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## *All or Nothing . . . or Just a Hat? Farmers' Sun Protection Behaviors*

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*Farmers have an increased risk for developing skin cancers and thus comprise an important audience for messages that address sun protection practices. This project examines sun protection behaviors of farmers from southeastern Georgia and uses those measured behaviors to conduct a cluster analysis. Farmers (N = 480) were clustered into three groups using six variables that measured their frequency of sun protective and purchasing behaviors. The three groups were characterized as either engaging heavily in sun protective behaviors, engaging in none of the recommended sun protective behaviors, or only wearing hats as a sun protective behavior. Practitioners seeking to develop health message interventions that target farming populations should consider the current behaviors of subgroups of farmers when developing audience segments to tailor messages aimed at increasing sun protective behaviors. Practical recommendations for message content targeted toward the subgroups of farmers are provided.*

**Keywords:** *cluster analysis; skin cancer; farmers; audience segmentation; sun protection; message design*

**M**ore than 1 million cases of basal and squamous skin cancer are diagnosed annually with another 53,000 cases of melanoma added to that figure (American Cancer Society [ACS], 2002). The reported incidence of skin cancer in the United States is directly related to exposure of the skin to the sun with greater exposure leading to increases in reported cases of skin cancer (English et al., 1998; Koh, 1991; Preston & Stern, 1992). Although all individuals are at risk of contracting skin cancer, certain groups are at greater risk than others. For example, farmers, who number more than 3 million in the United States (U.S. Department of Agriculture, 2002), are at greater risk of skin cancer because they spend more time in the sun than most

other groups (Blair & Zahm, 1991; Blair, Zahm, & Pearce, 1992; Hogan & Lane, 1986). Unable to avoid the sun because of the nature of their work, farmers typically rise before dawn and work until the evening hours, all the while exposing themselves to the potentially dangerous rays of the sun. It is clear that farmers comprise an important target audience for messages that promote sun protection strategies because their occupation increases their risk factor for skin cancer (Blair & Zahm, 1991; Blair, Zahm, & Pearce, 1992; Hogan & Lane, 1986). This study examines farmers' current sun protection behaviors to identify subgroups within the farming population as a strategy to design messages that promote sun protection practices.

### ► BACKGROUND

Health campaigns aimed at reducing the incidence of skin cancer typically incorporate messages that pertain to specific behavioral recommendations from the American Academy of Dermatology (AAD) and the ACS. For example, slogans like "Slip, Slop, & Slap" are designed to appeal to broad audiences and advise individuals to slip on a shirt, slop on sunscreen with a sun protection factor (SPF) of at least 15, and slap on a hat (ACS, 2003), whereas other programs target more specific groups like elementary school children (Buller et al., 2000), lifeguards (Lombard, Neubauer, Canfield, & Winnett, 1991), and farmers (Parrott, Monahan, Ainsworth, & Steiner, 1998). To reduce the risk of skin cancer, the AAD and ACS recommend that individuals limit their time spent in the sun; avoid the sun's rays between 10 a.m. and 3 p.m.; use sunscreen with an SPF of 15 or more; wear sun protective clothing like sunglasses, wide-brimmed hats, long sleeve shirts, and long pants; stay in the shade whenever possible; and examine their skin regularly. Farmers, however, have difficulty adopting some of the recommended behaviors given the realm of their work.

For example, farmers are unlikely to be able to avoid the sun between 10 a.m. and 3 p.m., find shade throughout the day, and limit the amount of time they spend in the sun. It would be more likely that farmers would wear sunscreen, sunglasses, and hats as well as engage in other accessible protection behaviors than to simply

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avoid the sun every day. However, research demonstrates that even though farmers are cognizant of the risks associated with sun exposure, they do not rank skin cancer as a high concern for them compared to other occupational threats (Thu, Donham, Yoder, & Ogilvie, 1990). Farmers also understand that skin cancer is a serious threat and recognize that sunscreen and protective clothing are useful preventative actions, but they do not tend to enact those behaviors, citing summer heat and discomfort as reasons (Marlenga, 1995). Additionally, one study found that less than 23% of farmers report using sunscreens (Marlenga & Lee, 1996). Research has found that family expectations and information giving along with knowledge about skin cancer prevention is significant in predicting sun protection behaviors (Parrott & Lemieux, 2003).

Parrott et al. (1998) examined the sun behavior practices of farmers in southeastern Georgia. Similar to some research findings for farmers in Wisconsin (Marlenga, 1995), Parrott et al. found in their formative research that many farmers did little to protect themselves from the sun. Using a behavior adaptation model (BAM), the researchers sought to understand why efforts to promote prevention and detection practices are more or less likely to succeed. The BAM acknowledges that avoidance of the sun is not a practical strategy for farmers and promotes behavior adaptation (i.e., wearing long sleeve shirts, hats, and sunscreen) to reduce cancer risk among farmers. The model identifies interpersonal expectancies (Chow, 1987; Rosenthal & Rubin 1978; Shenkel, Rogers, Perfetto, & Levin, 1985; Tinsley, 1992), social resources (Clark & Zimmerman, 1990; Driggers, Nussbaum, & Haddock, 1993), perceived procedural knowledge (Garcia, 1995; Maibach, Flora, & Nass, 1991), actual procedural knowledge (Bandura, 1997; Parrott, Steiner, & Goldenhar, 1996), and public commitment (Molteni & Garske, 1983; Stone, Aronson, Crain, Winslow, & Fried, 1994) as variables relevant to sun protection behavior. The model also identifies purchasing behaviors along with the frequency of using specific sun protective products as outcome variables of sun protection adaptation behaviors for farmers (Parrott et al., 1998), thereby providing possible criteria for understanding different subgroups and ideas for content in sun protection messages. In other words, variables geared toward actual enactment of sun protection behaviors are used in this study as an audience

segmentation strategy because current behavior may provide useful information for message tailoring.

Creating messages that suggest impractical sun protection strategies for farmers reduces message impact. Equally problematic for message impact is a lack of understanding by health message designers regarding the subgroups that might exist within a population of farmers. Specific sun protection behaviors engaged in by farmers provide a behavioral approach to segmenting the farming population. In other words, even though farmers have been defined already as a unique population at increased risk for certain cancers, they are not a homogenous group and are likely to engage in different sun protective behaviors. For example, some farmers may use sunscreen on a daily basis and wear a hat, whereas others wear long sleeve shirts but do not use sunscreen. Behaviors that farmers do and do not engage in regarding sun protection can inform practitioners' efforts to more appropriately target messages toward individual groups, as health message design is an audience-centered process where the needs and situation of the target audience are key to the effectiveness of the message (Maibach & Parrott, 1995).

The purpose of this study is to identify subgroups of farmers so that health communication messages can better address the sun protective and skin cancer detection needs of each group. Whereas many audience segment strategies focus on psychographic, geographic, or demographic variables (Slater, 1995), this study focuses on sun protection behaviors reported by farmers as a novel way to identify different target audiences for subsequent message tailoring about sun-safe practices. Thus, the following research question is posited for inquiry:

*Research Question 1:* What groups are identified when farmers are clustered by how often they wear and purchase sunblock, hats, and long sleeve shirts?

## ► METHOD

This study is a secondary analysis of data from a larger research project interested in developing an intervention that addressed barriers and behaviors associated with sun protection practices of farm families (for further description of participants and procedures beyond the scope of the current project, see Parrott et al., 1996, 1998).

### *Participants*

A random sample of farmers ( $N = 480$ ) from eight counties in southeastern Georgia comprised the participants. Farmers' names were randomly selected from a list of operators provided by the University of Georgia's Cooperative Extension Service and county agricultural extension field agents. All farmers were White males between the ages of 29 to 85 ( $M = 50.42$ ,  $SD = 12.66$ ) and most farmers were married (90.4%). Their farming

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experience ranged from 1 to 81 years with an average of 37.5 years ( $SD = 16.14$ ) of farming experience. The majority of farmers (84%) reported having health insurance coverage.

### **Instrumentation and Procedures**

Farmers responded to a telephone survey addressing skin cancer prevention and detection, which took participants approximately 20 minutes to complete. In the phone survey, participants were asked about their sun protection behaviors and skin cancer detection practices as well as other questions that measured public commitment, perceived procedural knowledge, interpersonal expectancies, and social resources related to skin cancer prevention and detection. Six questions from the survey pertaining to the frequency of purchase and use of sun protection items are of interest in the current project. Those items include the following: (a) During the past year, did you wear sunscreen while working in the sun? (b) During the past year, did you wear a sun-protective hat while working in the sun (wide-brimmed hat or cap with flap)? (c) During the past year, did you wear a long sleeve shirt while working in the sun? (d) During the past year, did you purchase sunscreen to wear while working in the sun? (e) During the past year, did you purchase a sun-protective hat to wear while working in the sun? and (f) During the past year, did you purchase a long sleeve shirt to wear while working in the sun? All questions were measured on 5-point scales with higher numbers indicating greater frequency of behavioral performance.

### **Data Analysis Method**

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS). A hierarchical cluster analysis was conducted to group farmers by the aforementioned six variables pertaining to the frequency of use and purchase of sun protection items. The similarity index was the Squared Euclidean Distance Index (which is really a dissimilarity measure that assumes larger values as two entities become less similar), and Ward's method was used to cluster units. A  $k$ -means solution was then generated using the initial cluster centroids from Ward's method as starting seeds. Concern for the effect of outliers was minimized because Ward's method is not as seriously affected by the presence of outliers, and the impact of outliers appears to be less severe for  $k$ -means partitioning methods (Milligan, 1996).

Cluster analysis provides a means for grouping participants across attributes (Aerts, Geys, Molenberghs, & Ryan, 2002; Aldenderfer & Blashfield, 1984; Everitt, Landau, & Leese, 2001) and affords a significant strategy to guide audience segmentation associated with health behavior (see Slater, 1995). The goal of this project was to examine whether there were natural clusters within the farming sample based on their reported sun protec-

tion behaviors. Cluster solutions were examined to determine the most parsimonious solution, and selection criteria were based on (a) heuristic inspection of the dendrogram to ascertain the different groups that were present in the data, (b) examination of the means of each factor to assess the differences between each of them across possible cluster solutions, and (c) distribution of participants across the cluster solutions.

## **► RESULTS**

The cluster analysis of farmers on the six variables indicated that three different subgroups of farmers existed in the sample. Three-, four-, and five-cluster solutions were assessed thereby revealing that the best solution was one that identified three different subgroups in the population sample based on the aforementioned criteria. Group 1 comprised 30% of the participants who wore hats, Group 2 comprised 25% of participants and exhibited many sun protection behaviors, and Group 3 consisted of the remaining 45% of participants who did not protect themselves from the sun. The Euclidean distance between groups (Table 1) indicated the greatest difference between Groups 2 and 3 ( $d_{23} = 4.77$ ). An examination of the descriptive information (Table 2) indicated that the mean score of Group 2 on all six variables was approximately twice that of Group 3. The distance between Groups 1 and 3 ( $d_{13} = 3.32$ ) indicated the greatest similarity among the three clusters. However, the two groups differed substantially in regard to the wearing and buying of hats. Group 1's mean score for wearing hats ( $M = 4.30$ ,  $SD = 0.86$ ) was 3 times greater than Group 3's mean score for wearing hats ( $M = 1.31$ ,  $SD = 0.55$ ). Additionally, Group 1 ( $M = 2.88$ ,  $SD = 1.06$ ) was twice as likely to purchase a hat as compared to Group 3 ( $M = 1.50$ ,  $SD = 1.02$ ). Lastly, the distance between the centroids of Groups 1 and 2 ( $d_{12} = 3.37$ ) showed that the two groups scored similarly on wearing a hat, but Group 2 scored significantly higher overall on the other five variables. A comparison of the hierarchical agglomerative method and the  $k$ -means methods indicated similar clustering centroids for each group thereby demonstrating the consistency of the cluster solutions regardless of the clustering method employed.

## **► DISCUSSION**

Farmers comprise a large population in the United States; in Georgia alone, there are more than 67,300 farm operators who farm approximately 940 million acres of land each year (U.S. Department of Agriculture, 2002). It was the goal of this project to determine what subgroups may exist in the farmer population based on certain sun protection and purchasing behavior variables identified in previous research (Parrott et al., 1998). The aforementioned variables were selected as significant behavior adaptation variables that distinguish between groups because a prerequisite for farm-

**TABLE 1**  
**Euclidean Distance Matrix**

	<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>
<i>Group 1</i>	0.00		
<i>Group 2</i>	3.37	0.00	
<i>Group 3</i>	3.32	4.77	0.00

ers' use of sun protective gear is having those types of resources available. Thus, it was important to understand if purchasing varied across groups so that message content could be tailored to encourage the purchase of sun protective products as well as their consistent use, depending on the characteristics of the different subgroups that emerged from the cluster analysis. Three distinct groups with particular behaviors differentiating them from each other were revealed in the results.

Those in the first cluster, consisting of 30% of the farmers, wear hats but seldom practice any other sun exposure protective behavior. This hat-wearers group typically wears baseball hats, because they keep the sun out of farmers' eyes and are often provided free by farm suppliers like feed and seed companies. The problem with this particular group is that they are engaged in only one sun protection behavior, and their common choice of baseball hats leaves the back of the neck and ears exposed to the sun. Therefore, health messages targeted toward this group should attempt to reinforce wearing hats but target specific types of hats that maximize sun protection, as knowledge about sun protection behavior is related to enactment of behaviors (Marlenga, 1995; Parrott & Lemieux, 2003). For instance, a message could state, "You've already developed the habit of wearing a hat, but did you know that many skin cancers form on the neck and ears? So, the next time you reach for a hat, be sure it's one that covers all important areas." Additionally, messages targeted toward this group could also incorporate ideas like, "You're on your way to sun safety by wearing a hat. Don't forget to block up with sunscreen and a long-sleeved shirt."

The second cluster indicated a group of farmers (25%) who practiced all of the six behaviors at a moderately high to high rate. This group of sun-protected farmers takes action to practice sun protective behaviors and also purchases sunblock, hats, and shirts to meet their sun protective needs. The sun-protected farmers recognized the importance of practicing protective behaviors but may need encouragement through maintenance messages to follow through with purchasing sunblock on a consistent basis (Maibach & Cotton, 1995). One way of addressing this deficit is to make sure that sunscreen is available in the kinds of stores that farmers visit. For instance, making sunblock available at farm equipment stores or feed stores would make it more accessible to farmers at sites where they do their everyday shopping (Parrott et al., 1998). More accessible sunblock paired with health messages that recom-

mend stocking up on all supplies including sunblock may also be an effective sun protection message that targets the sun-protected group.

The third cluster represents the unprotected farmers who take little to no precautions against sun exposure. This group is of great concern because it is the largest cluster of the three, they do the least to protect themselves from the sun, and they do the least in terms of providing themselves with the right supplies to protect themselves from the sun. The minimal behaviors of this group suggest a lack of concern, resources, and/or knowledge about sun exposure protection, which is reportedly not uncommon in the farming population (Marlenga, 1995; Marlenga & Lee, 1996; Thu et al., 1990). As there are no particular behaviors in which this group currently engages, a starting point for message construction would be to identify appropriate sun protection behaviors while emphasizing the benefits and risk reduction associated with message compliance. For example, a message might state, "You are at risk of skin cancer if you are a farmer. Yes. Skin cancer. Reduce your risk by wearing a hat that protects your entire head, a long sleeve shirt, and sunscreen. Protect yourself." Formative research needs to identify barriers to performance of sun protection behaviors, which would likely include a variety of behavioral determinants. Extensive, long-term health campaigns need to be implemented to address this group because of its size (45% of the sampled population), its high risk factor (Hogan & Lane, 1986), and the multitude of perceived barriers that might need to be addressed (Marlenga, 1995; Thu et al., 1990).

## ► CONCLUSIONS

The results from this cluster analysis have practical implications for application within the health realm. Specifically, the hat-wearer group in this project was an unexpected cluster that identified a particular behavior prevalent among certain farmers, perhaps requiring a foot-in-the-door technique where the behavior of wearing a hat provides an opportunity to discuss the adoption of one or two additional sun protection behaviors. The other two groups, sun protected and unprotected, indicated an almost all-or-nothing attitude among farmers with the all group performing all recommended sun protection behaviors at a moderately high level and the nothing group seldom performing any of the behaviors. Whereas the sun-protected group may require messages encouraging behavior maintenance, the unprotected group would require different types of messages that provide evidence of the importance of farmers' protecting their skin from the sun. For example, evidence in sun protection messages might take the form of statistics, personal testimonies, fear appeals, and so forth to increase farmers' feelings of susceptibility and/or severity of the risk of skin cancer as well as their self-efficacy about protecting themselves from the sun. Overall, health promoters working with farming groups through

**TABLE 2**  
**Total Sample and Individual Cluster Means and Standard Deviations**

Variable	Total Sample (N = 480)		Cluster 1: Hat Wearers (n = 142)		Cluster 2: Sun Protected (n = 121)		Cluster 3: Unprotected (n = 217)	
	M	SD	M	SD	M	SD	M	SD
Sunblock	1.87	1.32	1.23	0.48	3.23	1.50	1.54	1.02
Hat	2.96	1.69	4.30	0.86	4.32	1.06	1.31	0.55
Longshirt	2.44	1.42	2.03	1.07	3.78	1.42	1.96	1.12
Buyblock	1.85	1.15	1.85	0.62	2.93	1.34	1.55	0.70
Buyhat	2.38	1.20	2.88	1.06	3.37	0.94	1.50	1.02
Buylong	2.12	1.25	1.85	0.99	3.16	1.33	1.71	1.02

NOTE: Sunblock = How often do you wear sunscreen while working in the sun? Hat = How often do you wear a hat that blocks the sun from the neck and ears while working in the sun? Longshirt = How often do you wear a long sleeve shirt to wear while working in the sun? Buyblock = How often do you purchase sunscreen to wear while working in the sun? Buyhat = How often do you purchase a hat that blocks the sun from your neck and ears to wear while working in the sun? Buylong = How often do you purchase a long sleeve shirt to wear while working in the sun?

agricultural extension or other outreach programs should stress to farmers the importance of practicing a few behaviors that will help them to avoid skin cancer and ultimately also save them time and money in the long run. Purchasing and wearing a hat that protects the nose, ears, and back of the neck may be the first step for farmers, especially those who already wear a hat. The next focus might be on purchasing and wearing a loose fitting, long sleeve shirt that shields skin from the sun. Finally, health promoters would want to encourage the use of sunscreen on any area of the body left exposed to the sun. Small behavioral adaptations that move farmers toward smart sun protection behaviors that do not interfere with their work may be an effective approach.

Future research should include farmers of different racial and ethnic backgrounds, because the sample in this study was limited to White male farmers; thus, the results are not generalizable to other racial and ethnic groups. This research focuses specifically on sun protection behavior as a novel strategy to identify subgroups among farmers. Thus, although our focus is on current behaviors in which farmers engage, there also exist many other psychosocial and social determinants that could identify different segments within the farming population. Future research should aim to characterize audience segments based on behavioral, psychosocial, and social determinants to increase the efficacy of health communication campaign messages. One challenge when identifying different audiences, however, is the balance between audience segment size and resources; it is important that segments be unique in their characteristics and composition of members but large enough in size to merit resources being allotted to them. In other words, too many audience segments may be problematic, because limited funds exist for the development and production of tailored messages for different groups. Practitioners may want to collaborate with state public health agencies to enhance their reper-

toire of available resources so that they may appropriately tailor and target effective health messages for different groups of farmers.

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