Nightwatch: Sleep disruption of caregivers of children with asthma in Detroit

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Running title: Sleep disruption in caregivers

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Abstract:

Caregiving for ill loved ones can impact sleep quality and quantity. Insufficient sleep has been associated with worse physical and mental health outcomes, as well as an impact on work performance and ability to accomplish necessary tasks. While some research has looked at the sleep of caregivers of loved ones with chronic illness and found that they experience poorer sleep, little is known about the impact of caring for a child with asthma on the caregiver's sleep and the ways in which their sleep may be affected. Community Action Against Asthma, a community-based participatory research partnership, conducted interviews with semi-structured and open-ended questions with 40 caregivers of children with asthma who live in Detroit. We found that caregivers regularly experience poor quality sleep due to sleeping lightly in order to listen for the child's symptoms, waking multiple times to check on the child due to worry and providing care for him or her when he or she experiences symptoms in the middle of the night. Results of the Epworth Sleepiness Scale indicate that 12.5% of caregivers received a score of 16 or more, the score on the scale used to indicate likely presence of a sleep disorder, and 42.5% had a score of 10 or more, indicating excessive sleepiness. Sleep disturbance in caregivers is an under-recognized consequence of childhood asthma with implications for providers caring for children with asthma.

Key words:

Ashma, children, caregivers, sleep disruption

Text:

Introduction:

More than 7.1 million school-aged children currently have asthma (1), a leading chronic disease among children (2). African Americans, Hispanics, and people living in low income and inner-city communities experience worse asthma outcomes, including disproportionate emergency department visits, hospitalizations, and deaths (1, 2, 3).

Asthma symptoms can cause disruptions to sleep (4, 5, 6, 7, 8, 9, 10, 11). Patients with respiratory symptoms are more likely to present to emergency rooms between the hours of midnight and 8:00 AM or call physicians between 11:00 PM and 7:00 AM, indicating increased severe respiratory symptoms at night (7). Researchers have concluded that asthma symptoms at night are due to unstable asthma, (4, 12) in response to asthma triggers (10). The guidelines of the National Asthma Education and Prevention Program, NAEPP (13) specify that not sleeping well is an indicator for increased medication. While some studies have seen a decrease in sleep disruption with changes in medication regimen (6), others have found that these night symptoms persist despite physician care and using medications commonly prescribed to control nocturnal symptoms (4, 10). Pediatric asthma patients described having difficulty falling asleep due to their asthma medication (14). Additionally, one study found that even of those who perceive their asthma as being mild some still experienced sleep disruption (10).

Caring for an ill spouse, parent, or child impairs sleep quality of the caregiver including sleep duration, sleep latency, sleep efficiency, and daytime dysfunction (15, 16, 17). These sleep disturbances are due to care recipient's behavior, performing caregiving duties, and stress related to care recipient's health (15, 16, 18). However, caregivers may resist prescribed sleep

medications due to concern they may inhibit ability to carry out caregiving responsibilities (19). Caregivers also stated that even when sleeping, they felt they were only "half-asleep" in order to be vigilant to the needs of the care recipient (16). Research has shown similar sleep disruption among caregivers of children with chronic illness with parents who care for children who have severe chronic non-asthma respiratory disease getting less sleep than parents of healthy children (18).

Providing care for a family member with a chronic illness can have a profound impact on the caregiver's emotional health (18, 20, 21). While little is known about the impact on the caregiver of caring for a child with asthma, previous studies have demonstrated that providing care for a sick loved one can impact the emotional health of caregivers of adults with dementia (15) or cancer (16) or children with cerebral palsy (22) or other disabilities (18, 21). Williams and colleagues (20) found that 95% of caregivers of children with asthma considered their child's asthma among the top third of their daily problems.

Studies of caregivers for ill adults have found a relationship between caregiver sleep and symptoms of depression or anxiety (15, 16). A study that compared the sleep and mental health of caregivers of children with (non-asthma) chronic respiratory diseases to caregivers of healthy children has demonstrated similar connections between sleep disturbance and distress. Forty percent of parents of children with cystic fibrosis or children who are on a ventilator report waking due to stress related to their child's breathing. While researchers found an association between the child's health and levels of both depression and fatigue of the caregiver, this association may have been due to sleep disturbance, as the relationship disappeared when the researchers controlled in their analysis for sleep quality (18).

Sleep disturbances can also impact physiological health and the ability to carry out life and caregiving responsibilities. In addition to impacting mood and quality of life, there is an association between sleep loss and cardiovascular disease, diabetes mellitus, and respiratory disorders (5). In a study by Diette and colleagues (6), parents of children who woke due to their child's asthma reported missing work or usual activities. Caregivers physical health, sleepiness, and emotional health may impact their ability to care for their ill relative (5), thus increasing health care costs, decreasing productivity earnings, and increasing costs associated with service provision of services for care recipient (22).

While previous research has demonstrated that caregiving for ill loved ones can impact sleep quality and quantity, as well as physical and emotional health, little is known about the effect of caring for a child with asthma on the caregiver's sleep. The purpose of this study is to examine whether the caregivers of children with asthma living in Detroit experience sleep disruptions, the ways in which their sleep is interrupted, and the impact of any sleep disruption.

Methods

Community Action Against Asthma (CAAA) (22) is an ongoing community-academic partnership examining environmental triggers of childhood asthma in Detroit. The research conducted by CAAA includes an epidemiological component (24), examining the effects of indoor and outdoor air quality on childhood asthma exacerbation and neighborhood and household-level intervention components (25, 26). In the summer of 2009, CAAA conducted a mixed methods study in order to examine the effects of a child's asthma on family members, their caregiver's health and stress, and the ways in which caregivers' skills for managing their child's asthma translate into management of their own health. This study used a community-based participatory research (CBPR) approach, where the design and questions asked were

developed with the steering committee of CAAA, which includes academic and community partners. The PI and trained graduate students conducted a total of 40 interviews with caregivers of children with asthma in Detroit. A translator was present at two interviews where the caregiver preferred to conduct the interview in Spanish. A convenience sample of participants from two other concurrent studies of CAAA's was recruited for this study. The inclusion criteria for these studies was that the child sleep most nights a week in the caregiver's home, be between the ages of 6 and 12, have symptoms consistent with persistent asthma, and reside in the Michigan cities of Detroit, Dearborn, Highland Park or Hamtramck. Each interview took approximately 2 hours. Each caregiver received $30 incentive. The Institutional Review Board of the University of Michigan approved the interview process and all interviewees gave consent to participate in the study. All but one interviewee gave permission to be audio recorded.

The interviews consisted of 27 semi-structured, open-ended questions and a structured questionnaire with 148 items. A sample of the semi-structured, open-ended questions are included in Table 1. The structured questionnaire included demographic information for the caregiver and the child(ren) with asthma and measures that have been tested and validated such as the Epworth Sleepiness Scale and the CES-D scale. The Epworth Sleepiness Scale, a simple eight-item questionnaire with a high level of internal consistency (α=0.88), uses a Likert scale to assess the degree to which an individual has the propensity to fall asleep. The individual is asked how likely it is that he/she will fall asleep in eight different situations or activities that most people engaged in as part of their lives. Possible scores range from 0 to 24. In order to create a dichotomous variable, threshold value of 16 was used to indicate a sleep disorder (27) and a score $\geq$10 indicated excessive sleepiness (28). The CES-D is a 20-item questionnaire, with a range of scores from 0 to 60, designed to measure depressive symptoms in the general

population, using validated questions and has been demonstrated to have high validity and reliability. A higher score indicates more symptoms (29).

The open-ended portion of each interview was audio-recorded and transcribed, except for the interview for one participant who declined to be audio-recorded. The interviewer took extensive notes during this interview. The transcripts and notes were analyzed by the PI and graduate students using open coding. N-Vivo 8.0 was used to facilitate the management of the data. After coding several interviews, a code-book was generated that represented key concepts that were arising from the data. These concepts included a series of codes and subcodes. Additional codes were added to the codebook, as necessary, during analysis. Members of the research team each coded a sample of interviews. The PI and graduate students met to discuss coding decisions for these interviews. Any disagreement was discussed until consensus was reached. After it was determined that members were coding consistently across team members, one research team member coded each of the remaining interviews. Table 2 includes examples of codes and subcodes used. Quantitative descriptive data was entered into one database and analyzed using SPSS. Descriptive tests were used for all demographic variables. Although we had a small sample (40 caregivers with a total of 57 children) with insufficient power to draw conclusions, to identify suggestive trends we conducted Chi-square test for independence to look for associations between a rating of excessive sleepiness or sleepiness scores indicative of sleep disorder and various measures of the child's asthma. Regression analysis to examine the relationship between CES-D and Epworth Sleepiness Score. A p-value of .05 was used to indicate statistical significance.

Results

We will first present quantitative findings that describe the caregivers of children with asthma included in this study. We next present qualitative results that present the experience of these caregivers. The 40 caregivers in this study cared for a total of 57 children diagnosed with asthma. Some of those interviewed cared for more than one child with asthma symptoms: 12 caregivers cared for two children with asthma and two cared for three or more children with asthma. Table 3 provides information about the asthma symptoms of the 57 children who exhibited symptoms of asthma.

The demographic characteristics of the caregivers can be seen in Table 4. Overall, the caregivers were predominantly female (92.5%, 37), African American or Black (80%, 32), and not married (67.5%, 27) with nearly three-quarters (73.7%, 28) reporting an annual income of $20,000 or less per year. Scores for the Epworth Sleepiness Scale indicated 12.5 % (5) participants had possible sleep disorder and 42.5% (17) had excessive daytime sleepiness at the threshold for clinical referral.

We did not find any significant relationships between whether the caregiver had more than one child with asthma, had at least one child who in the last year woke at least one time a week with asthma symptom, had a child hospitalized for asthma in the last year, or had a child who was taking daily medication and Epworth scores that indicated either excessive sleepiness (>10) or likely sleep disorder (>16) (Table 5). The only relationship that approached levels of significance was between caregivers reporting more than one child with asthma and an Epworth score greater than 10 (p=.091). Regression analysis indicated that there was a significant relationship between depression and sleepiness with a significance level p=.023.

Qualitative results

The children with asthma cared for by study participants experienced nighttime asthma symptoms.

> *At night, when he lays down, you can hear [him coughing]. And I can hear him through the wall. As he's sleeping, you can hear it.*

Caregivers attributed the night symptoms to various triggers, such as "the night air," change weather, exposure to smoke, or "playing too hard." Parents tried to reduce these triggers to avoid nighttime symptoms by modifying behaviors of the child and others in the family or reducing environmental triggers. Behavioral modifications included restricting the child's physical activity or prohibiting smoking inside their house. Efforts to address environmental triggers in the child's bedroom included opening the window, having a fan, or using a vaporizer.

> *He don't like to sleep at night…. He'll say, "I can't breathe." He will come in and, "I don't feel good" or "I can't breath" or this and that. And I'll get up and see what's going on with him and stuff, and it's OK. Let's see what's what. Well, crack the window. One time I put a little vaporizer in there, or whatever, because I know the heat here is dry and stuff.*

Caregivers reported three ways in which the child's asthmatic symptoms impacted their sleep: caregivers were awakened and/or kept awake by the sound of the child's symptoms; they were awake in order to care for their symptomatic child when he or she exhibited nighttime symptoms; they slept lightly or awoke several times to check on their child throughout the night.

Caregivers reported being awakened by the sound of their child's symptoms, such as coughing, wheezing, or snoring or by the child telling them that they were experiencing symptoms. In some cases, the child did not experience symptoms for long, and the caregiver was able to resume sleeping.

> *Well, if it's in the middle of the night and I hear him, …I tell him to blow his nose. … He just go back to sleep. So, it's nothing I have to rush in and give asthma treatment or stuff like that treatment, stuff like that.*

Other caregivers reported remaining awake in order to provide care or address triggers or to monitor the child's symptoms.

Caregivers also explained that their sleep was disrupted because they were frequently checking on the child. Some caregivers checked on the child to see if he or she was experiencing asthmatic symptoms, in order to prevent the worsening of symptoms.

> *[When I check on him at night], I'm looking to see how he's breathing and stuff, and if he knows that he's coughing, you know. And so a lot of times, I'll wake him up.*

Other caregivers checked on the child each night out of worry, regardless of whether the child was exhibiting symptoms. Parents mentioned specifically checking on their child to make sure that he or she was still breathing.

> *You know what? I sleep light now. I used to sleep hard, but I don't now because I'm always having my ears open for [Child]. All the time. It do, it bothers my sleep a lot. I don't sleep a lot. I sleep maybe four, five hours at the most every night because I just be listening. The house quiet, I'm listening. I get up. I'll go in there to check on him to make sure he's still breathing. I do that a lot.*

> *I really, really have to watch them throughout the night, literally, if I want to keep them around for the air to help them breathe because it really bothers them…[in] the middle of the night.*

> *I worry. I got to get up and watch him. Sometimes I feel like he's going to stop breathing when he sleep, so you know what I mean? That's my biggest fear with him. I watch him like a hawk.*

Caregivers expressed how the worry related to their child's asthma contributed to their overall stress.

> *The part that bothers [me] is the worrying because I'm scared, you know? What if they have an attack and I'm not there?*

I'm a little panicky, at times, especially when he sleeps. The fact that, for some reason, I have this big, strange fear of this boy's going to stop breathing, and I'm trying to get myself out of that. It's like the more he can get to the healthy side, the better I'll be.

Caregivers described experiencing depression and or stress. While some of this stress was worry related to the child's asthma, other stress was due to other stressors, including financial concerns, neighborhood factors, health problems, or the death of family members.

It's just the depression. That's a hard thing, too. … I'm usually upstairs in my room. When I'm up in my room, I just cry all the time. And I don't know why. I just cry. I know this comes from me being without an income, because I was so used to taking care of myself.

I lost my mother in 2007, so I go through little issues as far as, you know, I cry at night…. I just pray about it. That's pretty much that. But I mean, you know, everyday life is stressful, you know, as far as the jobs and the stuff you have to deal with every day.

Caregivers expressed often feeling fatigued. This fatigue may impact their ability to perform their other family duties. The fatigue may cause them to feel overwhelmed by their many competing responsibilities.

I had a busy day with working and everything and then coming home and the homework and all of that and he all of a sudden have an attack, and I'm exhausted. I'm very exhausted, and I just want to say, "forget it. I don't care. I don't want to be bothered with it." But yet, still I know, "OK, come on, son. We got to do it." But I'm just, I literally be falling asleep if I'm too exhausted while he's on the machine, but he's right there….. It's some work. It's work.

I'm learning how to network it in away where I can take care of the needs of everybody and I crash at nighttime because it's so hard taking care of the needs of everybody during the day and then at night. Sometimes you're too tired to take care of your own needs, like you don't feel like…doing anything. All you want to do is sleep at the end of the day.

Despite the fatigue and stressors, caregivers' sense of responsibility propelled them to continue taking care of their children with asthma and other responsibilities.

> *Sometimes as a parent, you are going to be tired throughout the day, but that is something you have to deal with, parents, you know what I'm saying? …Well, you can't get upset, you know what I'm saying? We know the consequences before we had children. We know things are going to happen.*

Discussion:

In this study we examined the degree to which caregivers of children with asthma living in Detroit experienced sleep disruptions, the ways in which their sleep is interrupted, and the impact of any sleep disruption on their lives. Caregivers in our sample exhibited sleep disruption for many of the same reasons as those described previously in the research on caregivers of other ill family members (15, 16, 18). Caregivers reported waking to perform caregiving duties, as 38.7% of the children with asthma woke up at least once per week due to asthma symptoms. This rate exceeds the criteria for poorly controlled asthma as defined by the NAEPP guidelines: waking two times per month (13). The method that caregivers in this study described to alleviate the impact of their child's asthma on their sleep was trying to address the asthma nighttime symptoms or reduce asthma triggers. However, some of the actions (e.g. using a humidifier) are not in line with treatment recommendations (13), and may be inappropriate responses to asthma symptoms, and unlikely to provide the child relief. Our research indicates the need to expand the information provided to caregivers of children with asthma to include effective ways to address asthma symptoms when they occur.

Caregivers' sleep was impacted even when the child was not actually experiencing symptoms. Parents slept lightly in order to remain vigilant to listen for their child's symptoms. A striking finding in this study is that caregivers wake frequently in

order to make sure the child is still breathing and did not die due to asthmatic symptoms. To our knowledge, this has not been described in literature on caregiving that we found, including that of caregivers providing care to those in last stages of illness (15, 16).

Caregivers' Epworth sleepiness scores indicated that more than the half (55%) of the caregivers were either experiencing excessive sleepiness or were likely to have a sleep disorder. Quantitative analysis did not elucidate why some caregivers experienced sleepiness, while others did not, as there was no significant relationship between whether the caregiver had more than one child with asthma, had at least one child who woke at least one time a week with asthma symptom, had a child hospitalized for asthma symptoms over the last year and either excessive or a sleepiness score indicative of sleep disorder, or had a child who was taking daily medication and sleepiness. These quantitative results must be viewed with caution, as the sample size was quite low.

The excessive sleepiness experienced by participants may not only be due only to caring for a child with asthma. It is possible that becoming being a caregiver for a child (independent of the child's asthma), being African American, and/or a single parent can increase likelihood of sleep disruption independent of having a child with asthma. Previous studies of the general population have shown parents' sleep to be disrupted after they become parents. The National Sleep Foundation (32) found that 48% parents and caregivers reported much more insomnia and 27% reported experiencing somewhat more insomnia than before they became a parent or caregiver. Most caregivers in this sample were African American or black (80%) and single parents (67.5%). Previous studies have shown an association between being non-White (33) or a member of a minority population (Maori population in New Zealand) (34) and having higher ESS. We were unable to find published research on the sleep of single parents, so we do not

know how the ESS of our sample compares to those of single parents of healthy children. This would be an interesting area for future research.

While it is possible that these other factors (being a parent, being African-American or Black, or being a single parent) may also contribute to sleep disruption, participants in this study reported specific reasons for sleep disruption that are unique to caring for a child with asthma: caring for asthmatic symptoms, sleeping lightly so they would hear their child's symptoms, and checking to make sure their child did not die. Participants articulated that their sleep was impacted by stressors -- stressors related to the child's asthma and broader life factors, including financial stress, neighborhood stressors, the death of loved ones, or other family responsibilities. An in depth examination of these stressors is beyond the scope of this paper, but can be found elsewhere (35).

Several of our respondents described experiencing symptoms of depression or anxiety. These findings echo previous research on caregivers that have found an association between sleep disturbance and emotional health and mental health (18, 20, 21). Quantitative analysis, though consisting of a small sample, supported this relationship. Regression analysis indicated that depression accounted for a significant proportion of sleepiness variance, and was also a significant predictor of sleepiness. While caregivers in this study articulated some of the ways in which these concepts are related (e.g. stress causing the caregiver to check to make sure child was breathing), the relationship between sleep disturbance and stress is complex and a potential area for future research.

Strengths and limitations

Participants in this study were enrolled in other studies of childhood asthma. The recruitment methods for these studies selected for children with poorly controlled asthma. Thus, the results presented here must be considered in this context and may not be representative of the general population of children with asthma and their caregivers, but represents the level of sleep disturbance among a group of caregivers of children with moderate to severe asthma.

This study provides a unique view into the lives of caregivers of children with asthma in Detroit. While the inclusion of standard scales in the structured interview section provides a glimpse at their realities, the size of the sample limited the power of these scales and conclusions that can be drawn from regression analysis. However, the inclusion of these measures in the study complements the qualitative findings of this study and provides initial exploration of areas that can be expanded in future research. The in-depth, open-ended questions provided a more nuanced understanding of the lived experiences of these caregivers and elucidated what specifically about caring for an asthmatic child causes sleep disturbance and the impact this lack of sleep has on the caregiver's other responsibilities and emotional health.

The Epworth Sleepiness Scale, while useful for diagnostic purposes, may not capture the sleep problems faced by caregivers of children with asthma. Caregivers described feeling fatigued during the day. However, the items in this scale ask about the likelihood of sleeping in restful situations (like laying down or watching TV). These scenarios may not be relevant to the lives of those who are constantly caring for others. It is possible that the results underestimated the true level of sleepiness experienced by participants. Lastly, because this study only collected data at one time point, we cannot specify the relationship between sleep disruption and stress or other mental illness.

Conclusion:

Providers caring for children with asthma can ask targeted questions to ascertain the night symptoms that the child may be experiencing. While some researchers (4, 10) found that sleep disruptions persisted despite medication, Diette and colleagues (6) state that sleep disruption due to asthma can be reduced with an appropriate medication regimen. According to the NAEPP guidelines (13), the absence of nighttime symptoms is one important component of the definition of controlled asthma, and should be a goal of treatment. Providers must also consider the physiologic and psychological health needs of the caregiver in order to ensure that the caregiver can provide the best possible care to the child. This care may include an assessment of sleepiness, stress levels and mental health issues, such as depression and anxiety, and may require working with the caregiver to seek assistance for these issues from his or her own health care provider. Additionally, health care providers should reinforce education about best responses to asthma symptoms and work with caregivers to address barriers to providing prescribed medication, such as concerns about the medication, lack of insurance of the child or other in the household who may then share medication, or availability of supervision to ensure the child takes his or her medication correctly. Additional research is needed to further elucidate the complex relationship between sleep and stress and to identify appropriate places and mechanisms for intervention.

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Tables:

Table 1: Sample semi-structured, open-ended questions and probes:

1. On a day that [child's name] has asthma symptoms, what is that like?

2. Tell me about how things are going with [child's name]'s asthma.
    a) daytime symptoms
    b) night-time symptoms
    c) ER visits
    d) hospitalizations
    e) in the day-to-day, have you seen changes over time?

3. How does [child's name]'s asthma affect your everyday life?
    a) Anything else?
    b) Worry
    c) Sleep
    d) Work
    e) School
    f) Play
    g) Routine tasks
    h) Managing symptoms
    If no effect,
    i) Well, what is the hardest part?

4. Can you tell me about your health?

Table 2: Sample codes

Sample Code 1: Child's general experience with asthma or clinical experiences

Sample code 1 subcodes:

1) Emotional responses to asthma
2) Behavioral responses to asthma (parent or child initiated)
3) Learning about asthma
4) Using meds with or without assistance
5) Awareness of symptoms or emerging attack
6) Dealing with multiple chronic illnesses
7) Communication of asthma needs
8) Social activities and asthma (e.g., won't do sleepovers, activities not bothered by asthma)
9) Sleep-related issues

Sample code 2: Family life

Sample code 2 subcodes:

1) Siblings' needs and experiences
2) Asthma's impact (or non-impact) on day-to-day family or caregiver's life (from J1)
3) Others care (or lack of care) for child
4) Others with asthma in family (may be dbl-coded as D2.a.)
5) Caregiving/parenting experiences with asthma (was Q.)
   a. Organizing or changing life patterns due to asthma (e.g., keeps child at home more than other children, increased monitoring, establishing a routine)
   b. Parent or family coping strategies to address emotional/mental effects of asthma (e.g., meditation, prayer)
   c. Teaching or modeling attitudes for children (about life or asthma)

Sample Code 3: About the caregiver

Sample code 3 subcodes:

1) Physical health
   a) Personal asthma experiences
2) Emotional/mental health (in general, code here J2.)
   a) Worry/stress/fear specific to asthma (e.g., hard to watch child have attack)
3) Learning about personal health
4) Health-seeking behaviors (i.e., action, delay or avoidance of these; prioritizing or putting aside)
5) Experience with medical professionals, medical encounters (re: caregiver, not re: child)
6) Social support
7) Family problems
8) Other family responsibilities (e.g., caregiving for parent)
9) Other stressors

10) Work Life
11) Sleep

Table 3: Children's asthma symptoms	
	% (#)
Diagnosed with asthma by doctor, nurse, or other health professional (n=57)	89.5 (51)
Caregiver reports that their child (or children) has (have) health insurance (n=40)	85.0 (34)
During the 12 months before the interview:	
Child woke up at least one time per week from sleep due to wheezy, dry cough, tightness in the chest, or shortness of (n=57)	38.7 (22)
Child had taken medication, inhalers, or nebulizers prescribed by a doctor (n=57)	93.0 (53)
Child had taken doctor-prescribed medications for breathing problems every day even when he/she was not having trouble (n=57)	47.4 (27)
Child stayed overnight in the hospital for wheezing, dry cough, tightness of the chest, or shortness of breath (n=56)	12.3 (7)
Number of days child missed because of breathing problems in 12 months before the interview (n=54)	
Between 1 and 5 school days	48.1% (26)
Between 6 and 10 school days	16.7% (9)
More than 10 days	11.1% (6)

Table 4- Demographics of Caregivers (n=40)	
	% (#)
Gender (n=40)	
Female	92.5 (37)
Race/Ethnicity (n=37)	
Black	80.0 (32)
White	0.0 (0)
Multi-racial	8.1 (3)
Other	5.4 (2)
Hispanic	7.5 (3)
Education (n=40)	
< High school	5.0 (2)
Some high school	22.5 (9)
High school graduate /GED	22.5 (9)
Some college	35.0 (14)
Associate's or Bachelor's degree	15.0 (6)
Annual Income ($) (n=38)	
Less than 10,000	50.0 (19)
10,001 -20,000	23.7 (9)
20,001 – 30,000	10.5 (4)
> 30,001	15.8 (6)
Marital Status (n=40)	

Married	32.5 (13)
Domestic partner	5.0 (2)
Single – never married	52.5 (21)
Divorced or separated	10.0 (4)
Age (n=39) Mean=39.4	
30 or under	12.8 (5)
31-40	43.6 17)
41-50	30.8 (12)
51 or over	12.8 (5)

Table 5 – Relationships between sleepiness scores and other caregiver variables.			
Variables	Chi-Squre	df	Asymp Sig.
Having more than one child with asthma Epworth score of at least 10	2.857	1	.091
Regression analysis to examine the relationship between CES-D and Epworth Sleepiness Score			
CES-D score as independent variable Epworth Sleepiness as dependent variable	CES-D score predicted sleepiness scores: $\beta = .146$, $t=2.662$, $p=.023$ CES-D score accounted for a significant proportion of the variance of Epworth sleepiness. $R^2 = .140$, $F(1,35)=5.688$, $p=0.023$.		

Figure caption:

Figure 1: Epworth Sleepiness Scores for Caregivers