

# Clean Indoor Air Ordinance Coverage in the Appalachian Region of the United States

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The prevalence of smoking continues to decline in the United States, with an estimated 19.8% of adults who identified as current smokers in 2007.<sup>1</sup> There is still, however, a divide between groups defined by socioeconomic status, with smoking being a more prevalent behavior among adults in the lower socioeconomic status groups. The dramatic decline in smoking that has occurred since 1965, when 42.4% of the population smoked, can be attributed to a number of factors, including policies that restrict smoking in public places.<sup>2,3</sup> Clean indoor air (CIA) ordinances have been associated with lower per capita cigarette consumption<sup>4</sup> and lower smoking rates.<sup>4,5</sup> In addition, strong CIA ordinances are related to improvements in air quality,<sup>6</sup> reductions in exposure to nicotine among nonsmoking employees,<sup>7</sup> reductions in the rates of coronary heart disease admissions,<sup>8,9</sup> and improvements in the success of smoking cessation treatments.<sup>10</sup> Local CIA ordinances can also set the stage for a statewide CIA law. Indeed, the Americans for Nonsmokers' Rights organization indicates that a state needs to have a significant number of communities with a local CIA ordinance before it should start a statewide campaign to ban smoking entirely in indoor locations.<sup>11</sup>

Not all communities have CIA ordinances and there has been limited examination of the factors that are associated with their adoption. Identifying these community-level characteristics is important because the information could be used to predict which communities successfully pass CIA ordinances. Skeer et al. analyzed data from towns in Massachusetts to determine the characteristics associated with the strength of restaurant CIA ordinances.<sup>12</sup> The strongest predictors were receipt of Massachusetts Tobacco Control Program funding, having a higher percentage of the town residents that voted in favor of the formation of the Massachusetts Tobacco Control Program in 1992, and bordering a town with a strong ordinance and 2 measures of community

**Objectives.** We sought to quantitatively examine the pattern of, and socioeconomic factors associated with, adoption of clean indoor air ordinances in Appalachia.

**Methods.** We collected and reviewed clean indoor air ordinances in Appalachian communities in 6 states and rated the ordinances for completeness of coverage in workplaces, restaurants, and bars. Additionally, we computed a strength score to measure coverage in 7 locations. We fit mixed-effects models to determine whether the presence of a comprehensive ordinance and the ordinance strength were related to community socioeconomic disadvantage.

**Results.** Of the 332 communities included in the analysis, fewer than 20% had adopted a comprehensive workplace, restaurant, or bar ordinance. Most ordinances were weak, achieving on average only 43% of the total possible points. Communities with a higher unemployment rate were less likely and those with a higher education level were more likely to have a strong ordinance.

**Conclusions.** The majority of residents in these communities are not protected from secondhand smoke. Efforts to pass strong statewide clean indoor air laws should take priority over local initiatives in these states. (*Am J Public Health.* 2010;100:1313–1318. doi:10.2105/AJPH.2009.179242)

advantage—education and income. In a study that focused on “smoke-free” campaigns in Wisconsin, experienced campaign leaders and newspaper coverage predicted a successful campaign result.<sup>13</sup> Socioeconomic status of the communities was not examined in this study.

Tobacco-growing communities may be difficult environments in which to pass CIA ordinances. However, strong grassroots coalitions<sup>14</sup> and efforts to build consensus among legislators<sup>15</sup> may be critical factors in regions that are heavily dependent on tobacco farming and closely tied to the tobacco industry. To date, there has not been an examination of the prevalence of CIA ordinances or the characteristics of the communities that have adopted ordinances in tobacco-growing regions, which, in the United States, are primarily in the Appalachian states.<sup>16</sup>

In 1965, the Appalachian Regional Development Act was passed in response to the high concentration of poverty, unemployment, and harsh living conditions in this region.<sup>17</sup> The Act created a standard definition of Appalachia, which includes 420 counties in 13 states from New York to Mississippi. Residents here

experience high rates of unemployment, poverty, and poor health.<sup>18,19</sup> Appalachian residents, in general, experience higher rates of morbidity and mortality compared with residents of non-Appalachian regions, and this is particularly true for tobacco-related illnesses such as heart disease, pulmonary disease, and cancer.<sup>20,21</sup>

With respect to smoking, the average smoking prevalence among adults in Appalachian states in 2007 was 24.1% (from 18.4% in Maryland to 28.8% in Kentucky).<sup>1</sup> Maryland was the only state below the national median of 19.8%. These results do need to be interpreted with some caution, however, because 12 of the states have Appalachian and non-Appalachian counties, and these prevalence estimates were for the entire state. It is possible that the Appalachian counties have a much higher smoking prevalence than do the other counties in a particular state. In Ohio, for example, the smoking prevalence among adults in the non-Appalachian counties is 20.8% whereas it is much higher, 30.5%, in the Appalachian counties.<sup>22</sup> The Appalachian region has a long history of tobacco farming and it now produces 97% of all burley tobacco, which is primarily

used in cigarettes, in the United States.<sup>16</sup> Most of the farms are family operated and, though small, they generate significant income. Because of this economic dependence, the social norms surrounding use are unique and residents may be resistant to tobacco control efforts.<sup>23</sup>

The objectives of this study were to quantitatively examine the pattern of, and factors associated with, adoption of local, community-level CIA ordinances in the Appalachian region of the United States. The factors considered for this study were community measures of socioeconomic status, such as income, education, and unemployment. Although it is true that Appalachia is characterized by widespread poverty,<sup>18,19</sup> there are some communities that are more affluent than others. We hypothesized that these measures are related to whether a community passed a CIA ordinance.

## METHODS

The analysis included data from Appalachian counties in 6 states: Alabama, Georgia, Kentucky, Mississippi, South Carolina, and West Virginia. In all 6 states, there are weak statewide CIA laws in place that do not prohibit smoking in restaurants, bars, and many other workplaces. However, the statewide CIA laws in these states also do not prohibit local communities from passing stronger CIA ordinances. The other states that have Appalachian counties were not included for various reasons. New York, Ohio, and Maryland had strong statewide CIA laws that banned smoking in workplaces, restaurants, and bars at the time of the study. Therefore, little to no community-to-community variability in the strength of the ordinance existed, because with a state law that bans indoor smoking in nearly all public locations, communities did not have a reason to pass their own CIA ordinance.

North Carolina, Tennessee, and Virginia had very weak state CIA laws that did not prohibit smoking in workplaces, restaurants, or bars. For example, the Tennessee law prohibited smoking in restaurants, but not in bars or most other workplaces. Very importantly, these weak state laws included preemption of local CIA ordinances. These preemption provisions prohibited local communities from passing CIA ordinances that differed from the state law. The preemption provision in Tennessee's law, for

example, prohibits local jurisdictions from passing any laws relating to the regulation of tobacco products. The Tennessee Code states, "Any law or regulation of tobacco products enacted or promulgated after March 15, 1994, by any agency or political subdivision of the state or any agency thereof is void."<sup>24</sup> As local communities in these states were legally unable to pass comprehensive CIA ordinances, they were excluded from our analysis. Finally, Pennsylvania had a weak state CIA law at the time of the project initiation, and there was ongoing litigation as to whether the state law preempted local ordinances. Therefore, Pennsylvania was excluded as well. (Pennsylvania has since enacted a stronger statewide law that includes a provision preempting local CIA ordinances.)

We created a database that contained information about the Appalachian communities with at least 2000 residents in the 6 states under study. In most states, CIA ordinances were passed at the city level (with a few exceptions where counties passed an ordinance); however, in all of West Virginia they were passed at the county level. The database had 1 entry for each Appalachian community, whether it was a city or county. The data elements included information on the CIA ordinance in the community, if applicable, and characteristics of the communities (described later in this section). Because CIA ordinances can be implemented, or removed, at any time, we limited our analysis to ordinances that were in place during the summer (June through August) of 2008. One of the coauthors (A.L.) conducted Web-based searches; if nothing could be found on the Web, A.L. called the city hall in each town or county and asked for the person most familiar with city ordinances, to determine whether there was a CIA ordinance.

### CIA Ordinance Ratings

A copy of every current ordinance was obtained; 4 individuals were involved in the review process. Each ordinance was rated independently by 3 reviewers and consensus was obtained on each ordinance. We first determined whether the ordinance was comprehensive, covering—separately—workplaces, restaurants, and bars. In addition to these 3 binary ratings, the overall strength of the ordinance was assessed. We based our rating scheme on the system developed by Chriqui

et al.<sup>25</sup> for state CIA laws. Their scoring system considered whether the state law covered 7 indoor areas, the penalties imposed on violators, and enforcement issues. Our revised rating system included scores for 7 indoor areas, but no points for penalties and enforcement issues. We decided not to score penalties because stronger penalties in the ordinances do not necessarily mean that there is better enforcement. Details about the scoring are presented in Table 1. Total scores could range from 0 to 13.

Because some communities prohibited the sale of alcohol and, therefore, did not have the possibility of including bars in the ordinance, we decided to consider the strength of the ordinance as the percentage of total possible points rather than the absolute number of points. Although each state in this study had a statewide CIA law at the time of the review, most were weak and did not completely ban indoor smoking in public places. We did not modify the rating of the local ordinance to account for the presence of a state CIA law because our intention was to determine the strength of local ordinances developed by local authorities.

We obtained characteristics of the community from the US Census Bureau<sup>26</sup> and the US Bureau of Labor Statistics.<sup>27</sup> The following community indicators from the 2000 Census were obtained: percentage of adults aged older than 25 years with a high-school education, median income, per capita income, and percentage of the population with a poverty-to-income ratio (PIR) less than 1.0.<sup>26</sup> We obtained 10-year unemployment statistics from the US Bureau of Labor Statistics.<sup>27</sup>

### Statistical Analysis

We used mixed-effects logistic regression models to examine relationships between community characteristics and the odds of a comprehensive workplace policy, restaurant policy, or either a workplace or restaurant policy. Freestanding bars were not considered in this analysis because that would have required the "dry" communities to be deleted from the analysis; these communities did not have the opportunity to include bars as a covered location. The community characteristics we considered were percentage completed high school, per capita income, median income, percentage poverty, and unemployment rate (average of yearly percentage reported

**TABLE 1—Clean Indoor Air Ordinance Rating Scheme Developed for Local Appalachian Ordinances: June–August 2008**

Location	Points on Rating Scale		
	0	1	2
Government worksites	No restrictions on smoking stated	Weak restrictions <sup>a</sup>	Strong restrictions <sup>b</sup>
Private worksites	No restrictions on smoking stated	Weak restrictions	Strong restrictions
Retail stores or recreational places	No restrictions on smoking stated	Weak restrictions	Strong restrictions
Restaurants	No restrictions on smoking stated	Weak restrictions	Strong restrictions
Bars (freestanding)	No restrictions on smoking stated	Weak restrictions	Strong restrictions
Schools	Federal law restrictions (prohibits smoking when students are present)	No smoking at any time in building	No smoking on school campus
Childcare facilities <sup>c</sup>	Weak restrictions (smoking restricted to designated areas, including those with separate ventilation)	No smoking permitted during operating hours	...

<sup>a</sup>Smoking restricted to designated areas, including those with separate ventilation.

<sup>b</sup>One hundred percent smoke free, with or without smoke-free grounds.

<sup>c</sup>Because children are the most vulnerable to the effects of secondhand smoke, we decided that any ordinance that does not prohibit smoking during operating hours in childcare facilities is weak and would receive a zero.

between 1998 and 2007). All models were adjusted for state and included random county effects to account for relationships between communities from the same county. If ordinances were passed on the county level, then we treated the county as a single community.

We used a similar approach to model the relationship between community characteristics and the percentage of possible ordinance rating points, though we used linear instead of logistic regression models. We restricted this analysis to communities with a CIA ordinance, of any type, because the model assumes normally distributed data. The data would have been highly skewed if we had added

communities without an ordinance because all would have had a score of zero. We calculated degrees of freedom for confidence interval estimates with the method of Kenward and Roger.<sup>28</sup> We used SAS PROC GLIMMIX to fit the logistic mixed effects models and SAS PROC MIXED to fit the linear random effects models (SAS version 9.1, SAS Institute Inc, Cary, NC).

**RESULTS**

In these 6 Appalachian states there were 332 communities, either counties or cities, identified. Table 2 contains the number of communities within each state and the number

of communities with a 100% comprehensive workplace, restaurant, or bar CIA ordinance. Among the 6 states, West Virginia clearly had the greatest proportion of communities with comprehensive CIA ordinances. More than three quarters of counties, which is the level at which ordinances are passed in West Virginia, had a comprehensive workplace CIA ordinance and more than half had comprehensive restaurant ordinances. However, when one considers comprehensive bar ordinances, West Virginia was not unlike the other Appalachian states with only 20% of its counties prohibiting smoking in freestanding bars. However, it must be noted that no community

**TABLE 2—Number of Communities, Community Type, and Number of Ordinances, by Appalachian States: June–August 2008**

State	No.	Communities With 100% Workplace CIA, No. (%)	Communities With 100% Restaurant CIA, No. (%)	Communities With 100% Bar CIA vs No. "Wet" Communities, No./No. (%)	Communities With at Least 1 CIA, No. (%)	Average % Possible Ordinance Rating Points <sup>a</sup>	Average % Possible Community Rating Points <sup>b</sup>
Alabama	113	3 (2.7)	6 (5.3)	6/83 (7.2)	7 (6.2)	26.3	16.3
Georgia	54	1 (1.9)	2 (3.7)	2/54 (3.7)	3 (5.6)	27.9	8.3
Kentucky	43	3 (7.0)	6 (14.0)	3/14 (21.4)	6 (14.0)	43.1	11.0
Mississippi	28	4 (14.3)	5 (17.9)	4/17 (23.5)	5 (17.9)	62.3	17.8
South Carolina	39	1 (2.6)	3 (7.7)	2/39 (5.1)	3 (7.7)	30.8	7.9
West Virginia	55	43 (78.2)	28 (51.0)	11/55 (20.0)	45 (81.8)	69.2	69.2

Notes. CIA = clean indoor air ordinance.

<sup>a</sup>Among the ordinances that have been passed (n = 170).

<sup>b</sup>Among all communities.

in West Virginia was “dry” and this was different from some of the other states. In Alabama, Kentucky, and Mississippi, 27%, 67%, and 39% of the communities, respectively, prohibited the sale of alcohol and, thus, freestanding bars could not be included as a covered location in the CIA ordinance.

Most community characteristics were not significantly related to CIA ordinances, with the exception of the percentage who completed high school (results not shown). Each 1% increase in high-school completion rate was associated with a 5% and 6% increase in the odds of a restaurant policy or either a restaurant or workplace policy, respectively.

Part of our failure to identify many relationships between community characteristics and CIA ordinances could be because the majority of the ordinances in our data set were passed in West Virginia. As mentioned previously, West Virginia differed from the other states included in the study because the majority of its communities had an ordinance. It is therefore possible that the associations between community characteristics and a comprehensive ordinance in West Virginia are quite different compared with the associations observed in the other states because there may be other reasons, such as a strong statewide tobacco control effort, that lead to such a high prevalence of comprehensive CIA ordinances.

With this in mind, we fit separate logistic regression models to the West Virginia communities and communities within the other 5

Appalachian states. As seen in Table 3, both the percentage who completed high school and unemployment rate were related to the presence of workplace and restaurant clean air policies in Appalachian communities outside West Virginia. Adjusting for state and county, a 1% increase in high school completion rate was associated with a 9% increase in the odds of a restaurant policy and a 10% increase in both the odds of a workplace policy and the odds of at least 1 policy (workplace or restaurant).

By contrast, we observed a negative relationship between the presence of an ordinance and unemployment rate: a 1% increase in unemployment rate was associated with an approximate 50% decrease in the odds of a restaurant policy, or either a workplace or restaurant policy. We observed the same relationship for workplace policies, though it was not significant at the .05 level. Univariate logistic regression models revealed no associations between county characteristics and CIA ordinances in West Virginia, with the exception of a significant negative relationship between median income and presence of a restaurant policy (a \$1000 increase in median income was associated with a 12% decrease in the odds of a restaurant policy, likelihood ratio  $P=.033$ ).

The strength ratings are presented in Table 2. We computed average percentages for communities that had an ordinance as well as average percentages for all communities (those

without an ordinance received a zero). Among communities with an ordinance, the average percentage of total possible points ranged from a low of 26.3% in Alabama to a high of 69.2% in West Virginia. In all states, except for West Virginia, average strength ratings decreased when all communities were included in the calculation of the average. Table 4 contains the slopes and 95% confidence intervals relating characteristics of communities outside West Virginia to the percentage of possible points for CIA ordinances. These linear models indicate that the percentage who completed high school and unemployment were both related to the percentage of possible points with the directions of the associations being consistent with our findings for the logistic models: a 1% increase in the percentage who completed high school was associated with an average increase of 0.9% in points achieved and a 1% increase in unemployment corresponded to an average decrease of 10.5% after adjustment for state. The analysis was repeated for the West Virginia counties, though no significant relationships were found.

## DISCUSSION

Few communities in the Appalachian regions in these 6 states have passed comprehensive CIA ordinances. Of the 332 communities with 2000 or more residents, only 16.6% had adopted a comprehensive workplace ordinance, 15.1% had adopted a comprehensive restaurant ordinance, and 10.7% of the nondry communities had adopted a comprehensive bar ordinance. Although 170 communities had passed a CIA ordinance, most were weak, as the average ordinance achieved only 43% of the total possible points for the 7 indoor areas. As stated previously, we did not adjust the ratings to account for the state CIA laws. However, we do not believe that such an adjustment would have altered the results, as the laws in these states are very weak, achieving only 26% of the total possible points. The American Nonsmokers' Rights Foundation estimates that 70.8% of the population is covered by a comprehensive workplace, restaurant, or bar law.<sup>29</sup> Only 35% of the population in the 332 communities considered in this analysis is covered by a comprehensive ordinance. Taken together, the results suggest that the Appalachian

**TABLE 3—Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Predictors of Clean Indoor Air Ordinances in Appalachian Communities, Excluding West Virginia: June–August 2008**

Predictor <sup>a</sup>	Workplace Policy, OR (95% CI)	Restaurant Policy, OR (95% CI)	Either Workplace or Restaurant, <sup>b</sup> OR (95% CI)
% completed high school	1.10 (1.03, 1.18)	1.09 (1.04, 1.15)	1.09 (1.03, 1.14)
Per capita income <sup>c</sup>	1.07 (0.98, 1.18)	1.07 (0.99, 1.15)	1.07 (0.99, 1.15)
Median income <sup>c</sup>	1.03 (0.98, 1.08)	1.02 (0.98, 1.06)	1.02 (0.99, 1.06)
Unemployment rate <sup>d</sup>	0.52 (0.27, 1.02)	0.48 (0.28, 0.83)	0.53 (0.32, 0.89)
% poverty-to-income ratio <1.0	0.95 (0.86, 1.03)	0.99 (0.93, 1.06)	0.99 (0.93, 1.05)

Note. Odds ratios are adjusted for state (fixed effect) and county (random effect).

<sup>a</sup>If the ordinance was passed on a county level, predictors were based on the county level.

<sup>b</sup>Includes communities with both workplace and restaurant restrictions.

<sup>c</sup>In thousands of dollars.

<sup>d</sup>Mean, 1998–2007.

**TABLE 4—Slopes and 95% Confidence Intervals (CIs) for Predictors of Clean Indoor Air Ordinances in Appalachian Communities, Excluding West Virginia: June–August 2008**

Predictor <sup>a</sup>	Slope (95% CI)
% completed high school	0.913 (0.360, 1.467)
Per capita income <sup>b</sup>	0.543 (-0.348, 1.434)
Median income <sup>b</sup>	0.214 (-0.229, 0.656)
Unemployment rate <sup>c</sup>	-10.453 (-16.485, -4.422)
% poverty-to-income ratio <1.0	-0.096 (-0.804, 0.613)

Note. Slopes were obtained by using linear mixed models containing a fixed effect for state and a random effect for county.

<sup>a</sup>If the ordinance was passed on a county level, predictors were based on the county level.

<sup>b</sup>In thousands of dollars.

<sup>c</sup>Mean, 1998–2007.

population in these 6 states is largely not covered by a strong local CIA ordinance and the weak state CIA laws do little to prevent secondhand smoke exposure.

In addition to an overall low prevalence of CIA coverage in these communities, we found that community advantage, which was measured by average level of education and unemployment, was related to the presence of a CIA ordinance and the strength of an ordinance. Thus, socioeconomically advantaged communities were more likely to have ordinances that protect the health of employees and citizens. Disparities, therefore, do exist even in Appalachia, a region characterized by poverty and unemployment.<sup>18,19</sup> Our finding of an association between education level and ordinance strength is consistent with that of Skeer et al.,<sup>12</sup> who reported that towns with a higher average level of education had a greater odds of passing a strong versus weak restaurant smoking regulation. They also found that per capita income was related to the presence of a stronger ordinance; income was not a significant factor in our analysis, and the unemployment rate over the past 10 years, another proxy for socioeconomic status, was negatively associated with having an ordinance and the strength of the ordinance.

It is not clear why so few communities in these Appalachian states have passed a CIA ordinance. We can, however, speculate on a few possible reasons. Several studies have reported that adults in tobacco-growing states are supportive of CIA initiatives<sup>30,31</sup>; thus, lack of public support is likely not the main reason for the presence of relatively few ordinances in this

region. In a second part to the present study, reported in a separate article, we conducted interviews with tobacco control leaders in these states and several of the individuals reported that there is a general lack of motivation in some communities to push hard for passage of local ordinances and that some are satisfied with the state CIA laws, even though all of the state laws we reviewed are weak. Thus, whereas other researchers have found that Appalachian residents support CIA ordinances, we argue that there may not be enough enthusiasm in the community to organize a grassroots effort to create change, which is an important component of the process for passing a CIA ordinance in a tobacco-growing state.<sup>14</sup>

### Limitations

Several limitations need to be addressed. First, we used data from the 2000 US Census, which could be inaccurate. We do not have good current estimates of income and educational level for the communities. In using Census 2000 data, we are assuming that the relative rankings of the communities were the same in 2000 as they were in 2008 when we reviewed the ordinances. On a similar note, we did not attempt to match the year the ordinance was passed with the characteristics of the community at the time it was passed.

Also, we could not look at the impact of “bordering communities” and support for tobacco control program funding. Skeer et al. found that towns with strong restaurant ordinances tended to cluster together and that local support for tobacco control program funding was a predictor of having a strong ordinance.<sup>12</sup>

Because the Appalachian regions in these states are largely rural, many communities are isolated and do not have the opportunity to border others that may have a strong CIA ordinance. Skeer et al. also found that local support for tobacco control funding was a predictor of having a strong ordinance.<sup>12</sup> Our study did not include this variable, nor did it examine the role that state tobacco control funding may have played in catalyzing the adoption of local CIA ordinances.

Another limitation relates to the number of dry communities in these states. Because dry communities did not have the opportunity to even consider covering freestanding bars in their CIA ordinances we had to omit bars from consideration in the logistic regression analysis that modeled the outcome “presence of a comprehensive restaurant or workplace ordinance.” Thus, we were not able to consider all indoor areas in this model.

The final limitation is that we included only communities with at least 2000 residents. In at least 2 Appalachian states, a city is defined by this criterion. We believed that small communities (i.e., those with fewer than 2000 residents) would be less likely to have CIA ordinances and tobacco control leaders working on these issues.

### Conclusions

We found that the majority of citizens in these Appalachian communities are not being adequately protected from the dangers of secondhand smoke. Our results suggest that leaving the decision to pass a strong CIA ordinance to local officials does not result in a large number of communities adopting such ordinances, at least in 5 of the 6 states that we examined (the single exception was West Virginia). Even though the Americans for Nonsmokers’ Rights organization recommends that states should have a significant number of communities with local CIA ordinances before they attempt to pass a statewide CIA law, it is our recommendation that CIA efforts in these states should be statewide, because, clearly, leaving the effort to local communities does not result in a large number of strong local CIA ordinances. The recent passage of a CIA law in North Carolina that will ban smoking in restaurants, bars, and government workplaces in 2010 demonstrates that it is possible to pass a strong law, although

not 100% comprehensive for every indoor place, in a tobacco-growing state. ■

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### Contributors

A. Ferketich was the study principal investigator, reviewed all ordinances, and wrote the article. A. Liber collected and reviewed all ordinances. M. Pennell analyzed all data and wrote statistical methods and results. D. Nealy assisted in the creation of the rating scale and review some ordinances. J. Hammer reviewed almost all of the ordinances. M. Berman assisted in the creation of the rating scale and reviewed some ordinances.

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### Human Participant Protection

Institutional review board approval was not obtained because no human participants were included in this study.

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