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To cite this article: Rachel Margolis, Melissa H. Bellin, Paul Sacco, Donna Harrington & Arlene Butz (2018): Evaluation of MOS social support in low-income caregivers of African American children with poorly controlled asthma, Journal of Asthma, DOI: [10.1080/02770903.2018.1510504](https://doi.org/10.1080/02770903.2018.1510504)

To link to this article: <https://doi.org/10.1080/02770903.2018.1510504>



Published online: 01 Oct 2018.



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## Evaluation of MOS social support in low-income caregivers of African American children with poorly controlled asthma

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### ABSTRACT

**Objective:** The purpose of this study was to examine the factor structure of the Medical Outcomes Study Social Support Survey (MOS-SSS) in a sample of low-income, urban caregivers of African American children with poorly controlled asthma. Although the MOS-SSS is a commonly used measure of social support, its psychometric properties have not been studied in this population. **Methods:** Confirmatory factor analysis was conducted to determine the most appropriate factor structure for the MOS-SSS in caregivers of African American children with frequent Emergency Department visits for uncontrolled asthma. The following models were tested and compared using established fit statistics: an 18-item second-order four factor model, an 18-item four factor model, a bifactor model and an 18-item one factor model with nested models. **Results:** Participating caregivers were single (75.6%) and female (97%). An 18-item one factor version of the scale had the best fit statistics compared to the other models tested:  $\chi^2(142) = 308.319$ ,  $p > 0.001$ ; Root mean square error of approximation (RMSEA) = 0.077; CFI (Comparative Fit Index) = 0.990; and Tucker-Lewis Index (TLI) = 0.988. Construct validity was supported by a statistically significant negative relationship between our final MOS-SSS model and caregiver depressive symptoms ( $\beta = -0.374$ ,  $p < 0.001$ ). **Conclusions:** The 18-item one factor MOS-SSS may be appropriate for use in research and clinical practice with caregivers of African American children with poorly controlled asthma. It appears promising as a mechanism to advance understanding of relationships between social support and asthma outcomes in this vulnerable population.

### ARTICLE HISTORY

Received 27 March 2018  
Revised 5 July 2018  
Accepted 7 August 2018

### KEYWORDS

Youths; asthma; mothers; support; psychometrics; confirmatory factor analysis

## Introduction

Asthma is one of the most prevalent child health conditions in the United States with 8.3% of all children under the age of 18 years diagnosed with asthma and 15.7% of African American children affected [1]. The burden of asthma is particularly profound for urban African American children and their families [2]. In addition to a higher prevalence of asthma, morbidity rates are disproportionately higher in African American children with asthma compared to non-Hispanic white children, including a 260% higher Emergency Department (ED) visit rate, a 250% higher hospitalization rate and a 500% higher death rate [3]. Poorly controlled asthma is associated with a range of negative outcomes for caregivers including psychological symptoms (anxiety, depression), restricted employment and impaired quality of life [4–6]. However, social support, defined by Cohen [7] as “a

social network’s provision of psychological and material resources *intended to benefit an individual’s ability to cope with stress*” (p. 676) may moderate the burden of caring for a child with asthma and is associated with improved caregiver psychological health and child asthma outcomes [8–10].

Social support was found to be a robust predictor of depressive symptomology in a community-based sample of low-income caregivers of children with asthma, even after controlling for the effects of race, maternal education, life stress and physical health [6]. Other research examined the relationship between caregiver social support and asthma control in a sample of Latino children and their caregivers and found that when controlling for the child’s age, gender, controller medication use, poverty, and marital status, social support remained a statistically significant predictor of higher asthma control [9]. Santos et al. [8]

similarly observed social support to be negatively associated with wheezing symptoms in a sample of Brazilian non-atopic children with asthma and their mothers.

Collectively, these findings underscore the importance of using psychometrically sound tools to measure social support. The Medical Outcomes Study Social Support Survey (MOS-SSS) [11] has been widely administered as a brief measure of social support for diverse patient populations in the United States and globally [6,8,12–14], yet tests of its psychometric properties have been limited in scope and yielded inconsistent results. Five studies have examined the factor structure of the English language version of the MOS-SSS (Table 1). Two studies supported the original structure of the MOS-SSS that included four social support factors (1. emotional/informational; 2. tangible; 3. affectionate; and 4. positive social interaction), as well as an overall higher-order functional social support factor [15,16].

In contrast, the findings of Gjesfjeld et al. [17] and Higgins et al. [18] did not support the original factor structure. Following the work of Sherbourne and Stewart [11], these two studies removed Item 14 of the MOS-SSS from their analyses because it “did not discriminate well” (p. 708) from the emotional/informational support items. Gjesfjeld et al. [17] tested five models in 300 mothers whose children were receiving mental health treatment: 18- and 12-item scales with and without subscales and a 4-item scale. In order to construct the 12-item scale, the two items with the smallest factor loadings on each of the four factors were eliminated. The items with the highest factor loadings from each subscale were used to construct the 4-item scale. Based on CFA findings, the best fitting models were the abbreviated 4-item instrument and a 12-item second-order structure comprised of the four original factors (emotional/informational, tangible, affectionate and positive social interaction) and an overarching general social support factor.

Higgins et al. [18] sought to replicate the findings of Gjesfjeld et al. [17] in a sample of 406 women on probation and parole. The 4-item scale fits their data, while the 12-item model did not. Finally, Holden et al. [19] compared a 6-item model to a 19-item one factor model in two samples of Australian women and observed that the two models fit similarly well (Table 1). The 6-item scale was constructed by including the two items that loaded the highest on each of the three factors resulting from a previously conducted exploratory factor analysis (EFA), and then confirmed with a CFA.

In summary, five studies yielded different factor structures for the MOS-SSS. The inconsistent results emphasize the importance of psychometric testing of a measure with the specific population of interest [20]. It is possible that items in an instrument may be interpreted differently in different populations and the meaning constructs themselves may vary across populations. Although the MOS-SSS has been used in several studies of children with asthma and their caregivers, its factor structure with this population has not yet been explored [6,8]. The purpose of this study was to use confirmatory factor analysis to examine the factor structure of the MOS-SSS in a sample of low-income, urban caregivers of African American children with poorly controlled asthma.

## Methods

### Data source

For this secondary data analysis, we used baseline data collected between August 2013 and February 2016 from a randomized clinical trial evaluating the efficacy of the Asthma Express Environmental Control Educational Intervention for children with persistent asthma and frequent ED visits [21]. The Asthma Express Intervention was comprised of nurse home visits for asthma management combined with a clinic visit for asthma education. The control group in the study received standard asthma education during three nurse home visits. Caregivers of children with persistent, uncontrolled asthma were recruited from two large urban hospitals after their child was discharged from a pediatric ED for asthma. For those families who agreed to participate and met the inclusion criteria, a number of variables were assessed at baseline including: asthma severity, asthma control, asthma management stress, caregiver life stress, caregiver quality of life, caregiver depression and caregiver perceived social support. Both the Johns Hopkins Medical and the University of Maryland, Baltimore institutional review boards approved the study. The study design and data collection methods are described in detail by Butz et al. [21].

## Measures

### Social support

The MOS-SSS, developed by Sherbourne and Stewart [11], is a 19-item self-report instrument that assesses four dimensions of social support on a five-point

**Table 1.** Previous factor structure studies of the MOS-SSS English version.

| Study                         | Country       | Type of analysis                                                                                                                                                                                                                                                                                    | Number of factors                                                                                                                                                                                                     | Other factor structure possibilities that were evaluated            | Sample                                                                                                                                                                                                                               |
|-------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gjesfield, Greeno, & Kim [17] | United States | Confirmatory factor analysis (EQS, v6.1) 12-item second-order: Chi-square = 63.81 (df = 50, $p = 0.09$ ), RMSEA = 0.03, CFI = 0.99, GFI = 0.95, AGFI = 0.93, SRMR = 0.02 4-item: Chi-square = 1.73 (df = 2, $p = 0.42$ ), RMSEA < 0.01, CFI = 1.00, GFI = 1.00, AGFI = 0.98, SRMR = 0.01            | 12-item second-order: F1: 2, 12, 15 ("Tangible") F2: 6, 10, 20 ("Affectionate") F3: 7, 11, 18 ("Positive Interaction") F4: 9, 16, 17 ("Emotional-Informational") 4-item: 15, 17, 18, 20                               | 1) 18-item one factor 2) 18-item second-order 3) 12-item one factor | 330 mothers of children who were in mental health treatment                                                                                                                                                                          |
| Robitaille [16]               | Canada        | Confirmatory factor analysis (Mplus, v4.1) CFI = 0.96, TLI = 0.99, RMSEA = 0.076                                                                                                                                                                                                                    | 19-item four factor F1: 2, 5, 12, 15 ("tangible support") F2: 3, 4, 8, 9, 13, 16, 17, 19 ("emotional/informational support") F3: 6, 10, 20 ("affectionate support") F4: 7, 11, 14, 18 ("positive social interaction") |                                                                     | 2642 English-speaking Canadians aged 55 years or older                                                                                                                                                                               |
| Holden et al. [19]            | Australia     | Exploratory factor analysis Confirmatory factor analysis Mid-age cohort: CFI = 0.96, RMSEA = 0.02 Younger co-hort: CFI = 0.95, RMSEA = 0.02 Confirmatory factor analysis (Stata, v13.1) Mid-age cohort: RMSEA = 0.03, CFI = 0.99, SRMR = 0.01 Younger cohort: RMSEA = 0.05, CFI = 0.97, SRMR = 0.03 | 19-item 3 factor F1: Emotional-informational F2: Tangible F3: Affectionate-positive social interaction 19-item 3 factor 6-item: 2, 5, 16, 17, 18, 20                                                                  | 19-item one factor                                                  | Mid-age cohort (N = 11,648) from Wave 2 of the Australian Longitudinal Study on Women's Health (ALSWH) Wave 4 ALSWH. Women aged 53–58 (N = 10,616) and women aged 28–33 (N = 8977) "Mid-age" and "younger" cohorts from Wave 4 ALSWH |
| Conte, Schure, & Goins [15]   | United States | Principal components analysis and confirmatory factor analysis Chi-square = 510.02 (df = 146, $p < 0.001$ ), RMSEA = 0.08, CFI = 0.94, TLI = 0.94, SRMR = 0.04                                                                                                                                      | Four factor model: F1: 8 items ("Emotional support") F2: 4 items ("Tangible support") F3: 3 items ("Affectionate support") F4: 4 items ("Positive interaction")                                                       | 19-item one factor model                                            | 505 community-dwelling American Indians aged 55 years or older                                                                                                                                                                       |
| Higgins et al. [18]           | United States | Confirmatory factor analysis (Mplus, v6.12) Chi-square = 1.12 ( $p = 0.57$ ), RMSEA = 0.00, CFI = 1.00, WRMR = 0.12                                                                                                                                                                                 | 4-item: T3, E13, PS3, A3 (Gjesfield, Greeno, & Kim's 4-item model)                                                                                                                                                    | 12-item second-order [17]                                           | 406 victimized women on probation and parole                                                                                                                                                                                         |

Likert scale by asking the respondent “How often is each of the following kinds of support available to you if you need it?” Responses ranged from 1 (*none of the time*) to 5 (*all of the time*). The four domains include emotional/informational support (E/I; 8 items), tangible support (T; 4 items), affectionate support (A; 3 items) and positive social interaction (PSI; 3 items). The MOS-SSS yields five scores—one for each individual domain and an overall social support index. High scores on the MOS-SSS indicate a high level of social support. Sherbourne and Stewart [11] reported a Cronbach’s  $\alpha$  of 0.97 for the overall support index and  $\alpha$ s ranging from 0.91 to 0.96 for the four subscales.

### Demographic variables

Extensive demographic data were collected at baseline about the child and caregiver. Child data included age in years, gender, race (“Black,” “Hispanic,” “White,” “Asian/Pacific Islander,” “American Indian or Alaskan Native” and “Other”), and type of health insurance (“Medical Assistance,” “Private Insurance,” “Self-pay/Cash,” “Don’t know” and “Other”). Caregiver data included age, gender, marital status (“Married,” “Single,” “Divorced,” “Widowed” and “Other”), employment status (“yes” and “no”), and annual household income (coded in \$10,000 increments from under \$10,000 to over \$40,000 plus a category for “refused”).

### Data analysis

CFA was conducted using Mplus, version 8 to assess whether the original factor structure of the MOS-SSS was appropriate for a population of caregivers of African American children with poorly controlled asthma [22]. The mean- and variance-adjusted weighted least squares (WLSMV) estimator was used for ordered categorical data based on Kline’s [23] guidelines regarding Likert-scales with five or fewer categories. The assumptions for this type of analysis were adequately met. Kline [23] recommends using multiple fit indices to evaluate model fit. Four goodness-of-fit statistics were evaluated: the Chi-square Test of Model Fit ( $\chi^2$ ), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TFI). Acceptable fit was defined using the following cutoff values recommended by Byrne [24]: non-statistically significant  $\chi^2$  ( $p \geq 0.05$ ); RMSEA  $\leq 0.06$ ; CFI  $\geq 0.95$  and TFI  $\geq 0.95$ . In addition to evaluating the global fit of each model, local fit was assessed by inspecting

correlation residuals greater than the absolute value of 0.10 [23]. Modification indices  $>10$  were also assessed. Finally, the significance and magnitude of factor loadings and factor correlations were examined. Factor loadings  $\geq 0.70$  were considered an acceptable indicator that the item adequately represented the underlying construct [23]. Factor correlations  $\geq 0.85$  were considered too high and an indication of potentially poor discriminant validity [25].

The original 18-item second-order four factor model described by Sherbourne and Stewart [11] was first tested and then compared to an 18-item four factor model. An 18-item one factor model and ten nested models were also tested. Lastly, all prior models were compared to a bifactor model.

## Results

### Sample sociodemographic characteristics

The Asthma Express study sample ( $N=222$ ) was comprised of urban (Baltimore) children aged 3–12 years with persistent and uncontrolled asthma based on National Asthma Education Prevention Program guidelines [26] and their caregivers. We restricted our analysis to the 199 African American children in the sample. These children had a mean age of 6.3 years ( $SD=2.7$  years), were mostly male (67%), and received Medicaid (94.4%). Their caregivers were aged from 18 to 62 years with a mean of 31.5 years ( $SD=7.6$ ). Most caregivers were single (75.6%), female (97%) and had an annual household income of \$30,000 or less (62.2%). A little over half (54%) of their caregivers were employed at the time of the study. For complete sociodemographic information, see Butz et al. [21].

### Data screening

First, we examined item frequencies and missing data using SPSS version 21.0 (IBM Corporation, Armonk, NY) [27]. Overall, the data indicated high levels of social support among the participants. As seen in Table 2, five (*all of the time*) was the most frequent response on all items. By item, the percentage of participants who responded with a five ranged from 57% on Item 12 to 71% on Items 6, 10 and 20. Missing data were minimal, ranging from 0–1% per item. According to Muthen and Muthen [22], the WLSMV estimator handles missing data in the following way: “missingness is allowed to be a function of the observed covariates but not the observed outcomes” (p. 443).

**Table 2.** Item description, factor, frequency and percentage.

| MOS-SSS Item                                                                     | Factor | Response <i>N</i> (%) |                          |                      |                      |                     |
|----------------------------------------------------------------------------------|--------|-----------------------|--------------------------|----------------------|----------------------|---------------------|
|                                                                                  |        | None of the time (1)  | A little of the time (2) | Some of the time (3) | Most of the time (4) | All of the time (5) |
| 2: Someone to help you if you were confined to bed                               | T      | 9 (4.5)               | 10 (5.0)                 | 22 (11.1)            | 37 (18.6)            | 121 (60.8)          |
| 3: Someone you can count on to listen to you when you need to talk               | E/I    | 8 (4.0)               | 7 (3.5)                  | 19 (9.5)             | 38 (19.1)            | 127 (63.8)          |
| 4: Someone to give you good advice about a crisis                                | E/I    | 9 (4.5)               | 7 (3.5)                  | 21 (10.6)            | 37 (18.6)            | 125 (62.8)          |
| 5: Someone to take you to the doctor if you needed it                            | T      | 15 (7.5)              | 9 (4.5)                  | 29 (14.6)            | 25 (12.6)            | 121 (60.8)          |
| 6: Someone to show you love and affection                                        | A      | 3 (1.5)               | 2 (1.0)                  | 14 (7.0)             | 39 (19.6)            | 141 (70.9)          |
| 7: Someone to have a good time with                                              | PSI    | 4 (2.0)               | 3 (1.5)                  | 21 (10.6)            | 40 (20.1)            | 131 (65.8)          |
| 8: Someone to give you information to help you understand a situation            | E/I    | 11 (5.5)              | 5 (2.5)                  | 24 (12.1)            | 35 (17.6)            | 124 (62.3)          |
| 9: Someone to confide in or talk to about yourself or your problems              | E/I    | 8 (4.0)               | 8 (4.0)                  | 17 (8.5)             | 37 (18.6)            | 129 (64.8)          |
| 10: Someone who hugs you                                                         | A      | 7 (3.5)               | 3 (1.5)                  | 19 (9.5)             | 29 (14.6)            | 141 (70.9)          |
| 11: Someone to get together with for relaxation                                  | PSI    | 8 (4.0)               | 6 (3.0)                  | 24 (12.1)            | 33 (16.6)            | 128 (64.3)          |
| 12: Someone to prepare your meals if you were unable to do it yourself           | T      | 26 (13.2)             | 6 (3.0)                  | 26 (13.2)            | 27 (13.7)            | 112 (56.9)          |
| 13: Someone whose advice you really want                                         | E/I    | 19 (9.6)              | 9 (4.5)                  | 25 (12.6)            | 31 (15.7)            | 114 (57.6)          |
| 14: Someone to do things with to help you get your mind off things               | —      | 9 (4.5)               | 10 (5.1)                 | 26 (13.1)            | 34 (17.2)            | 119 (60.1)          |
| 15: Someone to help with daily chores if you were sick                           | T      | 23 (11.6)             | 6 (3.0)                  | 26 (13.1)            | 29 (14.6)            | 115 (57.8)          |
| 16: Someone to share your most private worries and fears with                    | E/I    | 17 (8.6)              | 7 (3.5)                  | 21 (10.6)            | 36 (18.2)            | 117 (59.1)          |
| 17: Someone to turn to for suggestions about how to deal with a personal problem | E/I    | 15 (7.5)              | 7 (3.5)                  | 25 (12.6)            | 37 (18.6)            | 115 (57.8)          |
| 18: Someone to do something enjoyable with                                       | PSI    | 7 (3.4)               | 9 (4.5)                  | 21 (10.6)            | 36 (18.1)            | 126 (63.3)          |
| 19: Someone who understands your problems                                        | E/I    | 14 (7.0)              | 10 (5.0)                 | 22 (11.1)            | 33 (16.6)            | 120 (60.3)          |
| 20: Someone to love and make you feel wanted                                     | A      | 5 (2.5)               | 4 (2.0)                  | 14 (7.1)             | 34 (17.2)            | 141 (71.2)          |

Note. E/I: emotional/informational; T: tangible; A: affectionate; PSI = positive social interaction; Item 14 is an extra item that is not included in analyses.

### Confirmatory factor analysis

Four models were tested and assessed against model fit indices: an 18-item second-order four factor model, an 18-item four factor model, a bifactor model and an 18-item one factor model. There were several problems with the second-order four factor model. First, it had a large, statistically significant chi-square tests indicating that the model did not fit the data well (Table 3). Additionally, the RMSEA values for this model exceeded the cutoff value of  $\leq 0.06$  at 0.114. Finally, and most importantly, the residual covariance matrix for the second-order four factor model was not positive definite. Mplus requires a positive definite matrix in order to be able to analyze the data. As a result of these issues, we rejected the 18-item second-order four factor model.

Global fit for the first-order four factor model was poor in that this model also had a large, statistically significant chi-square test (Table 3) and a RMSEA value that exceeded the cutoff value at 0.09. Local fit

was better for this model in that the factor loadings were all statistically significant ( $p < 0.001$ ) and well above 0.70; however, as presented in Table 4, the factor correlations for the first-order four factor model were also statistically significant ( $p < 0.001$ ) and were exceedingly high, ranging from 0.851 between T and A to 0.969 between A and PSI, suggesting a lack of discriminant validity [25]. Specifically, correlations this high indicate that the items may not be measuring different latent constructs and that a model with fewer factors may be a better fit for the data. Based on this reasoning, the first-order four factor model was rejected.

Next, an 18-item bifactor model consisting of a general social support scale that was orthogonal, rather than oblique, to the four more specific social support categories (i.e. E/I, T, A and PSI) was tested. Although the fit of this model was fair (Table 3), there were specific problems with the PSI subscale. Once the variance of the general factor was accounted for,

**Table 3.** Model goodness-of-fit indices.

| Fit indices             | Second order 4 factor model | First order 4 factor model | Bifactor Model | Base model 1 factor | Model 10 1 factor |
|-------------------------|-----------------------------|----------------------------|----------------|---------------------|-------------------|
| Chi-square              | 471.78                      | 336.32                     | 324.22         | 551.49              | 308.32            |
| (df)                    | 132                         | 129                        | 117            | 135                 | 142               |
| <i>p</i>                | <0.001                      | <0.001                     | <0.001         | <0.001              | <0.001            |
| RMSEA                   | 0.114                       | 0.090                      | 0.094          | 0.125               | 0.077             |
| (90% CI)                | (0.103–0.125)               | (0.078–0.102)              | (0.082–0.107)  | (0.114–0.135)       | (0.065–0.088)     |
| <i>p</i> (RMSEA ≤ 0.05) | <0.001                      | <0.001                     | <0.001         | <0.001              | <0.001            |
| CFI                     | 0.983                       | 0.990                      | 0.990          | 0.980               | 0.990             |
| TLI                     | 0.981                       | 0.988                      | 0.987          | 0.977               | 0.988             |

**Table 4.** Factor correlations for the four factor model.

| Factor correlations | E/I   | T     | A     | PSI |
|---------------------|-------|-------|-------|-----|
| E/I                 | 1.0   | –     | –     | –   |
| T                   | 0.909 | 1.0   | –     | –   |
| A                   | 0.887 | 0.851 | 1.0   | –   |
| PSI                 | 0.935 | 0.908 | 0.969 | 1.0 |

Note. E/I: emotional/informational; T: tangible; A: affectionate; PSI: Positive Social Interaction. All correlations are significant at  $p < 0.001$ .

all factor loadings for at least one subscale (PSI) were nonsignificant. Moreover, the model contained a negative residual variance estimate meaning the model estimates were untrustworthy, thus leading us to reject this model as well.

Finally, an 18-item one factor model was tested. It initially showed poor fit (Table 3), and when inspecting areas of local strain, we found that five residual correlations exceeded an absolute value of 0.10: items 2 and 5 (0.117), items 2 and 16 (–0.121), items 6 and 16 (–0.122), items 6 and 17 (–0.128) and items 12 and 15 (0.101). Positive correlation residuals indicate that the model under-predicts the association between variables while negative residuals indicate the opposite. Mplus generated modification indices suggesting that the addition of 13 error covariances would improve model fit. Ten of these suggestions made theoretical sense because they involved pairs of items that were on the same subscale in the original measure and thus, were conceptually related. We began to respecify the model by adding one error covariance at a time in order of MI size (largest to smallest). We performed Chi-square difference testing of the nested models using the DIFFTEST option in Mplus, which is appropriate when using the WLSMV estimator [22]. Fit continued to improve with the addition of each error covariance. We added error covariances until we had exhausted the 10 theoretically relevant options. As displayed in Table 3, the resulting model fits the data reasonably well with the following fit indices:  $\chi^2(142) = 308.319$ ,  $p > 0.001$ ; RMSEA = 0.077; CFI = 0.990; and TLI = 0.988. Factor loadings ranged from 0.807 to 0.957 (Table 5). Cronbach's  $\alpha$  was 0.97, which was identical to what Sherbourne and Stewart [11] reported for the overall support index in their original study.

**Table 5.** Factor loadings and error covariances for the final model.

| Item | Unstandardized | Fully standardized | Error covariances |
|------|----------------|--------------------|-------------------|
| 2    | 1.00           | 0.807              | Item 5            |
| 3    | 1.168          | 0.927              | Item 4            |
| 4    | 1.121          | 0.895              | Item 3, Item 8    |
| 5    | 1.074          | 0.861              | Item 2, Item 12   |
| 6    | 1.097          | 0.878              | Item 10, Item 20  |
| 7    | 1.156          | 0.919              | –                 |
| 8    | 1.210          | 0.957              | Item 4            |
| 9    | 1.163          | 0.924              | –                 |
| 10   | 1.093          | 0.875              | Item 6, Item 20   |
| 11   | 1.128          | 0.900              | Item 18           |
| 12   | 1.086          | 0.870              | Item 5, Item 15   |
| 13   | 1.135          | 0.904              | –                 |
| 15   | 1.099          | 0.879              | Item 12           |
| 16   | 1.172          | 0.930              | Item 17           |
| 17   | 1.166          | 0.926              | Item 16           |
| 18   | 1.114          | 0.889              | Item 11           |
| 19   | 1.165          | 0.926              | –                 |
| 20   | 1.058          | 0.849              | Item 6, Item 10   |

All loadings are significant at  $p < 0.001$ .

Lastly, in order to assess the construct validity of the instrument, we examined the relationship between scores on our final MOS-SSS model and caregiver depression as measured by the Center for Epidemiological Studies-Depression (CES-D) [28]. Regression analysis in Mplus revealed a statistically significant negative relationship between social support and depression ( $\beta = -0.374$ ,  $p < 0.001$ ). In other words, an increase in self-reported depression predicted a decrease in social support scores.

## Discussion

In this sample of low-income, urban caregivers of African American children with poorly controlled asthma, the 18-item one factor structure of the MOS-SSS was the best fitting model according to CFA. In contrast, the original 18-item second-order four factor structure developed by Sherbourne and Stewart [11] was not a good fit for the current sample. The poor fit of the four factor models suggests that sub-dividing social support into additional categories may not be clinically meaningful, because it may not accurately reflect the construct within this population. Indeed, the results of this study indicate that although social

support may be comprised of different categories, such as emotional/informational support, tangible support, affection and positive social interaction—these categories are not distinct enough to be described as separate constructs in this population. Our results differ from previous literature that discusses the significance of the different types of social support and the relationship between those specific types and health in African American communities [29–31]. For example, Israel et al. [31] found that when examined simultaneously in a sample of urban African American women, instrumental support as opposed to emotional support, was a better predictor of depressive symptoms, suggesting that they are two separate constructs; however, the authors did find a rather high correlation (0.63) between emotional and instrumental support, indicating that the same people who provide emotional support may also be providing instrumental support. This theory could explain our results as well. Perhaps for our population of mothers of African American children with asthma, the various types of social support are being provided by the same people and/or at the same time, rendering it difficult to parse those types of social support into separate constructs.

In addition to being the first study to examine the factor structure of the MOS-SSS with caregivers of African American children with asthma, another strength of this study was our awareness of the non-normal distribution of the data, which we addressed through the use of the WLSMV estimator for ordered categorical data. In this sample, as in a number of previous studies, the items were positively skewed, indicating high levels of social support but also suggesting a ceiling effect [11,32,33]. A ceiling effect implies a lack of sensitivity in the scale such that discrimination between respondents at the top of the scale is impossible. Consequently, it is important to keep the likelihood of this effect in mind when interpreting scores on the 18-item one factor MOS-SSS or any other version of the scale. In future, it may be helpful to designate a cutoff point in order to differentiate between caregivers with high versus low social support.

This study has its limitations. First, the results are specific to the population reflected in the sample (i.e. low-income, urban caregivers of African American children with poorly controlled asthma) and may not be generalizable to other groups of asthma caregivers. Second, the sample size limited our ability to test more complex and alternative models. Finally, these data are cross-sectional, and as a result, we were

unable to test the stability of the factor structure over time.

Considering the associations between social support and improved caregiver psychological health and child asthma outcomes, it is critical to be able to accurately measure social support [8–10]. Despite the limitations of our study, our results suggest that with further validation, the 18-item one factor MOS-SSS may be appropriate for use in research and practice with caregivers of African American children with poorly controlled asthma. Indeed, the 18-item one factor MOS-SSS appears promising as a mechanism to allow healthcare researchers and providers to advance their understanding of the relationship between social support and asthma outcomes in this vulnerable population.

## Acknowledgements

The authors are grateful to the caregivers who participated in this research and helped advance understanding of social support in families raising children with asthma.

## Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## Funding

This work was supported by National Institute of Nursing Research [R01 NR013486].

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## References

- Centers for Disease Control and Prevention. Most Recent Asthma Data [Internet]. 2018. Available from: [https://www.cdc.gov/asthma/most\\_recent\\_data.htm](https://www.cdc.gov/asthma/most_recent_data.htm).
- Gergen PJ, Toggias A. Inner city asthma. *Immunol Allergy Clin North Am* 2015;35:101–114.
- Akinbami L. The state of childhood asthma, United States, 1980–2005. *Adv Data* 2006;12/12:1–24.
- Easter G, Sharpe L, Hunt CJ. Systematic review and meta-analysis of anxious and depressive symptoms in caregivers of children with asthma. *J Pediatr Psychol* 2015;40:623.
- Kaugars AS, Klinnert MD, Bender BG. Family influences on pediatric asthma. *J Pediatr Psychol* 2004;29:475–491.

6. Shalowitz MU, Mijanovich T, Berry CA, Clark-Kauffman E, Quinn KA, Perez EL. Context matters: a community-based study of maternal mental health, life stressors, social support, and children's asthma. *Pediatrics* 2006;117:e940–e948.
7. Cohen S. Social relationships and health. *Am Psychol* 2004;59:676–684.
8. Santos LM, Santos DM, Rodrigues LC, Barreto ML. Maternal mental health and social support: effect on childhood atopic and non-atopic asthma symptoms. *J Epidemiol Community Health* 2012;66:1011.
9. Scheckner B, Arcoleo K, Feldman JM. The effect of parental social support and acculturation on childhood asthma control. *J Asthma* 2015;52:606–613.
10. Kub J, Bellin MH, Butz A, Elizabeth Bollinger M, Lewis-Land C, Osteen P. The chronicity of depressive symptoms in mothers of children with asthma. *West J Nurs Res* 2017; 05/01:193945917705858-.
11. Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32:705–714.
12. Freitas RPA, Andrade SC, Spyrides MHC, Micussi MTABC, Sousa MBC. Impacts of social support on symptoms in Brazilian women with fibromyalgia. *Rev Bras Reumatol Engl Ed* 2017;57:197–203.
13. Huynh AK, Kinsler JJ, Cunningham WE, Sayles JN. The role of mental health in mediating the relationship between social support and optimal ART adherence. *AIDS Care* 2013;25:1179–1184.
14. Jenks Kettmann JD, Altmaier EM. Social support and depression among bone marrow transplant patients. *J Health Psychol* 2008;13:39–46.
15. Conte KP, Schure MB, Goins RT. Correlates of social support in older American Indians: the native elder care study. *Aging Mental Health* 2015; 09/0119:835–843.
16. Robitaille A, Orpana H, McIntosh CN. Psychometric properties, factorial structure, and measurement invariance of the English and French versions of the medical outcomes study social support scale. *Health Rep* 2011;22:33–40.
17. Gjesfeld CD, Greeno CG, Kim KH. A confirmatory factor analysis of an abbreviated social support instrument: the MOS-SSS. *Res Soc Work Pract* 2008;18:231–237.
18. Higgins G, Marcum CD, Golder S, Hall MT, Logan TK. Confirmatory factor analysis of the medical outcomes study—social support survey: examining the factor structure among victimized women on probation and parole. *Am J Crim Justice* 2015;40:811–822.
19. Holden L, Lee C, Hockey R, Ware R, Dobson A. Validation of the MOS social support survey 6-item (MOS-SSS-6) measure with two large population-based samples of Australian women. *Qual Life Res* 2014;23:2849–2853.
20. Stewart AL, Nápoles-Springer AM. Advancing health disparities research: can we afford to ignore measurement issues?. *Med Care* 2003;41:1207.
21. Butz A, Morpew T, Lewis-Land C, Kub J, Bellin M, Ogborn J, Mudd SS, et al. Factors associated with poor controller medication use in children with high asthma emergency department use. *Ann Allergy Asthma Immunol* 2017;118:419–426.
22. Muthen LK, Muthen BO. *Mplus user's guide*, 8th ed. Los Angeles, CA: Muthen & Muthen; 2017.
23. Kline RB. *Principles and practice of structural equation modeling*, 4th Ed. New York: Guilford Press; 2016.
24. Byrne BM. *Structural equation modeling with Mplus: basic concepts, applications, and programming*. [electronic resource]. Hoboken (NJ): Taylor & Francis; 2011.
25. Brown TA. *Confirmatory factor analysis for applied research*. 2nd Ed. New York: Guilford Publications; 2015.
26. U.S. Department of Health and Human Services. National Asthma Education Prevention Program. Expert Panel Report 3 (EPR3): Guidelines for the Diagnosis and Management of Asthma. NIH Publication 07-4051. Washington (DC): US Department of Health and Human Services; 2007.
27. IBM Corp. *IBM SPSS Statistics for Windows*, Version 21.0. Armonk (NY): IBM Corporation; 2012.
28. Radloff LS. The CES-D scale. *Appl Psychol Meas* 1977;1:385.
29. Green BL, Rodgers A. Determinants of social support among low-income mothers: a longitudinal analysis. *Am J Community Psychol* 2001;29:419.
30. Holt C, Roth D, Huang J, Clark E. Role of religious social support in longitudinal relationships between religiosity and health-related outcomes in African Americans. *J Behav Med* 2018;41:62–73.
31. Israel BA, Farquhar SA, Schulz AJ, James SA, Parker EA. The relationship between social support, stress, and health among women on Detroit's east side. *Health Educ Behav* 2002;29:342–360.
32. Giangrasso B, Casale S. Psychometric properties of the medical outcome study social support survey with a general population sample of undergraduate students. *Soc Indicators Res* 2014;116:185–197.
33. Soares A, Biasoli I, Scheliga A, Baptista R, Brabo E, Morais J, Werneck G, Spector N. Validation of the Brazilian Portuguese version of the medical outcomes study-social support survey in Hodgkin's lymphoma survivors. *Support Care Cancer* 2012;20:1895–1900.