

# Impact of Female Acne on Patterns of Health Care Resource Utilization

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## ABSTRACT

**Background:** Limited data are available on acne treatment patterns in females through their adult years.

**Objective:** The purpose of this analysis was to evaluate health care resource utilization (HRU) and treatment patterns in cohorts with and without the use of acne medication and predictors of use.

**Methods:** A cross-sectional, web-based survey was administered to US females (25–45 years) with facial acne ( $\geq 25$  visible lesions). Data collected included: sociodemographics and self-reported clinical characteristics, acne treatments, and health care professional (HCP) visits. Subject characteristics associated with medication use were examined by logistic regression.

**Results:** Approximately half of the total sample (N=208, mean age: 35 $\pm$ 6) ever visited an HCP for acne and reported more over-the-counter (OTC) medication use (51.0%) than prescription (Rx) medication use (15.4%). Subjects did not use medications daily, averaging from 12–18 days over the previous 4 weeks. Logistic regression showed that race and prior HCP visits for acne were significant predictors of medication use ( $P < .05$ ).

**Conclusions:** Adult females generally self-treated their acne using primarily OTC medications; however, poor compliance was observed for Rx and OTC. Race and prior HCP visits for acne were significant predictors of current medication use.

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## INTRODUCTION

Acne vulgaris (acne) has typically been regarded as an adolescent condition, but is also common among adults ( $\approx 22\%$  females;  $\approx 3\%$  males).<sup>1-4</sup> Despite the high prevalence of adult female acne (AFA), limited research has investigated the clinical presentation, treatment management, and health care resource utilization (HRU) for the condition.

Acne treatments are recommended based on acne severity, disease duration, treatment response, predisposition to scarring and post-inflammatory hyperpigmentation (PIH), patient preference, adherence, and cost.<sup>5,6</sup> Based on American Academy of Dermatology guidelines,<sup>7</sup> topical therapy is standard of care in acne treatment. First line topical therapies include retinoids, antibiotics, and benzoyl peroxide (BP).<sup>6,7</sup> Existing treatment paradigms combine standard, adjunctive, and cosmetic therapies to achieve optimal clinical outcomes, but are not specific to AFA. Consequently, a standardized, evidence-based algorithm is needed to manage the diverse and personalized treatment approach with females in their adult years.<sup>5,8</sup>

Despite the high prevalence of AFA and known morphological differences between adolescents and adults, limited data are available on HRU specific to females through their adult years,

emphasizing the need for additional research. The primary objective of this study was to evaluate the impact of facial acne on patterns of HRU in females through their adult years to better understand standard of care management and increase awareness of unmet needs.

## METHODS

### Study Design

This cross-sectional, web-based, observational survey was conducted in the US in October-November 2011. The survey screened for subject-reported signs consistent with acne and captured data on sociodemographic, clinical characteristics, and HRU. The study was approved by Ethical & Independent Review Services. Additional details on study design and methodology are described elsewhere.<sup>9,10</sup>

### Study Population: Recruitment and Screening

All subjects were recruited through the YouGov Panel (Palo Alto, CA) from a US pool of registered panelists  $\geq 18$  years of age. Eligible panelists were females ages 25-45 years; had an active e-mail address at the time of study invitation; able to read and understand English; had presence of self-reported acne ( $\geq 25$  visible facial lesions); and fulfilled age and/or race/ethnicity sampling targets.

## Study Variables

Sociodemographic, clinical characteristics, and HRU were collected. Subjects reported number of health care professional (HCP) visits (including dermatologists, primary care physicians (PCP), nurse practitioners (NP)/physician assistants (PA), and pharmacists) for acne in the past 3 months. Additionally, acne medication use (prescription [Rx] and over-the-counter [OTC], based on currently available medication classes) over the past 4 weeks and average monthly number and spending on OTC acne products were collected.

## Statistical Analyses

Descriptive statistics summarized HRU in the total sample, and stratified by No Medication Use or Medication Use (Rx and/or OTC) cohorts. Medication Use cohorts were compared using independent-groups *t* tests (continuous variables) or chi-square tests (categorical responses). Bivariate analyses identified subject characteristics that were potential predictors of medication use through logistic regression.

## RESULTS

### Sample Characteristics

A total of 7245 female panelists were invited to the survey, of whom 3702 responded to the e-mail invitation, provided consent, and completed screening, and 208 were eligible and completed the survey. The final sample comprised 51.9% 25–35 year-olds and 51.4% white/Caucasian subjects.

### Sociodemographics

Sociodemographic characteristics are presented in Table 1. Average age was 35.4 years (SD=5.8). Approximately half (51.9%) were overweight or obese (Body Mass Index, BMI  $\geq$ 25.0). Over half (56.8%) reported annual household income  $\leq$ \$50,000. Over 80% had health insurance and 77.9% had prescription drug coverage. When comparing acne medication use by race/ethnicity (Table 2), more whites used medications (66.4%) than non-white subjects (47.5%) ( $P<.05$ ).

### Acne History: Self-reported Clinical Characteristics

Subject-reported acne characteristics are shown in Table 3. Mean age of acne onset was 15.9 years (SD=6.6). Facial acne presented most prominently on the cheeks (79.8%), chin (77.9%), and forehead (77.4%). Almost all (>90%) experienced at least some erythema (“redness”) from facial acne in the past 4 weeks; over half (68.8%) described their erythema as moderate to extensive. Nearly two-thirds had moderate to extensive scarring (63.0%) or PIH (“dark marks”; 62.0%) in the past 4 weeks. (Note: “dark mark” defined as skin discoloration from a healed lesion; scar defined as raised or indented skin from a healed lesion).

### Acne History: HRU

HCP visits are summarized in Table 4. Half of subjects (49.5%) had ever visited an HCP for acne. The most common reason

for HCP consultation was frustration with efficacy (lack of acne clearing) with previous treatments. Financial burden was the most common reason for not seeking medical care.

### HRU in the Past Three Months

A small percentage (33/208, 15.9%) of subjects had recently visited an HCP for acne treatment. Of those, most saw a dermatologist (72.7%) or PCP (54.5%), with fewer subjects consulting a pharmacist (33.3%) or NP/PA (27.3%). Subjects had approximately 2 acne-related visits for each type of HCP. During the same period, nearly two-thirds (136/208, 65.4%) had used a treatment or procedure for acne. Among those who treated their acne ( $n=136$ ), the most frequent approaches were behavioral changes (eg, diet, sleep habits) (43.4%), homeopathic medications (eg, vitamins, supplements) (30.9%), and cosmetic procedures (eg, facials, microdermabrasion) (19.1%).

### Rx and OTC Acne Medication Use

In the previous 4 weeks, more subjects treated their acne with OTC (106/208, 51.0%) than Rx medications (32/208, 15.4%). Among Rx medication users, 81.3% (26/32) used topical and 50.0% (16/32) used oral treatments. Of topical Rx users ( $n=26$ ), retinoids (57.7%) and antibiotics (42.3%) were most commonly reported (Figure 1a). Oral antibiotics (13/16, 81.3%) were most frequently used among oral Rx users (Figure 2a). Among OTC medication users, almost all (104/106, 98.1%) used topical treatments; oral OTC treatments were relatively rare (16/106, 15.1%). Of topical OTC product users ( $n=104$ ), salicylic acid (SA) (75.0%), BP (69.2%), and BP/SA combinations (39.4%) were most commonly reported (Figure 1b). Subjects used an average of two OTC medications (SD=2.1) per month to treat acne, PIH, or scars and spent \$26.20 (SD=\$42.40) per month on OTC products.

Among Rx users, average use in the past 4 weeks was 18 days (SD=11.4) for topical antibiotics, 14 days (SD=10.5) for retinoids, and 12 days (SD=10.7) for oral antibiotics. Similarly, OTC topical medications were not used daily; BP was used on average 17 days (SD=8.8), SA used 15 days (SD=9.0), and BP/SA used 14 days (SD=8.8) in the past 4 weeks.

### Relationships Between Acne Medication Use, HRU, and Acne Characteristics

Over half the sample (119/208) had reported recent use of an acne medication, primarily OTC. No significant sociodemographic differences were identified between the No Medication Use and Medication Use cohorts. Overall, significantly fewer (28.1%) subjects in the No Medication Use cohort had  $\geq$ 1 HCP visit for acne than the Medication Use cohort (65.5%) ( $P<.0001$ ). Among those who visited an HCP, 52.0% (13/25) and 75.6% (59/78) were for adult-onset acne in the No Medication Use and Medication Use cohorts, respectively. The most common reason for not consulting an HCP was financial burden (Table 4).

**TABLE 1.**

<b>Sociodemographic Characteristics</b>				
<b>Variable/Characteristic</b>	<b>Total Sample (N=208)</b>	<b>No Medication Use (n=89)</b>	<b>Medication Use (Rx and/or OTC) (n=119)</b>	<b>p-value*</b>
<b>Age (years)</b>				0.3501
Mean (SD)	35.4 (5.8)	35.0 (5.7)	35.7(5.8)	
<b>Race/ethnicity (n, %)</b>				0.1329
White/Caucasian	107 (51.4%)	36 (40.4%)	71 (59.7%)	
Black/African American	51 (24.5%)	27 (30.3%)	24 (20.2%)	
Asian	16 (7.7%)	9 (10.1%)	7 (5.9%)	
Hispanic/Latino	23 (11.1%)	13 (14.6%)	10 (8.4%)	
American Indian/Alaska Native	4 (1.9%)	2 (2.2%)	2 (1.7%)	
Native Hawaiian/Pacific Islander	1 (0.5%)	0 (0.0%)	1 (0.8%)	
Other	6 (2.9%)	2 (2.2%)	4 (3.4%)	
<b>Employment status (n, %)</b>				0.1572
Employed, full-time	84 (40.4%)	31 (34.8%)	53 (44.6%)	
Employed, part-time	23 (11.1%)	10 (11.2%)	13 (10.9%)	
Unemployed	94 (45.2%)	44 (49.4%)	50 (42.0%)	
Other	5 (2.4%)	2 (2.3%)	3 (2.5%)	
Prefer not to answer	2 (1.0%)	2 (2.3%)	0 (0.0%)	
<b>Education (n, %)</b>				0.0357
<High school diploma	8 (3.8%)	8 (9.0%)	0 (0.0%)	
High school graduate	31 (14.9%)	15 (16.9%)	16 (13.5%)	
>High school diploma	168 (80.8%)	66 (74.1%)	102 (85.7%)	
Prefer not to answer	1 (0.5%)	0 (0.0%)	1 (0.8%)	
<b>Total annual household income (n, %)</b>				0.3657
\$0-\$20,000	43 (20.7%)	22 (24.7%)	21 (17.7%)	
\$20,001-\$50,000	75 (36.1%)	37 (41.6%)	38 (31.9%)	
\$50,001-\$100,000	64 (30.8%)	21 (23.6%)	43 (36.1%)	
≥\$100,001	21 (10.1%)	7 (7.9%)	14 (11.8%)	
Prefer not to answer	5 (2.4%)	2 (2.2%)	3 (2.5%)	
<b>BMI categories (n, %)</b>				0.5379
Underweight (<18.5)	7 (3.4%)	3 (3.4%)	4 (3.4%)	
Normal (18.5-24.9)	75 (36.1%)	30 (33.7%)	45 (37.8%)	
Overweight (25.0-29.9)	42 (20.2%)	16 (18.0%)	26 (21.8%)	
Obese (≥30.0)	66 (31.7%)	29 (32.6%)	37 (31.1%)	
Missing	18 (8.7%)	11 (12.4%)	7 (5.9%)	
<b>Insurance type (n, %)</b>				0.6925
Employer-provided	94 (45.2%)	36 (40.4%)	58 (48.7%)	
Government-provided	58 (27.9%)	27 (30.3%)	31 (26.1%)	
Private	18 (8.7%)	8 (9.0%)	10 (8.4%)	
No Insurance	38 (18.3%)	18 (20.2%)	20 (16.8%)	
<b>Prescription drug coverage (n, %)</b>				0.9147
No	46 (22.1%)	20 (22.5%)	26 (21.8%)	
Yes	162 (77.9%)	69 (77.5%)	93 (78.2%)	

BMI, body mass index; Rx, prescription; SD, standard deviation.

\*† test of mean score (continuous variables) or chi-square test (categorical responses) by medication use, based on comparison between No Medication Use and Medication Use groups.

Some differences were identified in acne characteristics. For facial acne location, the No Medication Use cohort had lower frequencies of forehead (70.8% vs. 82.4%,  $P<.05$ ) and hairline acne (37.1% vs. 55.5%,  $P<.05$ ) than the Medication Use cohort.

Most subjects (62.9% [No Medication Use] vs. 82.3% [Medication Use]) reported on average 25–75 visible, facial lesions over the past 4 weeks (Table 3). Facial acne troubled both cohorts, however the No Medication Use cohort reported be-

**TABLE 2.**

<b>Medication Use by Race/Ethnicity</b>			
Variable/Characteristic	Total Sample (N=208)	No Medication Use (n=89)	Medication Use (Rx and/or OTC) (n=119)
<b>Race/ethnicity (n, %)</b>			
White/Caucasian	107 (100%)	36 (33.6%)	71 (66.4%)
Non-white	101 (100%)	53 (52.5%)	48 (47.5%)
Black/African American		27 (52.9%)	24 (47.1%)
Asian		9 (56.3%)	7 (43.8%)
Hispanic/Latino		13 (56.5%)	10 (43.5%)
American Indian/Alaska Native		2 (50.0%)	2 (50.0%)
Native Hawaiian/Pacific Islander		0 (0.0%)	1 (100.0%)
Other		2 (33.3%)	4 (66.7%)

OTC, over-the-counter; Rx, prescription.

**TABLE 3.**

<b>Acne Characteristics</b>				
Variable/Characteristic	Total Sample (N=208)	No Medication Use (n=89)	Medication Use (Rx and/or OTC) (n=119)	p-value <sup>a</sup>
<b>Age when acne started (years)</b>				0.9805
Mean (SD)	15.9 (6.6)	15.9 (7.2)	15.9 (6.2)	
<b>Age when acne started (years), for adult onset acne (age ≥18 years)<sup>a</sup></b>				0.4691
N	51	26	25	
Mean (SD)	25.5 (6.2)	24.9 (6.6)	26.2 (5.9)	
<b>Facial acne on average over the last 4 weeks (n, %)</b>				0.0183
0–24 visible pimples	49 (23.6%)	30 (33.7%)	19 (16.0%)	
25–49 visible pimples	133 (63.9%)	48 (53.9%)	85 (71.4%)	
50–75 visible pimples	21 (10.1%)	8 (9.0%)	13 (10.9%)	
>75 visible pimples	5 (2.4%)	3 (3.4%)	2 (1.7%)	
<b>Facial acne location (n, %)<sup>b</sup></b>				
Chin	162 (77.9%)	64 (71.9%)	98 (82.4%)	0.0726
Cheeks	166 (79.8%)	68 (76.4%)	98 (82.4%)	0.2903
Forehead	161 (77.4%)	63 (70.8%)	98 (82.4%)	0.0484
Hairline	99 (47.6%)	33 (37.1%)	66 (55.5%)	0.0086
Jawline	128 (61.5%)	50 (56.2%)	78 (65.5%)	0.1695
Nose	104 (50.0%)	41 (46.1%)	63 (52.9%)	0.3266
<b>Where on your face do you most often experience acne (n, %)</b>				0.1338
Chin	42 (20.2%)	14 (15.7%)	28 (23.5%)	
Cheeks	92 (44.2%)	46 (51.7%)	46 (38.7%)	
Forehead	32 (15.4%)	14 (15.7%)	18 (15.1%)	
Hairline	4 (1.9%)	1 (1.1%)	3 (2.5%)	
Jawline	19 (9.1%)	4 (4.5%)	15 (12.6%)	
Nose	19 (9.1%)	10 (11.2%)	9 (7.6%)	
<b>What bothers or concerns you most about your acne (n, %)</b>				0.0006
Actual pimples	34 (16.3%)	10 (11.2%)	24 (20.2%)	
Dark marks	16 (7.7%)	9 (10.1%)	7 (5.9%)	
Both pimples and dark marks	138 (66.3%)	53 (59.6%)	85 (71.4%)	
Not bothered/concerned about my acne	3 (1.4%)	3 (3.4%)	0 (0.0%)	
Not asked	17 (8.2%)	14 (15.7%)	3 (2.5%)	
<b>Redness from facial acne in the past 4 weeks (n, %)</b>				0.0156
None	18 (8.7%)	14 (15.7%)	4 (3.4%)	
Some	47 (22.6%)	17 (19.1%)	30 (25.2%)	
A moderate amount	79 (38.0%)	28 (31.5%)	51 (42.9%)	
A lot	54 (26.0%)	26 (29.2%)	28 (23.5%)	
Extensive	10 (4.8%)	4 (4.5%)	6 (5.0%)	

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Variable/Characteristic	Total Sample (N=208)	No Medication Use (n=89)	Medication Use (Rx and/or OTC) (n=119)	p-value <sup>a</sup>
<b>Scarring from facial acne in the past 4 weeks (n, %)</b>				0.1452
None	24 (11.5%)	16 (18.0%)	8 (6.7%)	
Some	53 (25.5%)	21 (23.6%)	32 (26.9%)	
A moderate amount	63 (30.3%)	23 (25.8%)	40 (33.6%)	
A lot	56 (26.9%)	24 (27.0%)	32 (26.9%)	
Extensive	12 (5.8%)	5 (5.6%)	7 (5.9%)	
<b>Dark marks from facial acne in the past 4 weeks (n, %)</b>				0.0581
None	22 (10.6%)	15 (16.9%)	7 (5.9%)	
Some	57 (27.4%)	18 (20.2%)	39 (32.8%)	
A moderate amount	55 (26.4%)	23 (25.8%)	32 (26.9%)	
A lot	56 (26.9%)	24 (27.0%)	32 (26.9%)	
Extensive	18 (8.7%)	9 (10.1%)	9 (7.6%)	

OTC, Over-the-counter; Rx, prescription; SD, standard deviation.

\**t* test of mean score (continuous variables) or chi-square test (categorical responses) by medication use, based on comparison between No Medication Use and Medication Use groups.

<sup>†</sup>Responses not mutually exclusive

**TABLE 4.**

#### Health Care Professional Visits

Variable/Characteristic	Total Sample (N=208)	No Medication Use (n=89)	Medication Use (Rx and/or OTC) (n=119)	p-value <sup>a</sup>
<b>Ever visited an HCP for acne (n, %)</b>				<0.0001
No	105 (50.5%)	64 (71.9%)	41 (34.5%)	
Yes	103 (49.5%)	25 (28.1%)	78 (65.5%)	
<b>Common reasons for consulting an HCP about acne (n, %)<sup>†</sup></b>				<0.0001
Frustrated with lack of acne clearing with previous acne treatments	81 (38.9%)	14 (15.7%)	67 (56.3%)	
Frustrated with side effects and/or irritation from previous acne treatments	35 (16.8%)	6 (6.7%)	29 (24.4%)	
Getting ready for a big event and I want to look my best	19 (9.1%)	4 (4.5%)	15 (12.6%)	
Friend/loved one told me that my skin looked bad	30 (14.4%)	10 (11.2%)	20 (16.8%)	
Friend/loved one went to a dermatologist and her/his skin looks better	14 (6.7%)	4 (4.5%)	10 (8.4%)	
Read some information online	12 (5.8%)	3 (3.4%)	9 (7.6%)	
Heard about an Rx treatment that I want to try	14 (6.7%)	4 (4.5%)	10 (8.4%)	
Other	12 (5.8%)	6 (6.7%)	6 (5.0%)	
<b>Common reasons for not consulting an HCP for acne (n, %)<sup>†</sup></b>				<0.0001
Acne isn't serious enough to see a doctor	23 (11.1%)	14 (15.7%)	9 (7.6%)	
Not made an appointment yet	21 (10.1%)	14 (15.7%)	7 (5.9%)	
Don't have money to pay for the appointment	37 (17.8%)	17 (19.1%)	20 (16.8%)	
Satisfied with OTC treatments available	17 (8.2%)	8 (9.0%)	9 (7.6%)	
Have an appointment scheduled	2 (1.0%)	1 (1.1%)	1 (0.8%)	
Insurance coverage has changed	9 (4.3%)	4 (4.5%)	5 (4.2%)	
Other	22 (10.6%)	17 (19.1%)	5 (4.2%)	

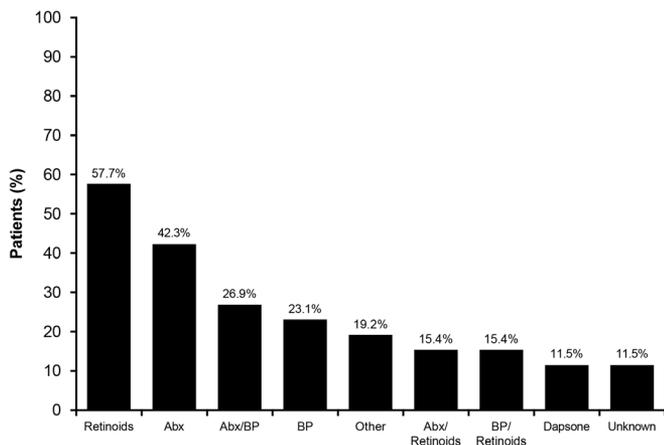
HCP, health care professional; OTC, over-the-counter; Rx, prescription.

\**t* test of mean score (continuous variables) or chi-square test (categorical responses) by medication use, based on comparison between No Medication Use and Medication Use groups.

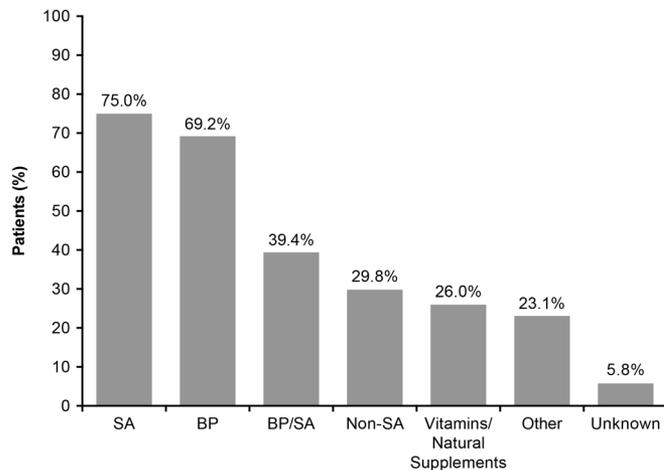
<sup>†</sup>Responses not mutually exclusive.

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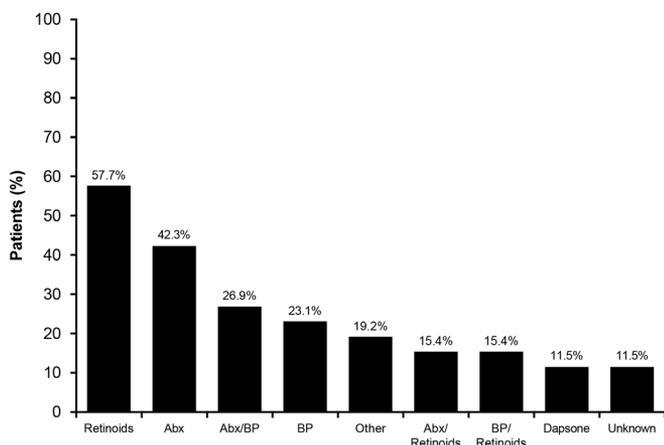
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**FIGURE 1.** Topical acne medication use in past 4 weeks by [A] prescription medications and [B] over-the-counter medications.**1a)**

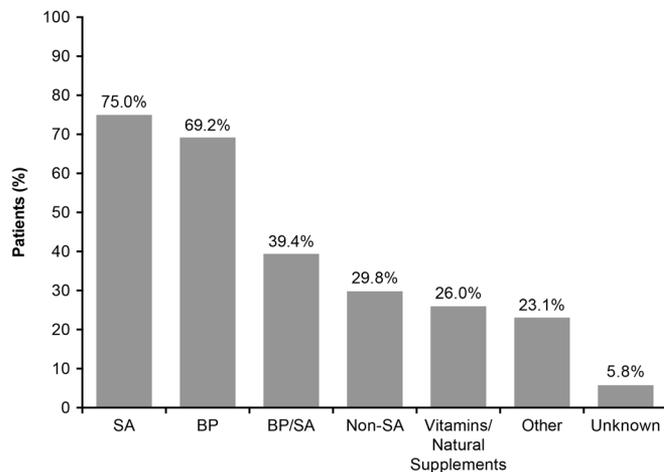
1a) n=26; responses not mutually exclusive.  
Abx, antibiotics; BP, benzoyl peroxide.

**1b)**

1B) n=104; responses not mutually exclusive.  
BP, benzoyl peroxide; SA, salicylic acid.

**FIGURE 2.** Oral acne medication use in past 4 weeks by [A] prescription medications and [B] over-the-counter medications.**2a)**

2a) n=16; responses not mutually exclusive.  
Abx, antibiotics.

**2b)**

2B) n=16; responses not mutually exclusive.

ing less troubled than the Medication Use cohort (65.2% vs. 95.8%,  $P<.0001$ ). The Medication Use cohort more often used makeup to cope with acne (68.9% vs. 43.8%,  $P<.001$ ) and followed a strict skin-cleaning routine (50.4% vs. 29.2%,  $P<.01$ ) than the No Medication Use cohort.

Subject characteristics and prior HCP visit associated with medication use were evaluated (Table 5). The final multivariate analysis indicated that race ( $P<.05$ ) and any prior HCP visit for acne ( $P<.0001$ ) were significant predictors of medication use, beyond other subject characteristics. White subjects were twice as likely to be using medication than non-white subjects (odds ratio [OR]=2.1,

95% confidence interval [CI]=1.1–4.0). In addition, subjects with  $\geq 1$  HCP visit for acne were five times as likely to be using medication than those with no history of HCP visit (OR=5.4, 95% CI=2.8–10.7).

## DISCUSSION

Acne affects approximately 45 million people in the US<sup>11</sup> and adult acne prevalence is increasing, especially in adult females.<sup>2</sup> Previous studies have evaluated HRU in acne<sup>4,12,13</sup>; however, limited data are available on HRU for females through their adult years. This was the first cross-sectional, web-based study collecting detailed subject-level information on HCP visits and acne medication use in adult females.

TABLE 5.

## Sociodemographic and Clinical Characteristics Predicting Acne Medication Use

Variable	Logistic Regression Models for Acne Medication Use					
	Univariate Models		Full Multivariate Model (All Parameters Included)		Reduced Multivariate Model	
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value
<b>Sociodemographic characteristics</b>						
Age (years)	1.01 (0.96-1.06)	0.7945	1.03 (0.97-1.10)	0.3795	1.01 (0.95-1.07)	0.8107
Race (ref: non-white)						
<i>White vs. non-white</i>	2.18 (1.20-3.95)	0.0105*	2.88 (1.24-6.68)	0.0140*	2.06 (1.07-3.96)	0.0312*
Total annual household Income (ref: ≤\$50,000)						
<i>&gt;\$50,000 vs. ≤\$50,000</i>	2.25 (1.22-4.14)	0.0095*	1.44 (0.66-3.18)	0.3627	1.50 (0.76-2.98)	0.2428
Health insurance coverage (ref: no)						
<i>Yes vs. no</i>	1.15 (0.54-2.49)	0.7149	3.37 (0.53-21.46)	0.1980	--	--
Prescription drug coverage (ref: no)						
<i>Yes vs. no</i>	1.01 (0.49-2.07)	0.9811	0.21 (0.04-1.25)	0.0867	--	--
Education (ref: >high school graduate)						
<i>≤High school graduate vs. &gt;high school graduate</i>	0.51 (0.24-1.07)	0.0758	0.57 (0.22-1.52)	0.2605	--	--
<b>Sociodemographic characteristics</b>						
Ever visited an HCP for acne (ref: no)						
<i>Yes vs. no</i>	6.00 (3.13-11.49)	<0.0001*	6.60 (3.12-13.99)	<0.0001*	5.43 (2.77-10.66)	<0.0001*
BMI categories (ref: normal BMI)						
<i>BMI ≥25 (overweight/obese) vs. BMI&lt;25.0 (normal/underweight)</i>	0.96 (0.53-1.72)	0.8794	1.65 (0.78-3.50)	0.1890	--	--
Age when acne started (years)	1.00 (0.95-1.04)	0.8568	1.02 (0.96-1.08)	0.5728	--	--
Where on your face do you most often experience acne (ref: cheeks)						
<i>Chin vs. cheeks</i>	2.12 (0.93-4.84)	0.0753	1.20 (0.43-3.36)	0.7267	--	--
<i>Forehead vs. cheeks</i>	1.53 (0.64-3.61)	0.3377	1.27 (0.47-3.39)	0.6375	--	--
<i>Hairline vs. cheeks</i>	2.80 (0.28-27.96)	0.3816	3.36 (0.28-40.78)	0.3415	--	--
<i>Jawline vs. cheeks</i>	3.73 (0.98- 14.16)	0.0534	1.87 (0.40-8.79)	0.4287	--	--
<i>Nose vs. cheeks</i>	0.83 (0.29-2.35)	0.7233	0.31 (0.08-1.26)	0.1016	--	--
Acne severity in the past 4 weeks (ref: 50+visible lesions)						
<i>0-49 visible lesions vs. 50+ visible lesions (50-75)&gt;75 visible lesions)</i>	0.96 (0.41-2.27)	0.9253	1.39 (0.48-4.00)	0.5458	--	--
Model fit	Univariate model for HCP visit for acne		Full model		Reduced model	
N	186		186		186	
Wald chi-square test	χ <sup>2</sup> (1)=29.25, P<.0001		χ <sup>2</sup> (15)=36.91, P=.0013		χ <sup>2</sup> (4)=32.33, P<.0001	
R <sup>2</sup>	0.16		0.24		0.19	
Adjusted R <sup>2</sup>	0.22		0.32		0.26	

BMI, body mass index; CI, confidence interval; HCP, health care professional.

This study demonstrated a small proportion of subjects had recent HCP visits for acne treatment and self-treatment was predominantly utilized. As expected, those with prior HCP interaction were more likely to be current acne medication users. Among medication users with previous HCP interaction, most subjects treated acne with OTC rather than Rx medications. Evidence supports that many acne sufferers

seek treatment from both Rx and OTC medications. However, OTC medication use is on the rise due to convenience, lower cost, and difficulty of obtaining a dermatologist appointment. Despite these advantages, efficacy of many OTC medications are not well-supported by clinical studies, with a considerable absence of double/investigator-blind, randomized, vehicle-controlled studies.<sup>14</sup>

Topical retinoid use in this study (7.2%) was similar to the 2007 Medical Expenditure Panel Survey (MEPS), where 7.8% of adults used topical retinoid monotherapy.<sup>13</sup> Oral (28.6%) and topical antibiotic (11.9%) treatments were higher in MEPS than this study (6.3% oral; 5.3% topical antibiotics); however, MEPS rates reflected 2007 total annual use,<sup>13</sup> while the current study referenced Rx and OTC medications in the past 4 weeks. Therefore, lower rates observed may be partially attributable to the shorter time period evaluated.

In the Medication Use cohort (primarily OTC), subjects reported greater acne severity, forehead and hairline acne, and overall troublesomeness with acne. Due to the cross-sectional study design, the analysis is associative and causal relationships to medication use cannot be established. However, results demonstrate that both Rx and OTC acne medications were used with less than daily applications. Lack of daily use and suboptimal treatment durations could significantly limit efficacy.<sup>15</sup> Low compliance observed for Rx and OTC acne medications may also contribute to limited acne clearing.

Significant predictors of medication use were race/ethnicity and any prior HCP visit for acne. Whites were more likely to be using medication than non-white subjects, which could relate to aspects of medical care beyond race/ethnicity: acne severity, prescribing and/or filling patterns, and behavioral/cultural factors.<sup>16,17</sup> Income, insurance/drug coverage status, and education were not significant factors, beyond the contribution of other characteristics. As expected, subjects with any previous HCP visit for acne were more likely to use either an Rx or OTC medication than those with no history of HCP visit.

Among non-medication users, financial burden was the most common reason reported for not seeing an HCP, despite over half reporting 25–75 visible, facial lesions. This cost barrier may help to explain why even OTC medication was not utilized in this group.

This study was unique in focusing on an acne subpopulation that has not been studied extensively, allowing for a more critical appraisal of HRU and medication use (OTC and Rx) in standard practice. This approach accessed a large pool of US panelists and allowed for stratified recruitment of a diverse sample of females who may be less likely to seek medical care.

This study was not without limitations. Clinical and HRU data were based on subjects' self-report and may differ from clinical assessments by an HCP and be subject to recall bias. Exclusion of milder cases of acne may limit generalizability of conclusions about HRU in the overall population of adult females. Overall limitations of the survey are described elsewhere.<sup>9,10</sup>

In conclusion, approximately 16% of females in this study had recent HCP visits for acne, 65% of whom used some type of

acne treatment. Generally, adult females self-treated their acne using OTC medications. Despite this, poor compliance was self-reported with both Rx and OTC medication use. Race and HCP visit were significant predictors of medication use. This pattern of HRU suggests further patient education on benefits of professional care and Rx medications is warranted. Informing clinicians on the treatment behavior and patterns in adult females may help guide recommendations for improving care.

## DISCLOSURES

This study was sponsored by Allergan Inc., Irvine, CA, USA. The sponsor and coauthors were involved in the study design, statistical analysis, and interpretation of results. The authors had full access to data and were involved in critical review and editing of the manuscript. All authors provided approval prior to submission. Dr. Baldwin has received honoraria from Allergan, Galderma, Glaxo SmithKline, Onset, L'Oreal, Merz, Ranbaxy, and Valeant and has performed clinical research for Galderma and SkinCeuticals. Dr. Daniels is an employee of Allergan, Inc. Drs. Kawata and Wilcox are employees of Evidera. Dr. Burk serves as a consultant for Allergan, Inc. Dr. Tanghetti has received research grants from DUSA Pharmaceuticals; has received honoraria from Allergan, Inc., Galderma, and DUSA; and has consultancy agreements with Allergan, Inc., Merz, Galderma, and DUSA.

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