve as a resource paired with PCP efforts.

2. Develop a referral checklist for use by medical case managers and discharge planners in hospitals/EDs for patients with asthma. The checklist should include the information necessary for hospitals and EDs to refer patients to community health centers, PCPs, specialists, and social-services as necessary. Checklist content should be region or city specific and again, could be developed and disseminated by the ACM. The referral checklist could be incorporated into the Follow-up, Learn about asthma medications, Asthma is a chronic disease, Respond to warning signs, and Emergency care for worsening symptoms (FLARE) discharge protocol in the hospitals and EDs that use the FLARE process.

Identify High-Risk Patients: overuse of quick-relief medication (e.g., albuterol) is a well-documented risk factor for death from asthma.[20] Thirteen of the 27 total cases extracted for this study used a quick-relief medication only. Currently, no system exists in Mississippi to identify patients using dangerous levels of albuterol.

Recommendation:

1. Develop a surveillance system using claims data to identify patients filling albuterol prescriptions at high-risk levels. This could be implemented through a partnership of the MSDH and the Division of Medicaid (DOM), two state agencies that already partner to share asthma claims data. Current data are retrospective, so a real-time (or one/two-month lag time) system would need to be developed.

Acknowledgments

This work was supported by CDC cooperative agreement no. 5U59EH000490-02.

The authors would like to thank Dr. Connie L. Bish and the Maternal and Child Health Epidemiology Program, Applied Sciences Branch, Division of Reproductive Health, National Center for Chronic Disease Prevention and Public Health Promotion, Centers for Disease Control and Prevention, for scientific guidance on this report.

We would also like to thank Mr. Dick Johnson and the Vital Records and Statistics Unit, Mississippi State Department of Health for providing death records of the deceased. We especially thank the next of kin whose participation made this study possible.

Disclaimer

Use of trade names is for identification purposes only and not be misconstrued as product advertisement or endorsement by the authors or their respective organizations.

References

1. Krishnan V, Diette G, et al. Mortality in patients hospitalized for asthma exacerbations in the US. American Journal of Respiratory Critical Care Medicine 2006; 174:633-638.

2. Grant E, Lyttle C, et al. The relation of socioeconomic factors and racial/ethnic difference in U.S. asthma mortality. American Journal of Public Health 2000; 90:1923-1925.

3. Sunyer J, Basagawa X, et al. Effect of nitrogen dioxide and ozone on the risk of dying in patients with severe asthma. Thorax 2002; 57:687-693.

4. Marder D, Targonski P, et al. Effect of racial and socioeconomic factors on asthma mortality in Chicago. Chest 1992; 101:426S-429S.

5. Chester D, Hanna E, et al. Asthma death after spraying polyurethane truck bed liner. American Journal of Industrial Medicine 2005; 48:78-84.

6. Earnst P, Spitzer W, et al. Risk of fatal and near-fatal asthma in relation to inhaled corticosteroid use. Journal of the American Medical Association 1992; 268:3462-3464.

7. Suissa S, Ernst P, et al. Low-dose inhaled corticosteroids and the prevention of death from asthma. New England Journal of Medicine 2000; 343:332-336.

8. Suissa S, Ernst P. Use of anti-inflammatory therapy and asthma mortality in Japan. European Respiratory Journal 2003; 21:101-104.

9. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U. S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2008.

10. Moorman J, Rudd R, Johnson L, King M, Minor P, Bailey C, Scalia M, Akinbami L. National surveillance for asthma - United States, 1980-2004. MMWR 2007; 56(SS08):1-54.

11. Mississippi State Department of Health. The burden of asthma in Mississippi: Asthma surveillance summary report. ; 2009.

12. Crocker D. Epi-aid trip report: EPI AID 2007-025: Investigation of asthma deaths in children, Georgia 2007. ; 2007.

13. Healthy Weight - It's Not a Diet, it's a Lifestyle! [Internet]; c2008 [cited 2009 September 1, 2009]. Available from:

http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmi_calculator/bmi_calculator.html.

14. National Asthma Education and Prevention Program. Expert panel report 3: Guidelines for the diagnosis and management of asthma. National Heart, Lung, and Blood Institute; 2007. Report nr 08-4051.

15. Baren J, Shofer F, Ivey B, Reinhard S, DeGeus J, Stahmer S, Panettier R, Hollander J. A randomized, controlled trial of a simple emergency department intervention to improve the rate of primary care follow-up for patients with acute asthma exacerbation. Annals of Emergency Medicine 2001; 38(2):115-22.

16. Robichaud P, Laberge A, Allen MF, Boutin H, Ross C, Lajoie P, Boulet LP. Evaluation of a program aimed at increasing referrals for asthma education of patients consulting at the emergency department for acute asthma. Chest 2004; 126(5):1495-501.

17. Sin DD, Bell NR: Man SF. Effects of increased primary care access on process of care and health outcomes among patients with asthma who frequent emergency departments. American Journal of Medicine 2004; 117(7):479-83.

18. Zeiger R, Heller S, Mellon M, Wald J, Falkoff R, Schatz M. Facilitated referral to asthma specialist reduces relapse in asthma emergency room visits. Journal of Allergy and Clinical Immunology 1991;87(6):1160-1168.

19. Zorc J, Scarfone R, Li Y, Hong T, Harmel M, Grunstein, L, Andre, JB. Scheduled follow-up after a pediatric emergency department visits for asthma: A randomized trial. Pediatrics 2003;111(3):459-502.

20. Spitzer W, Suissa S, Ernst P, Horwitz R, Habbick B, Cockcroft D, Boivin J, McNutt M, Buist A, Rebuck A. The use of beta-agonists and the risk of death and near death from asthma. New England Journal of Medicine 1992;328(8):501-506.

TABLES

Table 1. Reviewed deaths due to asthma by year, age, sex, and race – Mississippi, 2003-2007

Characteristics	**Cases (%) (n=27 cases)**
Year	
2003	4 (15%)
2004	5 (19%)
2005	8 (29%)
2006	7 (26%)
2007	3 (11%)
Age (years)	
5-11	4 (15%)
12-17	3 (11%)
18-35	20 (74%)
Sex	
Male	13 (48%)
Female	14 (52%)
Race	
White	1 (4%)
African American	26 (96%)

Table 2. Reviewed deaths due to asthma by county of residence – Mississippi, 2003-2007

County of Residence	**Number of Deaths (n=27 cases)**
Bolivar	1
Forrest	1
Harrison	1
Hinds	7
Jackson	2
Jones	3
Lauderdale	3
Madison	3
Panola	1
Sharkey	2
Tallahatchie	1
Webster	1
Winston	1

Table 3. Reviewed deaths due to asthma by co-morbid conditions* – Mississippi, 2003-2007

Co-morbid Condition	**Number of Cases with Condition (n=27 cases)**
Obesity	11
Eczema	3
Seizures	3
Hypertension	3
Cerebral Palsy	2
Congestive Heart Failure	2
Profound Mental Retardation	2
Cardiomegaly (enlarged heart)	1
Sinusitis	1
Gastroesophageal Reflux Disease (GERD)	1
Blindness	1
Neurologic Problems	1
Cardiomyopathy	1
HIV+	1
Protein-Calorie Malnutrition	1
Pregnancy	1

*cases could have ≥1 co-morbid condition, so total exceeds 27

Table 4. Reviewed deaths by environmental asthma trigger exposure* – Mississippi, 2003-2007

Environmental Asthma Trigger	**Number of Cases with Trigger (n=27 cases)**
Pollen	8
Dust	8
Environmental Tobacco Smoke (ETS)	7
Weather Changes	6
Exercise	4
Synthetic Carpet	3
Food Allergies	3
Cleaning Products	2
Cockroaches	2
Furry Animals	2
Extreme Heat/Cold	1
Space Heaters	1
Washing Detergents	1
Mold	1
Rodents	1
Pesticides	1

*cases could have ≥1 trigger, so total exceeds 27

Table 5. Recurrent themes from qualitative analysis of case assessments, Asthma Mortality Review – Mississippi, 2003-2007

Gaps in Care
Lack of specialist care
Lack of primary care
Lack of access to medications
Lack of insurance
Quality of Care
No patient-specific asthma action plan
Lack of symptom tracking/peak flow monitoring
Lack of asthma education
Lack of long-term control medications
Lack of appropriate referral
Barriers to Care
Lack of knowledge about disease
Lack of adherence to medications
Literacy
Environmental Issues
Exposure to environmental asthma triggers
Lack of adherence to medications
Literacy
Social Issues
Co-morbid conditions
Single-parent household
Employment status

FIGURES

Figure 1. Reviewed deaths due to asthma by insurance status – Mississippi, 2003-2007 (n=27 cases)

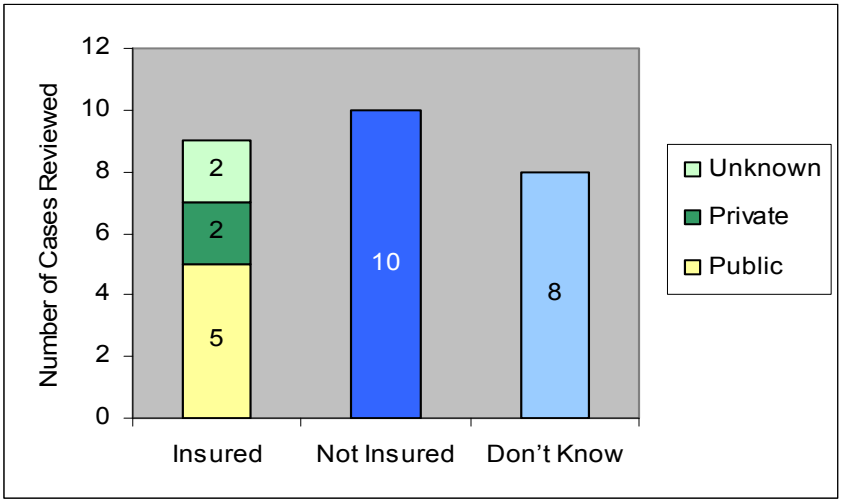
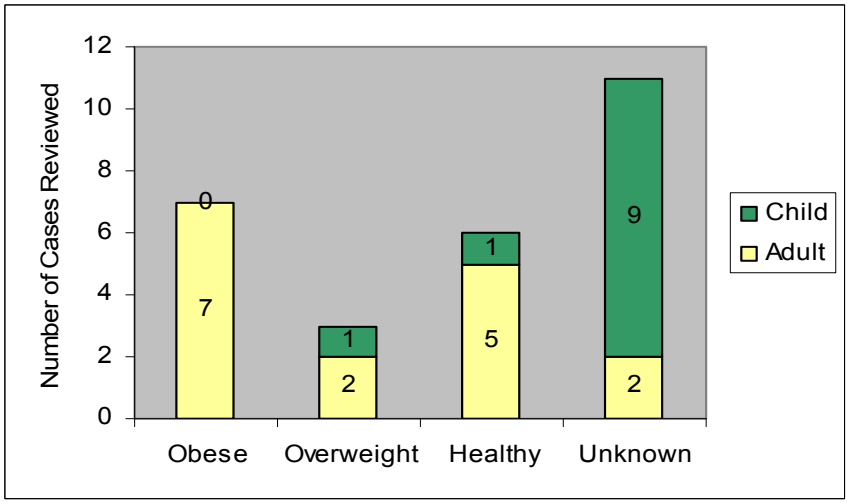


Figure 2. Reviewed deaths due to asthma by Body Mass Index* and age category – Mississippi, 2003-2007 (n=27 cases)



*For **adults** a BMI of 25 or more is considered "overweight" and a BMI of 30 or above "obese". For **children** the charts of BMI greater than the 85th but less than the 95th percentile is considered "overweight" and a BMI greater than or equal to 95th percentile is considered "obese"

Figure 3. Reviewed deaths due to asthma by medication use – Mississippi, 2003-2007 (n=27 cases)