Barriers to the Use of Sunscreen in Rural Communities

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Skin Cancer Types:
• Actinic keratoses
• Squamous cell carcinoma
• Basal cell carcinoma
• Melanoma

Background

Sunscreen is said to be one of the most effective preventative measures against skin cancer (melanoma & non-melanoma), photoaging and hyperpigmentation/ melasma.
What is... skin cancer
Cancer of the melanocytes, squamous or basal cells*
3rd most common type of skin cancer, beginning in the melanocytes. Tends to spread and have a higher mortality*

Cancer begins in basal or squamous cells; curable and most common types*

non-melanoma

photoaging
Damages like wrinkles, fine lines and extra pigmentation that is caused by exposure to sunlight/UV rays**

When patches of skin become darker than the surrounding skin. More common in people of color***

hyperpigmentation

Another name for hyperpigmentation, often used in with hyperpigmentation caused during pregnancy

*CDC: What Is Skin Cancer **Skin Cancer Foundation: Photoaging ***AOCD: Hyperpigmentation
UV rays alter DNA, causing abnormal cell development.

Sunscreen blocks UV rays, either physically or chemically.
## Breakdown of Sunscreen Effectiveness

<table>
<thead>
<tr>
<th>Effective</th>
<th>Effectiveness Questionable</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Actinic keratoses (^{(1, 2)})</td>
<td>- Basal cell carcinoma (^{(1, 2)})</td>
</tr>
<tr>
<td>- Squamous cell carcinoma (^{(1, 2)})</td>
<td></td>
</tr>
<tr>
<td>- Photoaging (^{(3)})</td>
<td>- Melanoma (^{(1, 8)})</td>
</tr>
<tr>
<td>- Hyperpigmentation (^{(4, 5)})</td>
<td></td>
</tr>
<tr>
<td>- Melasma (^{(4, 5, 6)})</td>
<td></td>
</tr>
</tbody>
</table>
Known Barriers To Use

**General**
- Cost \(^{(7)}\)
- Time constraints \(^{(7)}\)
- Dislike of “feel” or “appearance” \(^{(7)}\)

**Rural Communities**
- Forgetfulness \(^{(10, 11)}\)
- Lifestyle \(^{(12)}\)
- Generally inconvenient \(^{(10)}\)
- Desires to tan \(^{(10)}\)
- Never considered wearing it \(^{(10)}\)

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**Top Reasons for Not Wearing Sunscreen**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Total</th>
<th>Women (%)</th>
<th>Men (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t think I’m exposed to the sun enough</td>
<td>56%</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>My skin doesn’t burn easily</td>
<td>25%</td>
<td>22%</td>
<td>27%</td>
</tr>
<tr>
<td>I don’t like how it feels on my skin</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>I’m too busy</td>
<td>5%</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>I want to but forget</td>
<td>13%</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>It’s too expensive</td>
<td>7%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>I can’t find a product that I like</td>
<td>4%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>It interferes with my skincare or makeup routine</td>
<td>2%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
<td>11%</td>
<td>9%</td>
</tr>
</tbody>
</table>

*Source: RealSelf.com, 2019 RealSelf Sun Safety Report*
An assessment of factors affecting sunscreen use and barriers to compliance done via cross-sectional survey

Results:
Use is related to:
- higher income ($p < .001$),
- lower Fitzpatrick skin type ($p < .001$),
- higher education level ($p = .002$),
- younger age ($p = .0262$),
- history of melanoma ($p = 0$)
- female gender ($p = .045$)

... This all holds true in rural populations$^{(10)}$\[10\]
An online health screening survey collected data from a nonprobability sample of Texas residents in 2018. Data were weighted by sex, age, race, and ethnicity. Multinomial multivariable logistic regression and weighted Pearson’s $\chi^2$ test were used for analysis.

When compared to urban counterparts...
Rural Persons were less likely to:
- seek shade ($p = .004$)
- use sunscreen ($p = .013$)

More likely to:
- use higher levels of SPF sunscreen ($p = .002$)
- have had blistering sunburns ($p < .001$)
The Problem

~56% in a survey of 1000 wore sunscreen once a year or less

Regionally, West & South wear the least

Men wear less than women but re-apply more often

People who don’t believe they need it, wear less

*13
Why don’t we wear sunscreen?
What variables does it depend on?

To find out if there is a difference in barriers to use depending on several variables. Most notably, a difference between rural and urban populations which has not been examined in depth.
Methods

- Anonymous survey utilizing Google Forms
- Demographic questions
- Incentivization through tailored sunscreen suggestions
- Self-identified barriers using Likert and Top 2
## Literature Search
- Logic-focused search methodology to narrow question focus
- Michigan State University (MSU) Libraries as database

## Statistical Analysis
- Unpaired t-testing
- One- and two-way ANOVA
- Spreadsheet for data tabulation
- $P<.05$ = significant

## Data analyzed
- In Entirety
- Rural versus Urban
- People of Color versus White People

### Methods Cnt.

<table>
<thead>
<tr>
<th>Concept 1</th>
<th>Concept 2</th>
<th>Concept 3</th>
<th>Concept 4</th>
<th>Concept 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use</td>
<td>Sunscreen</td>
<td>Hyperpigmentation</td>
<td>Skin Cancer</td>
<td>Communities of Color</td>
</tr>
<tr>
<td>Application</td>
<td>Sunblock</td>
<td>Melasma</td>
<td>Melanoma</td>
<td>People of Color</td>
</tr>
<tr>
<td>Treatment</td>
<td>Sun Cream</td>
<td>Dyschromia</td>
<td>Non-Melanoma</td>
<td>Black Communities</td>
</tr>
<tr>
<td></td>
<td>Suntan Lotion</td>
<td>OR</td>
<td>OR</td>
<td>BIPOC</td>
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<td></td>
<td></td>
<td>OR</td>
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Methods Cnt.

Survey Creation & Acknowledgement

MSU IRB exempt survey

Data collected May-August 2021

Incentive for participation:

- Personalized sunscreen recommendations based on conditional logic of participant’s self-reported barriers to use.
- Sunscreen recommendations created with assistance from Kurt Ashack, MD, a board-certified dermatologist

Exclusion Criteria:

- Under 18
Skin Concerns was rated significantly higher as a barrier than most other barriers ($p<0.05$).

Judgement, Attainability, and Skin Congruity were rated significantly less of a barrier ($p<0.05$) than other options.
## Results

### Rural vs Urban Likert Scale Unpaired T-Test Results

<table>
<thead>
<tr>
<th>Barrier to Sunscreen Use Rural vs. Urban</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
<th>t</th>
<th>SED</th>
<th>CI</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>3.79 vs 3.52</td>
<td>1.22 vs 1.18</td>
<td>0.16 vs 0.12</td>
<td>1.3037</td>
<td>0.202</td>
<td>(-0.14, 0.66)</td>
<td>0.1944</td>
</tr>
<tr>
<td>Hassle</td>
<td>3.36 vs 3.04</td>
<td>1.51 vs 1.34</td>
<td>0.2 vs 0.14</td>
<td>1.3161</td>
<td>0.238</td>
<td>(-0.16, 0.78)</td>
<td>0.1902</td>
</tr>
<tr>
<td>Skin tone congruity</td>
<td>4.57 vs 4.22</td>
<td>1.13 vs 1.11</td>
<td>0.15 vs 0.12</td>
<td>1.8741</td>
<td>0.189</td>
<td>(-0.02, 0.78)</td>
<td>0.0629</td>
</tr>
<tr>
<td>Routine Compatibility</td>
<td>3.64 vs 3.35</td>
<td>1.51 vs 1.50</td>
<td>0.20 vs 0.16</td>
<td>1.1583</td>
<td>0.255</td>
<td>(-0.21, 0.80)</td>
<td>0.2486</td>
</tr>
<tr>
<td>Lack of Knowledge</td>
<td>3.00 vs 3.39</td>
<td>1.01 vs 1.38</td>
<td>0.13 vs 0.14</td>
<td>1.8398</td>
<td>0.213</td>
<td>(-0.81, 0.03)</td>
<td>0.0678</td>
</tr>
<tr>
<td>Skin Concerns</td>
<td>3.00 vs 3.13</td>
<td>1.43 vs 1.43</td>
<td>0.19 vs 0.15</td>
<td>0.5383</td>
<td>0.240</td>
<td>(-0.61, 0.35)</td>
<td>0.5912</td>
</tr>
<tr>
<td>Ethical Concerns</td>
<td>3.07 vs 4.00</td>
<td>1.45 vs 1.36</td>
<td>0.19 vs 0.14</td>
<td>3.8984</td>
<td>0.238</td>
<td>(-1.40, -0.46)</td>
<td>0.0001*</td>
</tr>
<tr>
<td>Attainability</td>
<td>4.86 vs 4.30</td>
<td>0.35 vs 1.13</td>
<td>0.05 vs 0.12</td>
<td>3.563</td>
<td>0.155</td>
<td>(0.25, 0.086)</td>
<td>0.0005*</td>
</tr>
<tr>
<td>Judgement</td>
<td>5.00 vs 4.52</td>
<td>0.00 vs 0.98</td>
<td>0.00 vs 0.10</td>
<td>3.6563</td>
<td>0.131</td>
<td>(0.22, 0.74)</td>
<td>0.0004*</td>
</tr>
</tbody>
</table>
Other Notable Data

SPF choice between Rural & Urban: insignificant (p = 0.084081)

SPF choice between People of Color & White People (*: p = 0.0453)

Routine Compatibility as a barrier Rural vs. Urban residents (*: p = 0.01)
**Data In Entirety**

- Skin concerns and routine compatibility rated significantly higher as barriers to sunscreen use
  - These results are congruent with literature review
- Fear of judgement, attainability and skin tone congruity rated significantly lower as barriers
  - These barriers have been generally unexplored and with this result, do not show much promise in any further research in those areas

**Importance**

- Useful for clinics to learn how to best encourage sunscreen use
- Separate surveys/studies not necessary
  - more effort into analyzing routinely collected demographic data
- People of color and rural citizens, especially in conjunction, historically overlooked
  - important in all future relevant research

**Limitations**

- Survey had relatively small sample size of <200
- Data was skewed to a younger population due to the advertising (social media)

**Ethnicity Sorted Data**

- People of Color chose significantly higher SPFs than people who identified as White.
  - This is an unusual finding, especially considering that melanin-rich skin has been found to have a natural SPF of up to 13
- No significant differences in barrier-rating or biggest barriers

**Residentially Sorted Data**

- Routine compatibility rated as top barrier significantly more in urban respondents than rural respondents
  - This may be useful in evaluating both anti-aging product advertising and how to encourage sunscreen use in certain populations
- No significant differences in barrier-rating compared to each barrier
- No difference found in SPF use; unusual as previous studies have found rural residents generally use a higher SPF
References


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<th>Reference</th>
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