

# Impact and Associations of Atopic Dermatitis Out-of-Pocket Health Care Expenses in the United States

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**Background:** Atopic dermatitis (AD) is associated with substantial financial cost, including increased out-of-pocket (OOP) expenses. Associations and impact of OOP costs are poorly understood.

**Objective:** The aim of the study was to characterize the impact and associations of OOP health care expenses for AD.

**Methods:** A 25-question online survey was administered to National Eczema Association members (N = 113,502). Inclusion criteria (US residents aged ≥18 years; self-reported AD or primary caregiver of individual with AD) were met by 77.3% (1118 of 1447).

**Results:** Respondents with monthly OOP expenses greater than \$200 were more likely to have increased AD severity, flares, health care provider visits, prescription polypharmacy, use of step-up therapy, frequent skin infections, and poorer disease control ( $P < 0.005$  for all). Respondents with OOP yearly expenditures greater than \$1000 had similar associations and additionally increased rates of comorbid asthma, allergic rhinitis, and anxiety/depression ( $P < 0.005$  for all). A total of 64.6% (n = 624) reported harmful household financial impact of OOP expenses. Predictors of harmful impact included severe AD (adjusted odds ratio [95% confidence interval], 2.62 [1.11–6.19],  $P = 0.04$ ), comorbid asthma (1.42 [1.07–1.87],  $P = 0.03$ ), 5 health care provider visits or more in a year (2.80 [1.62–4.82],  $P = 0.0007$ ), greater than \$200 OOP monthly expenditures (2.16 [1.45–3.22], 0.0006), and \$1000 annual OOP expenditures or more (4.56 [3.31–6.27],  $P < 0.0001$ ).

**Conclusions:** Out-of-pocket expenses for AD significantly impact household finances. Clinical interventions are needed to minimize OOP expenses while optimizing care outcomes.

## Capsule Summary:

- Atopic dermatitis (AD) is associated with significant financial cost, including increased out-of-pocket (OOP) expenses, although the impact and associations of OOP health care expenses for AD management are not well understood.
- The OOP health care expenses related to AD are associated with increased disease severity and health care utilization and significantly impact the household finances of patients and caregivers.

- Health care providers should be mindful of the OOP financial burden related to AD management and engage in shared decision making to create a treatment plan that is practical and effective and minimizes household financial impact.

Atopic dermatitis (AD) is a common chronic inflammatory skin disease that affects approximately 7% of the United States (US) population.<sup>1,2</sup> AD is a heterogeneous disorder with variable severity,

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lesional distribution, disease course, and symptoms, including itch, skin-pain, sleep disruption, and mental health symptoms.<sup>2-8</sup> Patients with AD have increased rates of comorbid allergic, autoimmune, neuropsychiatric, cardiovascular, and musculoskeletal disorders and impairment in health-related quality of life, resulting in reduced emotional, physical, and psychosocial well-being.<sup>2,9-14</sup>

The heterogeneous course and profound burden of AD leads to increased health care resource utilization (eg, outpatient, emergency, and inpatient visits) in US children and adults,<sup>7,15-17</sup> which in turn contribute to considerable direct and indirect overall costs.<sup>17-19</sup> Out-of-pocket (OOP) health care costs are particularly concerning to the everyday lives of AD patients and their families. Population-based studies showed that individuals with AD had multicomponent increases in OOP costs related to health care visits.<sup>14,20</sup> However, these studies were limited by their inability to assess the impact of AD severity, control, and/or a broad range of treatments and additional supportive care measures on the financial burden and OOP costs for AD patients and caregivers. Atopic dermatitis severity was previously found to be the strongest predictor of outpatient utilization of AD care, with various socioeconomic and racial/ethnic disparities driving higher rates of emergency department, urgent care, and hospital visits.<sup>15</sup> We hypothesized that OOP health care expenses are associated with AD severity and control and significantly contribute to financial impact on individuals and families. We sought to characterize the impact and associations of OOP health care expenses for AD management.

## METHODS

### Study Design

Between November 14 and December 14, 2019, a 25-question online survey was administered to all National Eczema Association (NEA) members, including 113,502 individuals with AD and family members. The survey was also advertised on online social media platforms, including Facebook. Electronic informed consent was obtained before initiation of the survey, and those who completed the survey were offered an optional chance to enter in a random drawing to win one of ten \$50 gift cards. Survey response was not linked to receipt of a gift card. Inclusion criteria were limited to US residents; 18 years or older; and either personal diagnosis of AD or primary caregiver of a child, teen, or young adult with AD.

### Survey Questions

Diagnosis of AD was confirmed by positive response to the question "Have [you/the person with AD] been diagnosed with atopic dermatitis by a health care provider?" Demographics included age, race/ethnicity, sex, household income, insurance coverage, and geographic setting. Current AD severity (clear/mild/moderate/severe), control (very well/moderately well/somewhat/minimally/not controlled), number of flare days in the last month (0/1-3/4-7/8-10/ $\geq 11$ ), chronic comorbid medical conditions (allergic rhinitis/food allergy/asthma/frequent skin infections/depression/anxiety), current

topical/external (antimicrobials/corticosteroids/crisaborole/pimecrolimus/tacrolimus/phototherapy) and systemic (oral corticosteroids/injectable corticosteroids/dupilumab/azathioprine/cyclosporine/methotrexate/mycophenolate mofetil/tacrolimus) prescription treatments, total number of prescriptions (0/1/2/3/4/5/ $\geq 6$ ), and number of HCP visits for AD in the past year (0/1/2/3/4/5/ $\geq 6$ ) were queried. Out-of-pocket expenses in the past month for co-pays and/or deductibles for doctor or other HCP office visits (excluding mental health providers) for evaluation or treatment of AD (\$0/\$1-\$50/\$51-\$100/\$101-\$150/\$151-\$200/\$201-\$250/\$251-\$275/\$275-\$300/ $>$ \$300), total yearly OOP expenses for AD across all health care and non-health care-related categories (free response), and impact of yearly OOP expenses on personal/family finances (none/minimal/moderate/significant/devastating) was also assessed.

### Data Analysis

Statistical analysis was performed using SAS Version 9.4 (SAS Institute, Cary, NC). Rao-Scott  $\chi^2$  tests were used for comparisons of categorical variables, including sociodemographic and AD activity measures. Kruskal-Wallis 1-way analysis of variance was used for comparison of median annual OOP costs. To determine predictors of financial impact of OOP expenses on household finances, we constructed a multivariate logistic regression model with financial impact as the dependent variable and invoked backward elimination stepwise selection. Corrected *P* values of 0.05 or less were considered significant.

## RESULTS

### Patient Characteristics

The survey was started by 1447 individuals, of which 954 (65.9%) fully completed; 1118 (77.3%) met inclusion criteria. The respondents included adults with AD (% prevalence, 77.5% [*n* = 866]) and parents and/or primary caregivers of children/teens (younger than 18 years, 20.0% [224]) or young adults (18-25 years, 2.5% [28]) with AD. Most respondents identified as female (76.5% [855]), White (72.4% [697]), and non-Hispanic (90.5% [871]) with employer-sponsored insurance coverage (57.7% [550]), median income of \$50,000 to \$74,999, and residence in a suburban location (56.6% [544]; Table 1).

### Associations With OOP Expenses

The respondents with OOP expenditures for co-pays and/or deductibles for HCP office visits for evaluation or treatment of AD greater than \$100 in the past month were more likely to have moderate and severe disease (% prevalence, 28.9% and 45.5%, *P* < 0.0001; Table 2). They were also more likely to report minimal disease control (41.1%, *P* = 0.0004), 11 days or more spent in an AD flare in the past month (39.4%, *P* < 0.0001), 5 HCP visits or more (49.8%, *P* < 0.0001), increasing prescription polypharmacy (39.7%, *P* < 0.0001), and use of step-up therapy, that is, systemic therapy including injectable,

**TABLE 1. Respondent Characteristics**

Variable	n (%)
Age, y	
≤2	42 (3.8)
3–5	69 (6.2)
6–11	68 (6.1)
12–17	49 (4.4)
18–25	139 (12.4)
26–35	130 (11.6)
36–50	173 (15.5)
51–64	247 (22.1)
≥65	201 (18.0)
Sex	
Female	855 (76.5)
Male	251 (22.5)
Nonbinary/other	4 (0.4)
Prefer not to answer	8 (0.7)
Race	
White	697 (72.4)
Black/African American	102 (10.6)
Asian	58 (6.0)
Native Hawaiian/Pacific Islander	7 (0.7)
American Indian or Alaskan Native	8 (0.8)
Multiracial	63 (6.5)
Other	28 (2.9)
Hispanic ethnicity	
No	871 (90.5)
Yes	92 (9.6)
Household income, \$	
≤24,999	175 (18.3)
25,000–49,999	190 (19.9)
50,000–74,999	192 (20.1)
75,000–99,999	122 (12.8)
100,000–124,999	103 (10.8)
125,000–149,999	61 (6.4)
≥150,000	111 (11.6)
Insurance	
None	41 (4.3)
Employer-sponsored coverage	550 (57.7)
Medicaid or state assistance	93 (9.8)
Medicare	160 (16.8)
Policy purchased on state/federal health exchange	37 (3.9)
Policy purchased on the commercial market	29 (3.0)
Tricare or VA benefit	22 (2.3)
Unsure	22 (2.3)
Geographical setting	
Urban	229 (23.8)
Suburban	544 (56.6)
Rural	188 (19.6)

VA, veteran's administration.

oral, or phototherapy (42.3%,  $P < 0.0001$ ). Although those with increased OOP expenses in the past month were more likely to have comorbid food allergy (36.4%,  $P = 0.008$ ) and frequent/persistent skin infections (38.4%,  $P = 0.022$ ), there was no increase in the

presence of asthma, allergic rhinitis, or anxiety and/or depression. Similar results were observed for the respondents with OOP expenditures greater than \$200 in the past month (Table 2).

Similar to monthly expenditures, the respondents with increasing annual total OOP expenses for AD care were more likely to have severe disease (median expense, \$1000 [range = \$16–\$23,000],  $P < 0.0001$ ; Table 2). They were also more likely to have more days spent in an AD flare in the past month ( $\geq 11$  days; \$1000 [\$0–\$200,000],  $P < 0.0001$ ), more HCP visits ( $\geq 5$  visits; \$1200 [\$2–\$20,000],  $P < 0.0001$ ), increasing prescription polypharmacy ( $\geq 3$  treatments; \$1000 [\$0–\$200,000],  $P < 0.0001$ ), and use of step-up therapy (\$1000 [\$0–\$200,000],  $P < 0.0001$ ). Individuals with higher annual OOP expenses were more likely have all surveyed comorbidities: asthma (\$800 [\$0–\$200,000],  $P = 0.002$ ), allergic rhinitis (\$775 [\$0–\$200,000],  $P < 0.0001$ ), food allergy (\$1000 [\$2–\$200,000],  $P < 0.0001$ ), frequent/persistent skin infections (\$1000 [\$2–\$200,000],  $P < 0.0001$ ), anxiety and/or depression (\$800 [\$0–\$200,000],  $P = 0.01$ ). Even when highest reported total annual OOP costs (eg,  $\geq \$100,000$ ) were removed from analysis, median expenses were unchanged and associations remained significant.

### Impact of OOP Expenses

When asked about the impact of OOP expenses for AD on personal/family finances, most respondents reported a moderate impact (% prevalence, 40.1%; Fig. 1). Nearly one quarter of the respondents (24.5%) reported a significant or devastating financial impact. Those with a higher degree of moderate, significant, and devastating financial impact were more likely to have lower household income and Medicaid, absent, or uncertain insurance ( $P < 0.0001$  for all; Table 3). They were also more likely to have increased AD severity, poorer AD control, increased number of days spent in AD flare in the past month, increased number of HCP visits, and all surveyed comorbidities ( $P < 0.001$  for all). There was no significant relationship with other sociodemographic factors, such as age, sex, race/ethnicity, and geographic location. Positive predictors of harmful financial impact included severe AD (adjusted odds ratio, 2.62 [95% confidence interval, 1.11–6.19],  $P = 0.04$ ), comorbid asthma (1.42 [1.07–1.87],  $P = 0.03$ ), 5 HCP visits or more in the past year (2.80 [1.62–4.82],  $P = 0.0007$ ), greater than \$200 spent on co-pays and/or deductibles for HCP office visits in the past month (2.16 [1.45–3.22], 0.0006), and greater than \$1000 annual expenditures for AD (4.56 [3.31–6.27],  $P < 0.0001$ ; Table 4). Negative predictors included household income of \$25,000 to \$99,999 (0.63 [0.44–0.90],  $P = 0.02$ ) and greater than \$100,000 (0.27 [0.18–0.41],  $P < 0.0001$ ).

### DISCUSSION

Using a nationally representative survey to characterize OOP health care expenses from the perspective of AD patients and caregivers, we discovered a number of important factors associated with OOP costs and their impact on household finances. We stratified direct health care OOP expenses in the past month for co-pays and/or deductibles for HCP office visits by patient-reported AD disease

**TABLE 2. Associations With OOP Costs**

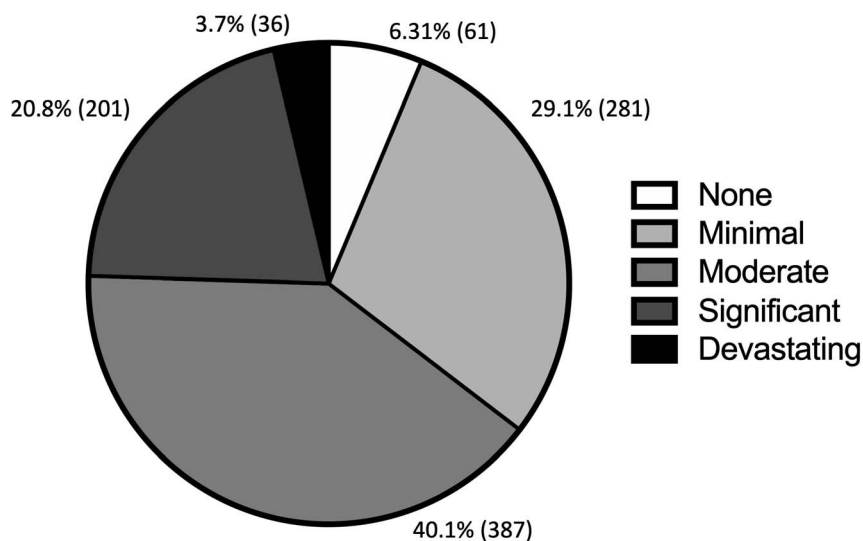
Variable, n (%)	OOP Costs in the Past 30 d, \$				OOP Costs in the Past Year, \$			
	≥100	P	≥200	P	Median (Min–Max)	P	≥1000	P
Current AD severity								
Clear	5 (20.0)	<0.0001	3 (12.0)	<0.0001	500 (0–5000)	<0.0001	6 (28.6)	<0.0001
Mild	44 (20.3)		18 (8.3)		360 (0–15,000)		49 (26.5)	
Moderate	135 (28.9)		62 (13.3)		500 (0–200,000)		159 (38.5)	
Severe	122 (45.5)		73 (27.2)		1000 (16–23,000)		144 (62.1)	
Current AD control								
Minimally controlled	94 (41.1)	0.0004	54 (23.6)	0.003	600 (0–200,000)	0.16	87 (43.5)	0.66
Somewhat controlled	124 (31.0)		60 (15.0)		600 (0–25,000)		155 (43.4)	
Moderately well controlled	76 (27.9)		32 (11.8)		500 (0–23,000)		93 (40.8)	
Very well controlled	15 (17.1)		11 (12.5)		500 (0–100,000)		28 (36.4)	
No. flare days in the past 30 d								
0	11 (27.5)	<0.0001	8 (20.0)	0.0004	300 (0–5,000)	<0.0001	10 (30.3)	0.0007
1–3	50 (21.0)		20 (8.4)		500 (0–100,000)		74 (34.4)	
4–7	56 (29.3)		24 (12.6)		500 (50–25,000)		67 (39.9)	
8–10	40 (28.6)		21 (15.0)		500 (50–15,000)		44 (36.4)	
≥11	153 (39.4)		84 (21.7)		1000 (0–200,000)		169 (51.1)	
Comorbidities								
Asthma	117 (33.8)	0.23	59 (17.1)	0.51	800 (0–200,000)	0.002	146 (48.8)	0.002
Allergic rhinitis	168 (33.0)	0.22	86 (16.9)	0.45	775 (0–200,000)	<0.0001	207 (47.5)	0.0007
Food allergy	139 (36.4)	0.008	83 (21.7)	<0.0001	1000 (2–200,000)	<0.0001	185 (55.7)	<0.0001
Frequent/persistent skin infections	73 (38.4)	0.022	44 (23.2)	0.003	1000 (2–200,000)	<0.0001	98 (60.1)	<0.0001
Anxiety and/or depression	121 (32.6)	0.44	62 (16.7)	0.58	800 (0–200,000)	0.01	154 (48.4)	0.002
HCP visits in the past year								
0	7 (6.9)	<0.0001	3 (2.9)	<0.0001	250 (0–3,000)	<0.0001	12 (15.2)	<0.0001
1–2	82 (20.5)		36 (9.0)		500 (0–23,000)		98 (27.5)	
3–4	110 (40.9)		49 (18.2)		1000 (20–200,000)		116 (50.2)	
≥5	112 (49.8)		70 (31.1)		1200 (2–20,000)		137 (68.2)	
No. treatments								
0	21 (20.6)	<0.0001	6 (5.9)	<0.0001	300 (0–5,000)	<0.0001	15 (19.2)	<0.0001
1–2	60 (19.0)		19 (6.0)		400 (0–20,000)		66 (23.3)	
≥3	230 (39.7)		133 (22.9)		1000 (0–200,000)		283 (55.7)	
Step-up therapy								
No	136 (23.3)	<0.0001	60 (10.3)	<0.0001	500 (0–25,000)	<0.0001	169 (33.5)	<0.0001
Yes	172 (42.3)		98 (24.1)		1000 (0–200,000)		190 (53.1)	

AD, atopic dermatitis; HCP, health care provider; OOP, out-of-pocket.

burden to better understand the associations with cost. A recent study demonstrated that this is the major category of OOP costs for AD patients and caregivers.<sup>21</sup> We also similarly stratified direct health care OOP expenses in the past year for all expenses related to AD care. The respondents with increased OOP monthly and yearly expenditures were more likely to have increased disease severity, poor disease control, increased flares, increased number of HCP office visits, increased prescription polypharmacy, use of step-up therapy, comorbid food allergy, and frequent skin infections. Those with increased OOP yearly expenditures were additionally more likely to have comorbid asthma, allergic rhinitis, and anxiety and/or depression. The respondents with a higher degree of impact of OOP expenses on household finances were more likely to have lower household income, Medicaid, absent or uncertain insurance, increased disease severity, poor disease control, increased flares,

increased number of HCP office visits, and all of the previously mentioned comorbidities. Positive predictors of this financial impact included severe AD, 5 HCP visits or more in the past year, greater than \$200 spent on co-pays and/or deductibles for HCP office visits in the past month, and greater than \$1000 annual expenditures for AD. These data highlight the onus that OOP costs place on AD patients and caregivers, especially those with the greatest burden of disease, and underscore the importance of personalized care to minimize household financial impact while striving to achieve better disease control.

Studies examining the associations of OOP costs in relation to patient-reported measures of disease activity (eg, severity, control, flares) are limited. A US population-based survey (National Health Interview Survey) that captured data from the previous decade showed that AD was associated with higher OOP costs, along with



**Figure 1.** Impact of OOP health care expenses for AD on household finances.

poorer overall health and increased HCP office visits.<sup>14</sup> However, because this was a general health-related survey, AD-related measures were not assessed. A more recent survey in France showed that OOP costs for patients with AD are significantly higher compared with the average French household, especially among those with the most severe AD (as measured by Patient Oriented SCORing Atopic Dermatitis, a patient-reported outcome [PRO] measure of disease severity).<sup>22</sup> Similarly, a cross-sectional telephone-based survey of 9 European countries showed elevated OOP expenses for AD patients, with higher costs incurred by those with more severe AD (as measured by patient oriented eczema measure, another PRO measure of AD activity). Compared with many other chronic inflammatory skin conditions, AD patients show a high willingness to pay for their care.<sup>23</sup> Those with poor control of their AD, increased flare days, and/or higher disease severity understandably have the highest incentive to relieve their symptoms. Potential categories for OOP expenditures beyond HCPs and prescriptions include nonprescription health care products (eg, moisturizers, hygiene products, allergy medications, sleep aids) and complementary approaches (eg, cleaning products, clothing/bedding, nonwestern alternative medicine). Despite insurance covering few of these costs, individuals with AD have been shown to spend money in all of these categories, despite varying degrees of evidence and efficacy behind some options.<sup>21</sup> Health care providers need to understand these potential areas of OOP expense and should fully review and discuss the treatment plan with patients during every encounter, particularly for those with the most severe burden of disease.

Atopic dermatitis is a highly heterogeneous inflammatory disorder consisting of a dynamic longitudinal course of lesional severity and extent.<sup>24</sup> Given that every patient has different levels of baseline disease punctuated by varying frequencies and degrees of flaring, there is no one-size-fits-all treatment. As a result, clinicians and patients continually modify their treatment approach, resulting in polypharmacy, intermittent use of step-up therapy, complex and

often unsustainable regimens, and use of nonevidence-based treatments.<sup>25</sup> Our data show that polypharmacy and step-up therapy were both associated with higher OOP costs, likely reflecting the OOP contribution to prescription costs (especially more expensive step-up therapies) in addition to the overall higher OOP costs for those with the highest disease activity. Atopic dermatitis patients would benefit from a streamlined regimen, consisting of a strong foundation in basic skin care (eg, bathing and emollients), a simple, nonburdensome strategy for the use of topical therapies, implementation of long-term, systemic therapies only as warranted, and deprescription of redundant or nonevidence-based treatments used inappropriately to address AD-specific symptoms (eg, oral antihistamines). Health care providers should discuss the financial impact of OOP costs with patients alongside efficacy, safety, and clinical evidence when crafting a treatment plan consisting of multiple interventions.

Atopic dermatitis is associated with a higher risk of allergic disorders (and may predispose individuals to conditions like asthma, allergic rhinitis, food allergy), infectious conditions, and mental health symptoms of anxiety and depression.<sup>26</sup> Furthermore, these comorbidities are associated both with increasing AD severity and higher health care utilization.<sup>12,27</sup> We found that the presence of these comorbid conditions was associated with increasing OOP costs. The comorbid health burden of AD is often underappreciated, and a substantial number of patients can go undiagnosed and untreated, especially in the case of mental health symptoms.<sup>28</sup> Patients may seek out additional nonprescription or complementary treatments and/or various other HCPs for relief, contributing to excess expenses. It is critical for HCPs to appreciate the full spectrum of cutaneous and noncutaneous comorbidities of AD to counsel, treat, and refer as needed for additional care to better control disease activity and reduce OOP costs.

Lower income and Medicaid, absent, or uncertain insurance were associated with higher OOP costs, and increased AD severity and both monthly and yearly OOP expenditures were positive

**TABLE 3. Financial Impact of OOP Costs**

Variable, n (%)	Financial Impact					P
	None	Minimal	Moderate	Significant	Devastating	
Age, y						
≤2	1 (2.7)	13 (35.1)	16 (43.2)	5 (13.5)	2 (5.4)	0.13
3–5	3 (4.8)	20 (31.8)	26 (41.3)	12 (19.1)	2 (3.2)	
6–11	2 (3.3)	13 (21.3)	24 (39.3)	16 (26.2)	6 (9.8)	
12–17	2 (4.8)	8 (19.1)	19 (45.2)	11 (26.2)	2 (4.8)	
18–25	6 (5.2)	29 (25.0)	47 (40.5)	29 (25.0)	5 (4.3)	
26–35	4 (3.8)	28 (26.4)	42 (39.6)	29 (27.4)	3 (2.8)	
36–50	5 (3.4)	41 (27.9)	62 (42.2)	32 (21.8)	7 (4.8)	
51–64	17 (7.8)	74 (33.8)	80 (36.5)	44 (20.1)	4 (1.8)	
≥65	21 (12.0)	55 (31.4)	71 (40.6)	23 (13.1)	5 (2.9)	
Sex						
Female	40 (5.5)	206 (27.8)	302 (40.8)	162 (21.9)	31 (4.2)	0.26
Male	21 (9.8)	72 (33.5)	81 (37.7)	37 (17.2)	4 (1.9)	
Nonbinary/other	0 (0.0)	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	
Prefer not to answer	0 (0.0)	2 (33.3)	2 (33.3)	1 (16.7)	1 (16.7)	
Race						
White	40 (5.7)	220 (31.6)	277 (39.7)	135 (19.4)	25 (3.6)	0.18
Black/African American	12 (11.8)	13 (12.8)	45 (44.1)	28 (27.5)	4 (3.9)	
Asian	3 (5.4)	15 (26.8)	24 (42.9)	11 (19.6)	3 (5.4)	
Native Hawaiian/Pacific Islander	0 (0.0)	3 (42.9)	1 (14.3)	2 (28.6)	1 (14.3)	
American Indian or Alaskan Native	0 (0.0)	2 (25.0)	4 (50.0)	2 (25.0)	0 (0.0)	
Multiracial	3 (4.8)	22 (34.9)	21 (33.3)	15 (23.8)	2 (3.2)	
Other	3 (10.7)	5 (17.9)	12 (42.9)	8 (28.6)	0 (0.0)	
Hispanic ethnicity						
No	58 (6.7)	260 (29.9)	343 (39.5)	176 (20.3)	32 (3.7)	0.24
Yes	3 (3.3)	20 (21.7)	41 (44.6)	25 (27.2)	3 (3.3)	
Household income, \$						
≤24,999	11 (6.3)	33 (18.9)	71 (40.6)	50 (28.6)	10 (5.7)	<0.0001
25,000–49,999	9 (4.7)	40 (21.1)	86 (45.3)	45 (23.7)	10 (5.3)	
50,000–74,999	6 (3.1)	58 (30.4)	74 (38.7)	45 (23.6)	8 (4.2)	
75,000–99,999	13 (10.7)	41 (33.6)	47 (38.5)	19 (15.6)	2 (1.6)	
100,000–124,999	4 (3.9)	31 (30.1)	44 (42.7)	21 (20.4)	3 (2.9)	
125,000–149,999	4 (6.6)	21 (34.4)	25 (41.0)	10 (16.4)	1 (1.6)	
≥150,000	12 (10.9)	53 (48.2)	33 (30.0)	11 (10.0)	1 (0.9)	
Insurance						
None	0 (0.0)	8 (19.5)	18 (43.9)	13 (31.7)	2 (4.9)	<0.0001
Employer-sponsored coverage	28 (5.1)	182 (33.2)	208 (38.0)	114 (20.8)	16 (2.9)	
Medicaid or state assistance	3 (3.2)	15 (16.1)	48 (51.6)	20 (21.5)	7 (7.5)	
Medicare	17 (10.6)	50 (31.3)	56 (35.0)	32 (20.0)	5 (3.1)	
Policy purchased on state/federal health exchange	3 (8.1)	6 (16.2)	21 (56.8)	6 (16.2)	1 (2.7)	
Policy purchased on the commercial market	2 (6.9)	8 (27.6)	13 (44.8)	2 (6.9)	4 (13.8)	
Tricare or VA benefit	4 (18.2)	4 (18.2)	10 (45.5)	4 (18.2)	0 (0.0)	
Unsure	2 (9.1)	4 (18.2)	6 (27.3)	10 (45.5)	0 (0.0)	
Geographical setting						
Urban	14 (6.1)	65 (28.5)	91 (39.9)	50 (21.9)	8 (3.5)	0.99
Suburban	35 (6.5)	159 (29.3)	215 (39.6)	115 (21.2)	19 (3.5)	
Rural	11 (5.9)	56 (29.8)	77 (41.0)	36 (19.2)	8 (4.3)	
Region						
New England	5 (7.7)	16 (24.6)	28 (43.1)	14 (21.5)	2 (3.1)	0.38
Mid-Atlantic	6 (4.7)	40 (31.3)	50 (39.1)	30 (23.4)	2 (1.6)	

(Continued on next page)

**TABLE 3.** (Continued)

Variable, n (%)	Financial Impact					P
	None	Minimal	Moderate	Significant	Devastating	
East North Central	12 (8.3)	40 (27.8)	58 (40.3)	30 (20.8)	4 (2.8)	
West North Central	5 (9.6)	13 (25.0)	24 (46.2)	8 (15.4)	2 (3.9)	
South Atlantic	14 (7.6)	48 (26.0)	73 (39.5)	48 (26.0)	2 (1.1)	
East South Central	2 (3.3)	17 (27.9)	29 (47.5)	10 (16.4)	3 (4.9)	
West South Central	3 (3.3)	24 (26.7)	35 (38.9)	21 (23.3)	7 (7.8)	
Mountain	4 (5.4)	23 (31.1)	33 (44.6)	12 (16.2)	2 (2.7)	
Pacific	10 (6.2)	59 (36.4)	54 (33.3)	28 (17.3)	11 (6.8)	
Current AD severity						
Clear	1 (4.4)	10 (43.5)	8 (34.8)	3 (13.0)	1 (4.4)	<0.0001
Mild	24 (11.7)	92 (44.7)	60 (29.1)	29 (14.1)	1 (0.5)	
Moderate	23 (5.0)	138 (30.1)	213 (46.5)	75 (16.4)	9 (2.0)	
Severe	10 (3.9)	34 (13.2)	98 (38.0)	91 (35.3)	25 (9.7)	
Current AD control						
Minimally controlled	12 (5.4)	47 (21.0)	82 (36.6)	63 (28.1)	20 (8.9)	<0.0001
Somewhat controlled	15 (3.9)	117 (30.0)	171 (43.9)	79 (20.3)	8 (2.1)	
Moderately well controlled	20 (7.8)	83 (32.2)	103 (39.9)	46 (17.8)	6 (2.3)	
Very well controlled	11 (12.9)	32 (37.7)	28 (32.9)	12 (14.1)	2 (2.4)	
No. flare days in the past 30 d						
0	7 (18.9)	16 (43.2)	7 (18.9)	6 (16.2)	1 (2.7)	0.0001
1–3	19 (8.2)	86 (37.1)	78 (33.6)	43 (18.5)	6 (2.6)	
4–7	12 (6.5)	49 (26.5)	85 (46.0)	34 (18.4)	5 (2.7)	
8–10	9 (6.7)	41 (30.6)	54 (40.3)	27 (20.2)	3 (2.3)	
≥11	14 (3.7)	89 (23.6)	162 (43.0)	91 (24.1)	21 (5.6)	
Comorbidities						
Asthma	13 (3.9)	83 (24.9)	127 (38.0)	96 (28.7)	15 (4.5)	<0.0001
Allergic rhinitis	19 (3.9)	132 (27.1)	197 (40.4)	123 (25.2)	17 (3.5)	0.0007
Food allergy	10 (2.7)	89 (24.0)	152 (41.0)	96 (25.9)	24 (6.5)	<0.0001
Frequent/persistent skin infections	4 (2.2)	34 (18.3)	74 (39.8)	60 (32.3)	14 (7.5)	<0.0001
Anxiety and/or depression	14 (4.0)	85 (24.2)	148 (42.1)	89 (25.3)	16 (4.6)	0.003
HCP visits in the past year						
0	11 (12.1)	44 (48.4)	29 (31.9)	7 (7.7)	0 (0.0)	<0.0001
1–2	40 (10.1)	134 (33.7)	152 (38.2)	66 (16.6)	6 (1.5)	
3–4	6 (2.4)	68 (27.0)	115 (45.6)	52 (20.6)	11 (4.4)	
≥5	4 (1.8)	34 (15.3)	90 (40.4)	76 (34.1)	19 (8.5)	

AD, atopic dermatitis; HCP, health care provider; OOP, out-of-pocket; VA, veteran's administration.

predictors, and higher income was a negative predictor of impact on household finances. Previous studies have suggested that lower socioeconomic status, including lower household income, is associated with the development of more severe AD,<sup>29</sup> which itself is likely driven by health care barriers related to insurance status and race, including difficulties in obtaining specialist care (like dermatology) and prescription medication coverage.<sup>14,30,31</sup> The overall effect of low socioeconomic status goes well beyond the impact of OOP costs, as the presence of AD in this population contributes to considerable direct and indirect costs that are underestimated by current economic models and cost impact studies.<sup>32</sup> Further studies are needed to better understand and target this public health burden to increase access for AD patients. Health care providers must be especially mindful to engage in shared decision making to create a fiscally

sound and practical treatment plan rather than putting forward a 1-sided “ideal” strategy that may be challenging or even impossible for patients to implement.

Strengths of this study include a large, nationally representative sample of AD patients and caregivers who were directly queried about their real-world OOP expenses and household financial impact. The inclusion of several different measures of patient-reported burden (eg, severity, control, flare days), current treatments, number of HCP visits, and comorbid chronic diseases allowed for a detailed understanding of features associated with OOP costs and financial impact. The cross-sectional nature of this survey is an important limitation, as we were unable to assess changes in costs and impact over time. In addition, although selection bias is possible given that this Internet-based survey was

**TABLE 4. Predictors of Financial Impact**

Variables	Adjusted OR	P
Household income, \$		
≤24,999	1.00 (ref)	–
25,000–99,999	0.63 (0.44–0.90)	0.024
≥100,000	0.27 (0.18–0.41)	<0.0001
Current AD severity		
Clear	1.00 (ref)	–
Mild	0.85 (0.36–2.00)	0.704
Moderate	1.34 (0.58–3.08)	0.543
Severe	2.62 (1.11–6.19)	0.044
Asthma		
No	1.00 (ref)	–
Yes	1.42 (1.07–1.87)	0.026
HCP visits in the past year		
0	1.00 (ref)	–
1–2	1.36 (0.84–2.20)	0.258
3–4	1.71 (0.99–2.87)	0.058
≥5	2.80 (1.62–4.82)	0.0007
OOP co-pays and/or deductibles for HCP office visits in the past 30 d		
≤\$200	1.00 (ref)	–
>\$200	2.16 (1.45–3.22)	0.0006
Annual OOP expenses		
≤\$1000	1.00 (ref)	–
>\$1000	4.56 (3.31–6.27)	<0.0001

AD, atopic dermatitis; HCP, health care provider; OOP, out-of-pocket; OR, odds ratio.

completed by members of the NEA and not the overall US population, the respondent demographics indicate sufficient variety in disease severity, geographic setting, household income, and insurance status. Although self-report of expenses may not be as accurate as a claim-based database, survey data collected directly from patients and caregivers provide a more accurate representation of individual considerations regarding disease severity and household finances. Diagnosis of AD by self-report has been previously validated for similar types of surveys.<sup>33,34</sup> Additional studies are needed to confirm these findings and better understand longitudinal associations of OOP expenditures in relation to the real-world, dynamic disease course of AD. Future analyses of financial burden should incorporate additional PROs to better understand predictors of cost and their impact on household finances, especially among those with socioeconomic and racial disparities.

In conclusion, OOP health care expenses related to AD are associated with increasing disease severity and significantly impact the household finances of patients and caregivers. Additional studies are needed to better understand longitudinal associations with cost and lessen this financial impact while striving to attain short- and long-term disease control.

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