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Strength of Tobacco Control in Rural Communities

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Abstract

Purpose—This study aimed to: (a) describe the Strength of Tobacco Control (SoTC) capacity, efforts and resources in rural communities, and (b) examine the relationships between SoTC scores and sociodemographic, political and health-ranking variables.

Methods—Data were collected during the baseline pre-intervention phase of a community-based randomized, controlled trial. Rural counties were selected using stratified random sampling ($n = 39$). Key informant interviews were employed. The SoTC, originally developed and tested with states, was adapted to a county-level measure assessing capacity, efforts, and resources. Univariate analysis and bivariate correlations assessed the SoTC total score and construct scores, as well as their relationships. Multiple regression examined the relationships of county-level sociodemographic, political and health-ranking variables with SoTC total and construct scores.

Findings—County population size was positively correlated with capacity ($r = 0.44$; $P < .01$), efforts ($r = 0.54$; $P = .01$) and SoTC total score ($r = 0.51$; $P < .01$). Communities with more resources for tobacco control had better overall county health rankings ($r = .43$; $P < .01$). With population size, percent Caucasian, tobacco production, and smoking prevalence as potential predictors of SoTC total score, only population size was significant.

Conclusions—SoTC scores may be useful in determining local tobacco control efforts and appropriate planning for additional public health interventions and resources. Larger rural communities were more likely to have strong tobacco control programs than smaller communities. Smaller rural communities may need to be targeted for training and technical assistance. Leadership development and allocation of resources are needed in all rural communities to address disparities in tobacco use and tobacco control policies.

Keywords

tobacco control; strength of tobacco control; environmental tobacco smoke pollution; rural communities

Largely as a result of socioeconomic disparities, rural populations are at increased risk for smoking and resultant poorer health outcomes than their urban counterparts.^{1,2} Adults living in rural communities are generally more likely to smoke cigarettes compared to those

in urban areas.^{1,3-5} Furthermore, those living in rural communities are more likely to be exposed to secondhand smoke than those living in urban areas.⁶

Despite the fact that smoke-free and other tobacco control laws are gaining popularity in the United States and globally, rural communities have fewer smoke-free laws and voluntary restrictions than do their urban counterparts.^{6,7} Further, smaller towns are less likely than larger ones to enact smoke-free policies.^{8,9} As efforts to enact smoke-free laws and other tobacco control policies increase, assessing local efforts, capacity and resources for tobacco control grows more important, especially in rural, underserved communities that may be late in adopting these laws.

Mobilizing local communities to enact tobacco control policies is recommended in the Centers for Disease Control and Prevention's (CDC) community-based model for tobacco control.¹⁰ The premise of the model, currently implemented in several states, is to promote policy development at both local and state levels to change social norms related to tobacco control.

The Strength of Tobacco Control (SoTC) instrument was initially developed to evaluate the effectiveness of state-level efforts related to tobacco control. The SoTC, developed by the American Stop Smoking Intervention Study (ASSIST), measured state-level tobacco control efforts and indirectly assessed the effectiveness of the ASSIST program.¹¹ The overall objective of ASSIST was to effect change in tobacco use through policy promotion and alterations in the social-political environment related to tobacco use.¹² Although the SoTC measure has been tested only at the state level, it may have utility as a measure of strength of tobacco control at the local level.

Purpose

The purpose of this exploratory study was to determine the utility of the SoTC measure at the local level for evaluating strength of tobacco control in rural communities. Specific aims were to: (a) determine SoTC construct scores in rural communities; (b) determine overall SoTC scores in rural communities; and (c) examine the relationships between SoTC total scores and sociodemographic, political, and health-ranking variables. The hypothesis was that communities with larger populations and lower smoking prevalence rates would have higher SoTC scores.

Methods

Design and Sample

The data were collected during the baseline pre-intervention phase of a randomized, controlled community-based trial to promote smoke-free policy in rural Kentucky. Key informant interviews were employed to examine the strength of tobacco control within rural communities after approval for human subject protection was obtained.

Sample/Setting

Stratified random sampling of rural communities was used ($N = 40$). Among the 99 rural Kentucky counties (located outside the Metropolitan Statistical Areas), there are 43 health department service areas; 14 are multi-county district health departments and the remaining are single-county health departments. To minimize organizational contamination, 1 county per local health department district was randomly selected for inclusion in the study using a random selection procedure in SAS (for Windows, Version 9.1; SAS Institute Inc.: Cary, North Carolina). For this study, data were available for 39 of the 40 counties. Of the 39 counties, 14 were located within a district health department and 25 were single-county

health departments. In all 39 counties, the tobacco control specialist (TCC) from the local health department was asked to participate in a 30- to 45-minute telephone interview conducted by a trained interviewer. TCCs were asked to participate because they are the source of information about smoking and secondhand smoke-related issues and programs in their health department service areas. All TCCs agreed to participate when contacted by the researchers.

Measures

The SoTC, developed as part of the ASSIST, was adapted to a county-level measure in this study by modifying items that were state-specific to be community-specific (ie, *How supportive is the governor of tobacco control* was changed to *How supportive is the city mayor*). The SoTC assessed 3 key constructs: (a) resources committed to tobacco control (ie, personnel devoted to tobacco control; 3 items); (b) capacity to implement tobacco control activities (ie, leadership, coalition strength as well as linkages between key agencies and advocacy groups; 47 items); and (c) anti-tobacco efforts (ie, time spent on media advocacy, training and technical assistance, policy advocacy; 111 items). These 3 areas are viewed as the major constructs that may impede or promote progress toward changing tobacco control norms¹¹ (see Table 1).

County-level sociodemographic and political variables included percent registered to vote and voter liberalism,¹³ smoking prevalence,¹⁴ number of tobacco staff per 10 000 population,¹⁵ pounds of burley tobacco produced,¹⁶ median annual household income,¹⁷ percent unemployed,¹⁸ percent Caucasian,¹⁹ and population size.²⁰ The Kentucky Institute of Medicine (KIOM) ranking, indicating county health characteristics relative to the other Kentucky counties, was included as a study variable.²¹ Assessment rankings identify differences in (a) demographics (ie, minimum education, per capita personal income); (b) health access (ie, adequacy of prenatal care, immunization coverage); (c) health outcomes (ie, infant mortality, infectious disease prevalence); and (d) behavioral/social factors (ie, smoking prevalence, physical activity; drug arrests) among Kentucky counties. Prior to the KIOM rankings, data were reported only on a national or state level and did not accurately identify specific local problems. For example, Kentucky's county-level smoking prevalence rates vary from 20% to 36% while its state-level prevalence rate is reported as 29%.²¹ Kentucky has 120 counties, and overall health rankings are classified from 1 (best overall health status) to 120 (worst overall health status).

Data Analysis

The SoTC total score for each county was created using an algorithm developed by Battelle Centers for Public Health Research and Evaluation (Battelle CPHRE) and was based on principal component analysis.²² The scoring algorithm first clustered survey items into sub-domains. Next, the sub-domain scores were averaged across the respondents from a given community and these sub-domain scores were then combined to form domains. Finally, the algorithm combined the domains into the latent variables (ie, constructs) of resources, capacity, and efforts. These domains were then averaged to create a single SoTC total score. At each level of score creation (sub-domain, domain, construct, and total score), the raw scores were standardized so that the resulting score would have a mean of 0 and a standard deviation of 1.

Descriptive statistics, including means, standard deviations and ranges, were used to summarize the demographic characteristics, construct scores and overall SoTC total scores by county. Pearson's product moment correlation assessed the degree of association among the study variables. Multiple regression examined the relationship of county-level

sociodemographic, health-ranking, and political variables with standardized SoTC construct and total scores.

Due to the sample size of 39 communities, only 4 independent variables were entered into each regression model to ensure stability of parameter estimates.²³ The sociodemographic, political and health-ranking variables chosen for each model were those with the strongest correlation with the dependent variable; variables that were correlated with each other at the .001 level were not included in the same model. Models were summarized using the adjusted R^2 as this is more conservative than the usual R^2 when the sample size is limited; variance inflation factors were determined to assess whether multicollinearity was present. Data analysis was conducted using SAS for Windows, version 9.1; an alpha level of .05 was used throughout.

Results

County-level demographics and SoTC construct and total scores are summarized in Table 2. Approximately half of the adult population was registered to vote, and of these three-fifths were registered Democrats. Nearly 30% of the population were current smokers, and the average population size was approximately 25 000. Consistent with rural areas in Kentucky, the majority of the population was Caucasian. The median annual household income was slightly more than \$30,000 and the mean unemployment rate was nearly 7%. The number of tobacco control staff per 10 000 population (ie, tobacco staff ratio) was 0.3 on average, and the average pounds of burley tobacco produced per county was over 1 million. The average KIOM ranking was 67, with actual rankings ranging from 4 to 119. Counties with lower KIOM scores had more positive health indicators.

SoTC Construct and Total Scores

SoTC construct scores ranged from -2.9 to 2.9 for resources, -1.9 to 1.9 for capacity, and -1.8 to 2.5 for efforts (see Table 2). The capacity construct was the most strongly correlated with the SoTC total score ($r = .78$; $P < .001$), while resources had the weakest relationship ($r = .54$; $P < .001$) (see Table 3). The resources construct had weak or no correlation with the other constructs and the sociodemographic, political and county health-ranking variables.

Overall SoTC scores in the 39 counties ranged from -2.5 to 2.6 ($M = 0.0$; $SD = 1.0$). The SoTC total score was correlated with population size ($r = .51$; $P = .0009$). Overall SoTC was not correlated with smoking prevalence. There were no significant correlations between SoTC and any of the remaining sociodemographic, political and county health-ranking variables.

The SoTC constructs of capacity and efforts were positively related to population size, while there was a significant negative correlation between resources and KIOM ranking (see Table 3). Significant correlations among the sociodemographic, political and health-ranking variables are shown in the correlation matrix, including the negative correlations between KIOM ranking and percent registered to vote and income; KIOM ranking was positively associated with percent unemployed.

Relationships Among SoTC Scores and Other Study Variables

With population size, percent Caucasian, tobacco production, and smoking prevalence as potential predictors of overall SoTC, only population size was significant (see Table 4). Larger rural counties had higher overall SoTC scores. With KIOM ranking, smoking prevalence, tobacco staff ratio, and percent Caucasian as potential predictors of the resources construct, KIOM ranking was the only significant predictor. Counties with more positive health indicators (as determined by a lower KIOM ranking) scored higher on

resources. With population size, tobacco staff ratio, KIOM ranking, and percent Caucasian as regressors, only KIOM ranking predicted capacity. Counties with more positive health indicators had lower capacity scores on average than did those with poorer health indicators. The regression of efforts on population size, percent unemployed, tobacco staff ratio, and tobacco production indicated that population size was the only significant predictor of efforts. Larger counties typically had higher efforts scores than smaller counties.

Discussion

Population size was the only variable that predicted overall strength of tobacco control in rural communities, consistent with previous research finding a positive relationship between population size and smoke-free policy development.⁹⁻²⁴ While rural communities may, at first glance, seem to be relatively homogeneous, we found variability in population size even within this small sample of rural counties. As with the overall SoTC total score, larger rural communities were more likely than smaller ones to report tobacco control efforts including time spent on media advocacy, training and technical assistance, and policy advocacy. Small rural communities need training and technical assistance in tobacco control to address disparities in tobacco use and tobacco control policies.

Interestingly, population size was not a predictor of resources or capacity for tobacco control in rural communities. The fact that the resources construct had so few items and reflected only personnel resources and not financial or other assets may have contributed to this finding. Larger communities may have additional resources available to tobacco control advocates that smaller communities lack, including easier access to voluntary non-profit organizations and greater numbers of coalition volunteers. Regardless of size, rural communities should be targeted for leadership development and allocation of resources to address disparities in tobacco use and tobacco control policies.

Rural communities with more positive overall health rankings were more likely to report greater resources for tobacco control than those with negative health rankings. It would be expected that communities with more staff devoted to tobacco control would positively contribute to the overall health of a community. Caution in interpreting these findings is warranted given the small number of items in the resources subscale and the fact that the items measure only personnel resources, not other community assets, including finances, volunteers, and space.

Capacity for tobacco control was actually higher in communities with more negative health rankings. One explanation might be that tobacco control coalitions, strong community leadership, and agency linkages may be more likely and necessary in these higher-risk communities. Tobacco control policy advocates, recognizing the need for improved health outcomes in their communities, may actively engage in planning and developing coalitions, programs, projects, and events to prevent further decline of their community's health.²⁵

Adult smoking prevalence was not associated with overall strength of tobacco control as hypothesized. This is inconsistent with previous research showing that smoking prevalence correlates negatively with strength of smoke-free policies.²⁶⁻²⁸ In the American Stop Smoking Intervention Study, states with lower per capita cigarette consumption had significantly higher SoTC total scores.¹² Given Kentucky's rich tradition of growing tobacco, the pro-tobacco culture in these rural communities may overshadow the effect of smoking prevalence on tobacco control.

Study Limitations

In this study, the sample size was a limitation given the number of independent variables being examined. However, the primary goal of this exploratory study was to determine the utility of the SoTC measure at the local level. Replicating the study with a larger sample size will improve the statistical power and determine if additional sociodemographic and political variables are associated with strength of tobacco control at the local level.

A second limitation is that county-level information was sought from key informants even though some tobacco control laws were enacted at the city level. Counties were chosen as the community of interest due to availability of existing county-level sociodemographic, political and health-ranking data. Informants were instructed to answer all questions based on their knowledge of county-level activities related to policy development and enactment. Lastly, while SoTC interviews were scheduled at the convenience of the respondents, the length of the telephone interview may have led to respondent burden.

Implications for Future Research

Effective tobacco control policy development requires comprehensive evaluation of the strength of tobacco control at both the state and local levels. Currently there is no measure of local strength of tobacco control, which is necessary to determine the readiness of a community to implement local policy change. Previous research has established that public support and involvement are crucial to changing community norms about tobacco use.^{26,29}

This study suggests that the modified SoTC instrument may be useful in determining strength of tobacco control at the local level in rural communities. Dissemination of the results to communities will help local leaders and coalitions focus their tobacco control efforts. Using the SoTC measure over time could be a valuable tool for evaluating the commitment to ongoing local tobacco control efforts, as well as counter efforts that policy advocates may face.

This study reports SoTC at only 1 time point, at baseline of a community-based trial to promote smoke-free policy. Future measurement of SoTC will allow us to evaluate its effects on smoke-free policy development and smoking prevalence rates in rural communities.

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Table 1

Strength of Tobacco Control Constructs and Domains Revised for the Community Level.11

| Construct | Domain | Subdomain | Number of items in lowest level (domain or subdomain) | Sample item in lowest level (domain or subdomain) |
|----------------------|------------------|---------------------------|---|---|
| Resources | Staff | Dedicated to TC* | 1 | Considering only those staff members who dedicate 100% of their work hours to TC activities, how many full-time equivalents do you have on your staff? |
| | | TC plus other duties | 2 | Do you have any staff members who spend only part of their work time on TC activities? (yes/no) |
| Capacity | Leadership | None | 6 | I would like your opinion about how supportive each of the following has been regarding your TC agenda over the past year. (entities rated include: County Judge Executive, Fiscal Court Magistrates, City Mayors, media, County and City Attorneys, Public Health Director; ordinal scale used to rate each) |
| | | Inter-agency relationship | Quality | 9 |
| | Quantity | | 9 | During the past year, how frequently did you have contact with these organizations (for the same 9 entities, an ordinal scale was used to rate frequency of contact) |
| | Coalitions | Coverage | 1 | What is the largest geopolitical boundary of your coalition's responsibility? (responses include: city, town or county; region within the state; the state; region encompassing more than 1 state) |
| | | Functioning | 1 | In the past year, would you rate this coalition's success in encouraging frank discussion of issues and the ability to respond quickly to changes affecting the coalition as excellent, good, fair or poor? (ordinal response) |
| | | Membership | 2 | How large is your coalition in terms of member organizations? (numeric response) |
| | | Level of Activity | 1 | How would you describe your coalition's activities (responses include: we primarily share information; we primarily plan and participate in TC activities; we spend an equal amount of time sharing information and participating in TC activities)? |
| | Staff experience | Organization | Inclusion | 1 |
| Institutionalization | | | 8 | Does your coalition have any paid staff? (yes/no) |
| Organization | | | 1 | How long have you worked for your present organization or agency? |

| Construct | Domain | Subdomain | Number of items in lowest level (domain or subdomain) | Sample item in lowest level (domain or subdomain) |
|-----------|----------------------|----------------------------------|---|---|
| | | | | (numeric response) |
| | | Position | 1 | How long have you been in your current position? (numeric response) |
| | | Tobacco Control | 3 | How long have you been involved in TC? (numeric response) |
| | | Program Institutionalization | 4 | Does your organization have a written work plan? (yes/no) |
| Efforts | Social environment | Media Advocacy | 6 | In the past year, has your organization participated in media advocacy activities? By media advocacy, we mean activities that are intended to get influential media representatives to understand and agree with anti-tobacco positions and policies. (yes/no) |
| | | Mass Media | 14 | In the past year, has your organization purchased mass media, or had in-kind donations of mass media, to inform the public about tobacco-related issues? (yes/no) |
| | | Developing Local Efforts | 10 | In the past year, has your organization participated in building, enhancing or maintaining local coalitions in your county? (yes/no) |
| | | Policy Advocacy | 25 | Does your organization work with a paid lobbyist to promote a TC agenda? (yes/no) |
| | Individual behaviors | Create and Disseminate Materials | 6 | In the past year, has your organization disseminated materials produced by others for use by the general public, such as pamphlets, videos, or radio spots? (yes/no) |
| | | Smoking Cessation | 22 | In the past year, has your organization provided or sponsored telephone or Internet counseling services for those who want to quit? (yes/no) |
| | | Prevention Programs | 2 | In the past year, has your organization provided tobacco use prevention programs for schools or youth groups? (yes/no) |
| | | Health Care Provider Training | 10 | In the past year, has your organization provided training for health care professionals about tobacco issues? (yes/no) |
| | | Health Fairs | 2 | In the past year, has your organization participated in any health fairs? (yes/no) |
| | | Public Forums | 2 | In the past year, has your organization participated in any public forums, such as seminars or workshops to educate the public about tobacco-related issues? (yes/no) |
| | Activities | Focus | 2 | TC activities are sometimes categorized into work that targets individual tobacco use behavior and work that targets the social climate surrounding tobacco use. For example, school prevention programs, provider training programs, and quit lines are "individual behavior" activities. Policy and media advocacy are "social climate" activities. Relative to your agency's individual behavior activities, how important would you say your agency's social climate activities are? (ordinal response) |

| Construct | Domain | Subdomain | Number of items in lowest level (domain or subdomain) | Sample item in lowest level (domain or subdomain) |
|-----------|--------|-----------------------|---|---|
| | | Research Surveillance | 10 | In the past year, has any organization done a survey of tobacco use in your state? (yes/no) |

* TC = tobacco control

Table 2County-level Demographics and Strength of Tobacco Control Total and Construct Scores ($n = 39$).

| Variable | Mean | Standard deviation | Range |
|-------------------------------------|-------------|---------------------------|-----------------|
| <u>Demographics</u> | | | |
| Percent registered to vote | 41.8% | 3.9% | 32.2 – 50.6% |
| Voter liberalism (% Democrat) | 60.6% | 23.4% | 12.9 – 92.1% |
| Smoking prevalence | 29.3% | 5.8% | 15.7 – 46.7% |
| Population size | 24,541 | 15,560 | 2,202 – 65,544 |
| Percent Caucasian | 96.7% | 3.2% | 86.9 – 99.5% |
| Median household income \$ | 31,829 | 7,143 | 19,728 – 47,415 |
| Percent unemployed | 6.7% | 1.3% | 4.7 – 10.3% |
| Tobacco staff ratio | 0.3 | 0.6 | 0.0 – 3.9 |
| Tobacco production (pounds) | 1,075,070 | 1,190,313 | 0 – 4,394,700 |
| KIOM county health ranking | 67.0 | 32.2 | 4 – 119 |
| <u>SoTC measures (standardized)</u> | | | |
| SoTC total score | 0.0 | 1.0 | -2.5 – 2.6 |
| Resources | 0.0 | 1.0 | -2.9 – 2.9 |
| Capacity | 0.0 | 1.0 | -1.9 – 1.9 |
| Efforts | 0.0 | 1.0 | -1.8 – 2.5 |

Table 3

Means, Standard Deviations, and Correlations among Strength of Tobacco Total Score (SoTC), SoTC Construct Scores, and County-level Sociodemographic, Political and Health Ranking Variables (*n* = 39).

| | SoTC total score | Resources | Capacity | Efforts | Percent registered to vote | Percent Democratic | Smoking prevalence | Population size | Percent Caucasian | Income | Percent unemp. | Tob. staff ratio | Pounds of burley |
|-------------------------------------|------------------|-----------|----------|---------|----------------------------|--------------------|--------------------|-----------------|-------------------|----------|----------------|------------------|------------------|
| SoTC total score | | | | | | | | | | | | | |
| Resources construct | 0.54*** | | | | | | | | | | | | |
| Capacity construct | 0.78*** | 0.07 | | | | | | | | | | | |
| Efforts construct | 0.77*** | 0.05 | 0.56*** | | | | | | | | | | |
| Percent registered to vote | 0.18 | 0.23 | 0.07 | 0.07 | | | | | | | | | |
| Voter liberalism (% Democrat) | 0.08 | 0.05 | 0.16 | -0.03 | 0.29 | | | | | | | | |
| Smoking prevalence | -0.18 | -0.27 | -0.04 | -0.07 | -0.31* | -0.12 | | | | | | | |
| Population size | 0.51*** | 0.08 | 0.44** | 0.54*** | 0.05 | 0.02 | -0.25 | | | | | | |
| Percent Caucasian | -0.20 | -0.14 | -0.27 | -0.01 | -0.24 | -0.17 | 0.46** | -0.48** | | | | | |
| Median income | 0.07 | 0.26 | -0.02 | -0.10 | 0.50*** | 0.47** | -0.38** | 0.14 | -0.40** | | | | |
| Percent unemployed | -0.16 | -0.20 | 0.03 | -0.16 | -0.38* | -0.18 | 0.10 | -0.25 | 0.11 | -0.55*** | | | |
| Tobacco staff ratio | -0.10 | 0.24 | -0.30 | -0.16 | 0.13 | 0.19 | -0.01 | -0.36* | 0.21 | -0.04 | -0.20 | | |
| Pounds of burley tobacco production | -0.20 | -0.07 | -0.21 | -0.12 | 0.09 | 0.05 | 0.15 | -0.30 | -0.03 | 0.28 | -0.18 | -0.02 | |
| KIOM county health ranking | -0.05 | -0.43** | 0.28 | 0.04 | -0.58*** | -0.14 | 0.38* | -0.03 | 0.28 | -0.67*** | 0.60*** | -0.09 | -0.28 |

* *P* ≤ .05;

** *P* ≤ .01;

*** *P* ≤ .001

Table 4

Multiple Regression Models for Each Dependent Variable: SoTC Total Score and Resources, Capacity, and Efforts ($n = 39$).

| Outcome Variable | Predictor | Standardized β | Variance Inflation Factor |
|------------------|---|----------------------|---------------------------|
| SoTC total score | Population | 0.52** | 1.5 |
| | Percent Caucasian | 0.08 | 1.7 |
| | Pounds tobacco produced | -0.02 | 1.2 |
| | Smoking prevalence | -0.08 | 1.3 |
| | $F_{4, 34} = 3.1^*$; $R^2 = 0.27$; Adjusted $R^2 = 0.18$ | | |
| Resources | KIOM county health ranking | -0.35* | 1.2 |
| | Smoking prevalence | -0.14 | 1.4 |
| | Tobacco staff ratio | 0.20 | 1.1 |
| | Percent Caucasian | -0.01 | 1.4 |
| | $F_{4, 34} = 2.7^*$; $R^2 = 0.24$; Adjusted $R^2 = 0.15$ | | |
| Capacity | Population | 0.33 | 1.4 |
| | Tobacco staff ratio | -0.10 | 1.2 |
| | KIOM county health ranking | 0.35* | 1.1 |
| | Percent Caucasian | -0.20 | 1.5 |
| | $F_{4, 34} = 4.1^{**}$; $R^2 = 0.33$; Adjusted $R^2 = 0.25$ | | |
| Efforts | Population | 0.59** | 1.7 |
| | Percent unemployed | 0.01 | 1.4 |
| | Tobacco staff ratio | 0.06 | 1.4 |
| | Pounds tobacco produced | 0.06 | 1.3 |
| | $F_{4, 34} = 3.6^*$; $R^2 = 0.30$; Adjusted $R^2 = 0.22$ | | |

* $P \leq .05$;

** $P \leq .01$;

*** $P \leq .001$