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The Relationship between School District Tobacco Policy and Smoking Rates of 10th Grade Students in Montgomery County, Ohio

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ABSTRACT

Tobacco use is responsible for a multitude of preventable deaths each year in the United States. Smoking is the most common form of tobacco use and tends to begin during the adolescent years, thereby resulting in a prolonged lifetime exposure to the harmful effects of tobacco. Smoking behavior among students has been shown to be influenced by school tobacco policies, thus the Ohio Department of Health (ODH) recommends all school campuses adopt a 100% tobacco-free policy. The purpose of this study was to evaluate the relationship between school district tobacco policies and student smoking rates. Survey responses from students in the 10th grade were obtained from the 2012 Dayton Area Drug Survey (DADS) and compared to tobacco control policies of the school districts in Montgomery County, Ohio. Seven school districts met the criteria for inclusion in the analysis. Self-reported prevalence of smoking among adolescents participating in the 2012 DADS was 7.0%, while the proportion of students who reported never smoking was 74.4%. When compared to a school with a more strict tobacco policy, students attending a less strict school were more likely to have a history of smoking (OR = 2.01) and more likely to have initiated smoking prior to the 10th grade (OR = 1.39). Tobacco use among adolescents remains a significant public health issue in Montgomery County, Ohio. There does appear to be value in following the ODH recommendations for a 100% tobacco-free campus.

Keywords: adolescent smokers, Ohio, tabacco-free campus, drug survey

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Despite overwhelming evidence that clearly illustrates the deleterious health effects associated with tobacco use, smoking remains a major cause of morbidity and mortality in the United States. Lung cancer, which has been strongly associated with smoking, is the leading cause of cancer-related deaths in the United States, and was responsible for more than 158,000 deaths in 2009 (Centers for Disease Control and Prevention, 2013). In addition, the World Health Organization attributes approximately 5 million deaths every year to tobacco use (Warren et al., 2008).

Adolescent smoking is a particularly important issue in public health due to increased duration of exposure that occurs during early initiation of tobacco use. More than 40% of adolescents in high school report using tobacco, and 54% have tried smoking (Moolchan, Ernst, & Henningfield, 2000). These rates illustrate the need for interventions that provide both knowledge and policy infrastructure required to enable adolescents to make healthier decisions about tobacco consumption.

Given the large proportion of time adolescents spend in educational establishments, schools have the potential to play a particularly important role in shaping smoking behavior. More specifically, school tobacco policies have been shown to influence smoking among students (Barnett et al., 2007; Cai et al., 2012; Murnaghan, Sihvonen, Leatherdale, & Kekki, 2007; Murnaghan, Leatherdale, Sihvonen, & Kekki, 2009; Trinidad, Gilpin, & Pierce, 2005).

In an effort to assess the impact of interventions designed to positively influence adolescent smoking behavior, studying 10th grade students could provide valuable information. In addition, the relatively high level of exposure to smoking behavior that most 10th graders

report (Sherman & Primack, 2009), studies at this stage may provide the opportunity to understand the impact of targeted public health-oriented interventions within high schools.

Exposure to Tobacco

A significant risk factor in the development of smoking-related morbidity and mortality is the level of exposure to tobacco. There is evidence that the higher the exposure to tobacco, the greater the likelihood of developing health problems. This dose-response relationship highlights the importance of adolescent smoking. Given the highly addictive nature of smoking, early initiation of smoking could result in a more prolonged lifetime exposure, as well as the associated health issues. Furthermore, smoking initiation during adolescence carries the greatest risk of becoming a regular smoker, and significantly reduces the likelihood of quitting (Sherman & Primack, 2009).

The purpose of this study was to evaluate the relationship between school district tobacco policies and student smoking rates. The hypothesis for this study was that smoking rates among students would vary between school districts according to the nature of the school tobacco policy. Specifically, it was expected that school districts with stricter tobacco policies will have lower student smoking rates.

Literature Review

Many antecedents with strong influences on adolescent smoking behavior have been described. Some examples include low socioeconomic status, gender, peer pressure, positive images of tobacco use in the media, low parental education and mental illness (Richardson et al., 2009). A more detailed analysis of risk factors adolescent smoking follows.

Race

The variability seen in the smoking rates among adolescents of different races could be a result of a number of confounders. As previously described, SES can influence smoking rates. Given that SES is not evenly distributed among different races, it stands to reason that smoking rates would not be evenly distributed either. Furthermore, there is evidence that demonstrates significant variability in how often adolescents of different races are asked to provide proof of age when attempting to purchase tobacco products (Sherman & Primack, 2009). These discrepancies have the potential to create differences in the observed smoking rates among adolescents of different races.

Gender

There have been numerous studies that sought to compare smoking rates between adolescent boys and girls. Although there have been conflicting results, there appears to be some evidence suggesting that adolescent girls have greater success when attempting to purchase cigarettes (Rosen & Maurer, 2008). This could conceivably lead to increased smoking rates among girls as a result of greater availability. However, overall smoking has not been shown to be consistently higher in either adolescent boys or girls (Rosen & Maurer, 2008).

Age and Education

The relationship between age and smoking behavior is somewhat complicated. Younger adolescent may not have developed adequate cognitive abilities to make informed decisions about using tobacco (Rosen & Maurer, 2008). In addition, interpersonal skills that are required to safely navigate through their social environment are still in the process of maturing. Perhaps the most overt issue regarding age is whether the adolescent appears to be old enough to legally acquire and consume tobacco products. As expected, there are a host of factors that determine

the perceived age of adolescents, thereby adding to the complexity of age as a determinant of smoking behavior.

Peers and Family

Social influences appear to be one of the strongest predictors of adolescent tobacco use (Simons-Morton & Farhat, 2010). The attitudes towards smoking that are manifested by peers, family, friends, and schools are some examples of factors that have been shown to affect smoking habits in adolescents (Kobus, 2003; Murnaghan et al., 2007). Furthermore, social networks have been demonstrated to impact smoking rates. For example, participation in organized sports at the high school and college level has been shown to decrease cigarette smoking (Lisha & Sussman, 2010). Adolescents that are identified as isolates have higher smoking rates than their peers that belong to a social network (Seo & Huang, 2012).

Tobacco Policy

School tobacco policies have been shown to influence smoking among students (Barnett et al., 2007; Cai et al., 2012; Murnaghan et al., 2007; Murnaghan et al., 2009; Trinidad et al., 2005). Aside from the possible exposure to second-hand smoke in school environments, schools that are not 100% tobacco-free may provide school age children an opportunity to experiment with smoking behavior that can result in students becoming regular smokers. Most school district authorities recognize the importance of maintaining healthy environments for both staff and students and have adopted tobacco use policies in an effort promote safety on school grounds and school-sponsored events. However, the specific details of these policies are not universal and tend to have significant variability in how they are implemented.

In addition to the school district policies that influence tobacco use among adolescents, youth access restrictions and mass media campaigns have been shown to reduce smoking rates

by 30% and 6% respectively. Also, increasing the cost of cigarettes through taxation has been shown to be an effective strategy in reducing smoking rates among the general public (Chaloupka, Straif, Leon, & Working Group, International Agency for Research on Cancer, 2011; Chaloupka, Yurekli, & Fong, 2012).

Ohio law prohibits students from using or possessing tobacco products on school property. However, the law does not govern the use of tobacco by staff or visitors to the school, thus allowing the potential for students to become exposed to tobacco use. In response to the shortcomings of existing laws, the Ohio Department of Health (ODH) is promoting a 100 percent tobacco free policy for all school districts. This initiative highlights the importance of eliminating tobacco from all school property by prohibiting all tobacco use by everyone including staff, faculty, visitors, and students on school grounds, and at all school events, at all times (ODH, 2013). In addition, the policy results in additional benefits such as reduced maintenance costs, decrease in risk of fire, and the protection of students against the development of tobacco addiction. Although a few school districts in Ohio have adopted a 100% tobacco-free concept, uptake of this policy has not been universal.

Methods

Setting and Sample

All participating schools were located in Montgomery County, Ohio. Montgomery County is a metropolitan county in southwest Ohio.

Data Collection

This analysis used two existing data sources. Student smoking behavior was extracted from the Dayton Area Drug Survey (DADS) and was obtained through the Center for Interventions, Treatment & Addictions Research (CITAR) at Wright State University Boonshoft

School of Medicine. School district tobacco policies were reviewed via online administrative documents found on the school websites.

Student smoking.

Data on student smoking behavior was obtained from the DADS (Falck, 2012). The DADS is a biennial, cross-sectional study designed to assess the incidence and prevalence of non-medicinal drug use among students in grades 7-12 attending schools in the Dayton, Ohio area. The DADS is conducted every two years by the CITAR. Area school districts were invited to participate at no charge. Students complete the survey questionnaire on an anonymous and voluntary basis in accordance with a protocol provided by the university's Institutional Review Board (IRB). Access to DADS data for analysis in this study was also granted by the university's IRB. Data were available for all grades from each of the participating schools. However, the analysis provided in this paper is focused on students in the 10^{th} grade.

DADS consists of a total of 62 questions covering a wide range of substance-related issues including tobacco, alcohol, marijuana, and cocaine, the focus of this review is on adolescent smoking. The first three questions of the survey – *"Have you ever smoked cigarettes?"*, *"How frequently have you smoked cigarettes during the past 30 days?"* and *"When (if ever) did you first smoke tobacco"* - measure smoking history, smoking initiation, and smoking frequency. Each question in the survey provided the participants with a range of possible responses that were scored on a Likert scale. For example, the question *"Have you ever smoked cigarettes?"* had possible responses of *"never"*, *"once or twice"*, *"occasionally"*, *"regularly in the past"* and *"regularly now"*. Demographic data collected in the DADS included current grade, gender, and race. Race was further defined as "white", "Asian-American", "Afro-American", and "other".

Tobacco policy.

Assessment of each school district tobacco policy was conducted by using the ODH recommendations for a tobacco-free campus as the standard unit of measurement. This policy strongly encourages the inclusion of explicit rules and consequences regarding the use of tobacco on school grounds, as well as all school-sponsored events. In addition, the ODH advocates for tobacco education and cessation programs. (Details regarding the ODH scoring rubric are found in Appendix A). Policies of all 16 school districts in Montgomery County were reviewed in order to assess their level of compliance with the ODH recommendation for a 100% tobacco-free campus.

Data Analysis

Raw data from the DADS was compiled into clinically relevant groups for further assessment and analysis. The results were stratified according to gender, race, and smoking frequency. The aggregate data obtained from the DADS provided baseline information for all the schools that participated. This allowed for the comparison of student smoking behavior of individual school districts to the overall average in the region.

In order to describe the relationship between tobacco policy and student smoking rates, schools participating in the DADS were cross-referenced with those that were evaluated in the policy review (Figure 1). In an effort to maintain confidentiality, the names of individual school districts were not used.

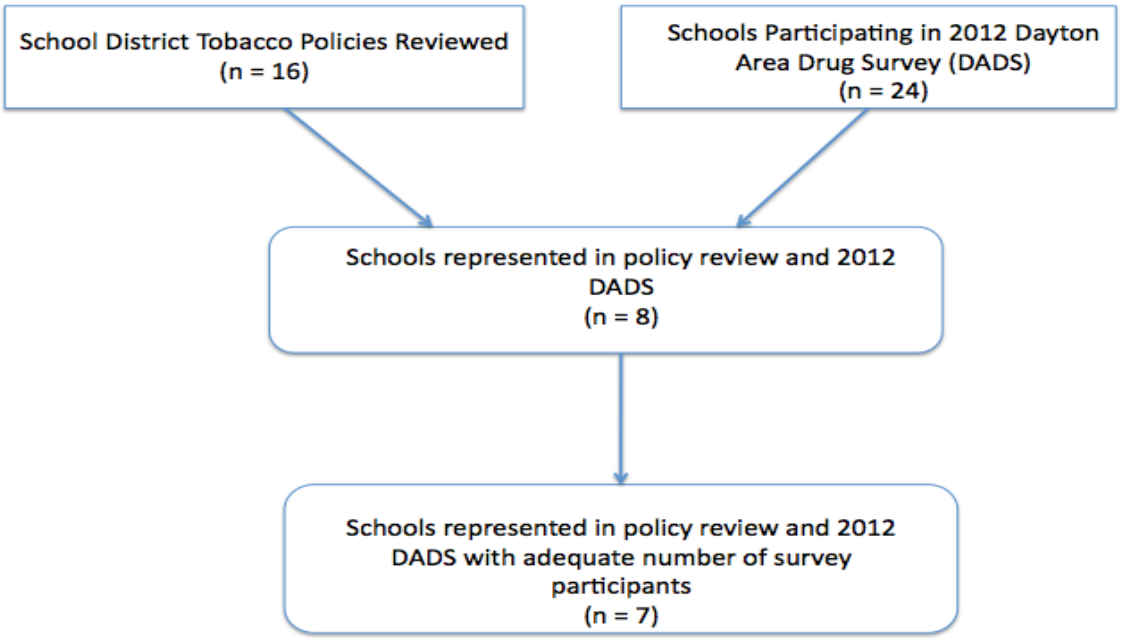

Figure 1. Flow chart describing the algorithm for inclusion in the analysis of the relationship between school district tobacco policies and smoking rates among students.

Results

Policy Review

A total of 16 Montgomery county school districts tobacco policies were evaluated for compliance with ODH recommendations. All school districts were found to have policies that clearly defined tobacco and the use of various forms of tobacco. In addition, all policies made specific references to both staff and students with regard to the use of tobacco products. Variation in policies were observed in a number of areas including tobacco education, requirement to post signs about the policy, punishment for violation of the policy, extension to all school-sponsored events, and explicit extension of the policy to include all visitors. Of note, only one district policy made reference to tobacco education.

Compliance ranged from a minimum of 56.5% to a maximum of 91.3% with the mode at 78.3% (Figure 2). The mean level of compliance with ODH recommendation was 76.6% with a

standard deviation of 8.5%. Data analysis with the Kolmogorov-Smirnov test revealed a non-normal distribution of compliance scores.

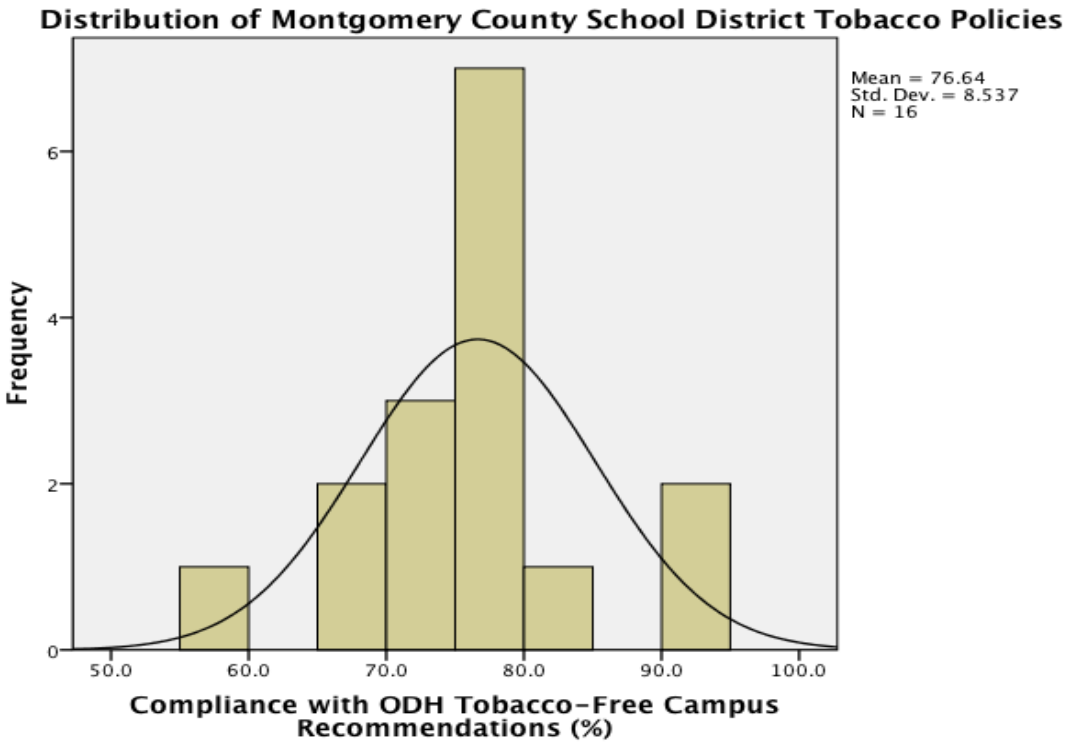

Figure 2. Compliance with Ohio Department of Health (ODH) tobacco-free campus recommendations by school districts in Montgomery County.

Dayton Area Drug Survey (DADS)

A total of 24 schools participated in the 2012 DADS. The number of students from each school that participated in the study varied significantly, the smallest number of student by school was 11. The aggregate data from the DADS used for analysis excludes the school with the lowest participation. Of the remaining 23 schools, a total of 1,684 10th grade students completed the first and second survey questions, while 1,685 students completed the third question. The demographic distribution according to race was 91.8%, 3.4%, and 4.8% for white, Asian-American, and Afro-American respectively (Figure 3). This aggregate data served as a reference point for evaluating individual schools within Montgomery County.

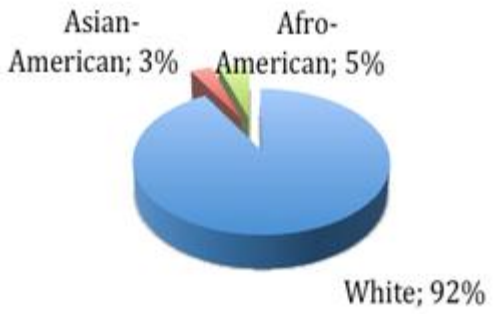

Figure 3. Participation in 2012 Dayton Area Drug Study (DADS) by race (percentages rounded).

Question #1 - Have you ever smoked cigarettes?

There were a total of 1,649 responses to this question. A total of 1,227 students (74.4%) reported that they never smoked cigarettes. For the less strict school, the proportion of students reporting that they never smoked cigarettes was 71.6%, with the more strict school having a rate of 76.8%. A history of smoking - defined as responding either "regularly now" or "regularly in the past" - was present in 7.0% of responders. The proportion of students with history of smoking in the less strict and more strict school districts were 8.8% and 5.7% respectively (Table 1).

Table 1

10th Grade Student Smoking History in 2012 Dayton Area Drug Survey

	Never	History of Smoking	Total # of Students	% Students with Smoking History*	% Students who Never Smoked
Aggregate from DADS	1227	116	1649	7.0%	74.4%
Less Strict School	234	29	327	8.8%	71.6%
More Strict School	324	24	421	5.7%	76.8%

*Smoking history was defined as responding either to "smoked regularly in the past" or "smoke regularly now".

Question #2 - How frequently have you smoked cigarettes during the past 30 days?

There were a total of 1,650 responses to this question. Smoking frequencies of 10, 20, and greater than 20 cigarettes a day were collected and aggregated to determine students who

smoked at least a half-pack per day (ppd). A smoking history of at least a ½ ppd was present in 2.2% of students. In the less strict and more strict schools, these proportions were 2.4% and 1.9% respectively (Table 2).

Table 2

Students Smoking at Least ½ Pack Per Day (ppd) in 2012 Dayton Area Drug Survey

	Students Smoking at Least 1/2 ppd	Proportion of 1/2 ppd Smokers
Aggregate from DADS	37	2.2%
Less Strict School	8	2.4%
More Strict School	8	1.9%

Question #3 - When (if ever) did you first smoke tobacco?

There were a total of 1,650 responses to this question. The largest overall proportion of smoking initiation (10.5%) occurred in 7th and 8th grade (Table 3). The aggregate data from DADS revealed that the total proportion of students who reported smoking initiation prior to the 10th grade was 22.3%, compared to 28.4% and 22.2% for the less strict and more strict schools respectively.

Table 3

Initiation of Smoking by Students in 2012 Dayton Area Drug Survey

	<Grade 6	Grade 7 or 8	Grade 9	Grade 10
Aggregate from DADS	65 (3.9%)	173 (10.5%)	130 (7.9%)	61 (3.7%)
Less Strict School	19 (5.8%)	50 (15.3%)	24 (7.3%)	0 (0.0%)
More Strict School	19 (4.5%)	59 (14.1%)	15 (3.6%)	n/a*

*No grade 10 data was available for the stricter school.

Tobacco Policy and Tobacco Use

Using the coding key from the DADS, eight of the 24 participating schools were identified as belonging to the districts in Montgomery County whose tobacco policies had been

evaluated for compliance with ODH recommendations (Figure 3). For the purposes of statistical analysis, the school with 11 student responses to the DADS was excluded as the calculated rates from this small sample contributed outliers that significantly skewed the results. Within the remaining seven schools, the number of students in each school that completed the survey ranged from 79 to 421. One school had a score of 69.6%, while the other six schools had a score of 78.3% on the ODH scoring rubric. Due to this small variation in scores, the correlation between policies and responses to tobacco-related questions did not achieve statistical significance.

However, the results did allow for direct comparison between the school with the lowest score and another school with a similar number of participants with a higher score on the ODH rubric. Construction of a 2x2 table was performed using the less strict policy as the exposure variable, and the tobacco use as the outcome. Odds ratios and chi-squares with associated p-values were calculated for the outcomes "regular smoker in the past", "regular smoker now", "smoking at least ½ pack per day", and "smoking initiation prior to 10^{th} grade". Of these variables, statistically significant odds ratios were found for "regular smoker in the past" (OR= 2.01) and "smoking initiation prior to 10^{th} grade (OR=1.39). Data used in the calculation of ORs are found in Tables 4 and 5.

Table 4

Contingency 2x2 Table for Calculation of Odds Ratios using Less Strict School as the Exposure and Regular Smoker in the Past as Outcome

	Regular Smoker in the Past	**Never Smoked**	**Total**
Less Strict School	18 (7.1%)	234 (92.9%)	252
More Strict School	11 (3.2%)	324 (96.7%)	335

Chi-Square = 4.5 with a statistically significant p-value of 0.03; df = 1.
OR = 2.01

Table 5

Contingency 2x2 Table for Calculation of Odds Ratios using Less Strict School as the Exposure and Smoking Initiation prior to 10th Grade as Outcome

	Smoking Initiation prior to 10th grade	**Never Smoked**	**Total**
Less Strict School	93 (28.4%)	234 (71.6%)	327
More Strict School	93 (22.2%)	326 (77.8%)	419

Chi-Square = 3.8 with a statistically significant p-value of 0.05; df = 1.
OR = 1.39

Discussion

The vast majority of students in this study were not regular smokers. The prevalence of smoking among adolescents participating in the 2012 DADS was 7.0%, while the proportion of students who reported never smoking was 74.4%. These rates are consistent with the literature (Barnett et al., 2007; Cai et al., 2012; Murnaghan et al., 2007; Spyratos et al., 2012; Warren et al., 2008) and are likely a reflection of numerous factors including the highly publicized harmful effects of smoking, accessibility of tobacco products, and shifts in social norms with regard to smoking behavior.

Variation in student smoking rates was observed between schools. This variation has been explained by a number of variables including tobacco policies, health education, school ethos, and punishment for non-compliance with existing tobacco policies (Murnaghan et al., 2007; Murnaghan et al., 2009). Although the small sample size of this study did not allow overarching conclusions to be drawn regarding tobacco policies and smoking behavior among adolescents, there was indeed a trend that supported existing literature regarding the advantages of stricter policies.

The less strict school in this study had more regular smokers when compared with the more strict school, thereby illustrating the influence of policies on tobacco use among students

(Table 4). Furthermore, the odds ration of 1.39 suggested that students who attended schools with a less strict tobacco policy were more likely to initiate smoking prior to the 10th grade (Table 5). As for the amount of cigarettes smoked by students on a regular basis, this study did not show statistically significant differences between schools according to the strictness of their tobacco policies. It is unclear whether these results were representative of true homogeneity between schools as opposed to being the consequence of a small sample size.

Public Health Implications

When considering the potential health implications of long-term tobacco use, an overall smoking rate of 7% among students is cause for concern. It should also be noted that these data represent the behavior of students in 10th grade and as such does not capture any initiation or other tobacco-related behavior that may occur during the last two years of high school. Although 7% may appear to be only a small proportion, it does represent a significantly large amount of the population that will be at risk of morbidity and mortality that is almost entirely preventable. In addition, the early age at which tobacco initiation tends to occur serves to increase the duration of exposure, thereby increasing the likelihood of the associated adverse effects.

Although all school district policies that were reviewed had sections dedicated to tobacco, none were found to be completely compliant with the ODH recommendation for a 100% tobacco-free campus. Comprehensiveness of the policies to include all individuals attending school sponsored events, as well as clearly defined penalties for policy violations represented the majority of the shortcomings. Of particular concern was the tendency for policies to be deficient in the areas of tobacco education and cessation programs. Thus, the need for increased tobacco education among adolescents is an important finding that is highlighted by this study. Public health initiatives that adequately target adolescents in the setting of a school

environment could potentially decrease student exposure to smoking and other forms of tobacco consumption, thereby decreasing the risk of developing tobacco-associated illnesses.

The Global Youth Tobacco Surveillance (GYTS) 2000-2007 found that 80% of adolescents favored a ban of smoking in public places, while 70% of current smokers expressed their wishes to quit smoking (Warren et al., 2008). The GYTS also found that 6 out of 10 adolescents were taught about the harms of smoking in school. These data suggests that adolescents are aware of the adverse consequences of tobacco use and may be at a stage of change that would be receptive to appropriate policies that are aimed at protecting them from exposure to tobacco.

Results of this study further illustrate the burden of disease in the general population that is associated with exposure to tobacco. Although the majority of students reported never smoking (74.4%), nearly a third of the remaining students with tobacco exposure had a history of smoking "regularly now" or "regularly in the past". Given that adolescent smoking is a strong predictor of chronic tobacco use as an adult, the significant smoking history in this subpopulation of students represents significant future health problems.

Limitations

Participation in the 2012 DADS was optional, therefore creating the possibility of bias in a number of areas. There could exist a potential difference in both tobacco use and school district tobacco policy enforcement between schools that decided to participate in the DADS and schools that opted out of the survey. Random selection of participating schools was not feasible. All grade levels were not equally represented throughout the DADS as a result of the various compositions of schools within each district. Furthermore, the smoking rates used for this study were computed by using the responses of mostly 10^{th} grade students. However, responses from

9th graders were used for two schools that participated in DADS that did not have any 10th grader responses.

The survey tool itself is limited by the fact that students are not obligated to participate, and those that do may not always respond truthfully for fear of negative consequences. This introduces the possibility for response bias, as well as limitations relating to the validity of the responses given on the survey as a result of under-reporting of tobacco use. However, the DADS explicitly states that responses to the survey are confidential and will not be disclosed.

Finally, there were no adjustments made for variations that existed between the average socio-economic status (SES) of students attending schools in different districts. Given that SES has been identified as a risk factor for tobacco use (Henderson, Ecob, Wight, & Abraham, 2008; Spyratos et al., 2012), it stands to reason that SES may account for some of the variability in smoking rates that was observed in this study.

Conclusion

Tobacco use among adolescents remains a significant public health issue in Montgomery County. Approximately 90% of smoking-related deaths occur in people who began smoking before the age of 18 (Sherman & Primack, 2009). Therefore, it is imperative to implement appropriately targeted interventions that focus on decreasing adolescent exposure, while providing education about the harmful effects of tobacco. Public health policy is a powerful tool for creating environments that support healthy behaviors. Effective and comprehensive tobacco policies can aid in decreasing exposure to the harmful effects associated with adolescent smoking.

Although the size and scope of this small study does not allow for accurate inferences to be made regarding the general population, it does, however, highlight the prevalence of smoking

among adolescents in Montgomery County and the opportunities to improve school tobacco policies. Notwithstanding the previously noted limitations, there does appear to be value in following the ODH recommendations for a 100% tobacco-free campus. Continued surveillance of adolescent tobacco use in Montgomery County has the potential to provide valuable information to help guide resource allocation. Public Health needs to continue to encourage school districts to participation in future surveys like the DADS.

References

Barnett, T. A., Gauvin, L., Lambert, M., O'Loughlin, J., Paradis, G., & McGrath, J. J. (2007). The influence of school smoking policies on student tobacco use. *Archives of Pediatrics and Adolescent Medicine, 161*(9), 842-848. doi:10.1001/archpedi.161.9.842

Cai, Y., Lu, L., Li, N., Zhu, J., He, Y., Redmon, P., . . . Ma, J. (2012). Social, psychological, and environmental-structural factors associated with tobacco experimentation among adolescents in Shanghai, China. *International Journal of Environmental Research and Public Health, 9*(10), 3421-3436. doi:10.3390/ijerph9103421; 10.3390/ijerph9103421

Centers for Disease Control and Prevention. (2013). *Lung Cancer*. Retrieved August 12, 2013 from http://www.cdc.gov/cancer/lung/statistics/index.htm

Chaloupka, F. J., Straif, K., Leon, M. E., & Working Group, International Agency for Research on Cancer. (2011). Effectiveness of tax and price policies in tobacco control. *Tobacco Control, 20*(3), 235-238. doi:10.1136/tc.2010.039982; 10.1136/tc.2010.039982

Chaloupka, F. J., Yurekli, A., & Fong, G. T. (2012). Tobacco taxes as a tobacco control strategy. *Tobacco Control, 21*(2), 172-180. doi:10.1136/tobaccocontrol-2011-050417; 10.1136/tobaccocontrol-2011-050417

Falck, R. (2012). *Dayton Area Drug Survey.* Unpublished findings, Center for Interventions, Treatment & Addictions Research, Wright State University Boonshoft School of Medicine, Dayton, Ohio.

Henderson, M., Ecob, R., Wight, D., & Abraham, C. (2008). What explains between-school differences in rates of smoking? *BMC Public Health, 8*, 218. doi:10.1186/1471-2458-8-218; 10.1186/1471-2458-8-218

Kobus, K. (2003). Peers and adolescent smoking. *Addiction, 98*(Suppl 1), 37-55.

Lisha, N. E., & Sussman, S. (2010). Relationship of high school and college sports participation with alcohol, tobacco, and illicit drug use: A review. *Addictive Behaviors, 35*(5), 399-407. doi:10.1016/j.addbeh.2009.12.032; 10.1016/j.addbeh.2009.12.032

Moolchan, E. T., Ernst, M., & Henningfield, J. E. (2000). A review of tobacco smoking in adolescents: Treatment implications. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*(6), 682-693. doi:10.1097/00004583-200006000-00006

Murnaghan, D. A., Leatherdale, S. T., Sihvonen, M., & Kekki, P. (2009). School-based tobacco-control programming and student smoking behaviour. *Chronic Diseases in Canada, 29*(4), 169-177.

Murnaghan, D. A., Sihvonen, M., Leatherdale, S. T., & Kekki, P. (2007). The relationship between school-based smoking policies and prevention programs on smoking behavior among grade 12 students in Prince Edward Island: A multilevel analysis. *Preventive Medicine, 44*(4), 317-322. doi:10.1016/j.ypmed.2007.01.003

Ohio Department of Health [ODH]. (2013). *Tobacco-free schools.* Retrieved August 12, 2013 from http://www.healthyohioprogram.org/healthylife/tobc2/tprevention/tobfreeschool.aspx

Richardson, L., Hemsing, N., Greaves, L., Assanand, S., Allen, P., McCullough, L., . . . Amos, A. (2009). Preventing smoking in young people: A systematic review of the impact of access interventions. *International Journal of Environmental Research and Public Health, 6*(4), 1485-1514. doi:10.3390/ijerph6041485; 10.3390/ijerph6041485

Rosen, I. M., & Maurer, D. M. (2008). Reducing tobacco use in adolescents. *American Family Physician, 77*(4), 483-490.

Seo, D. C., & Huang, Y. (2012). Systematic review of social network analysis in adolescent cigarette smoking behavior. *The Journal of School Health, 82*(1), 21-27. doi:10.1111/j.1746-1561.2011.00663.x; 10.1111/j.1746-1561.2011.00663.x

Sherman, E. J., & Primack, B. A. (2009). What works to prevent adolescent smoking? A systematic review of the national cancer institute's research-tested intervention programs. *The Journal of School Health, 79*(9), 391-399. doi:10.1111/j.1746-1561.2009.00426.x; 10.1111/j.1746-1561.2009.00426.x

Simons-Morton, B. G., & Farhat, T. (2010). Recent findings on peer group influences on adolescent smoking. *The Journal of Primary Prevention, 31*(4), 191-208. doi:10.1007/s10935-010-0220-x; 10.1007/s10935-010-0220-x

Spyratos, D. G., Pelagidou, D. T., Chloros, D., Haidich, A. B., Karetsi, E., Koubaniou, C., . . . Sichletidis, L. T. (2012). Smoking among adolescents in northern Greece: A large cross-sectional study about risk and preventive factors. *Substance Abuse Treatment, Prevention, and Policy, 7*, 38-597X-7-38. doi:10.1186/1747-597X-7-38; 10.1186/1747-597X-7-38

Trinidad, D. R., Gilpin, E. A., & Pierce, J. P. (2005). Compliance and support for smoke-free school policies. *Health Education Research, 20*(4), 466-475. doi:10.1093/her/cyg143

Warren, C. W., Jones, N. R., Peruga, A., Chauvin, J., Baptiste, J. P., Costa de Silva, V., . . . Centers for Disease Control and Prevention. (2008). Global youth tobacco surveillance, 2000-2007. *Morbidity and Mortality Weekly Report, 57*(1), 1-28.

Appendix A: ODH Scoring Rubric for 100% Tobacco-free Campuses

Target	Key Element	Explanation
Students	All tobacco (tobacco free only)	Policy prohibits use of all forms of tobacco, not just cigarettes/smoking.
	In any school facility or building	Policy specifies prohibition within all school-owned buildings.
	On school grounds, athletic grounds or parking lots.	Policy specifies prohibition on grounds, including athletic grounds or parking lots. References to "premises" include both buildings and grounds, and thus cover this criteria.
	School-sponsored events off campus	Policy specifies prohibition at off-campus events sponsored by the school.
	Enforcement is discussed	Policy mentions enforcement; can reference who is responsible, by what means the policy will be enforced, or consequences of violation.
	At all times (24/7)	Policy specifies prohibition is in effect at all times; can include such terminology as "24 hours a day," "365 days a year," "at all times."
	Possession is prohibited	Policy specifies that students are not permitted to possess tobacco.
Staff	All tobacco (tobacco free only)	Policy prohibits use of all forms of tobacco, not just cigarettes/smoking.
	In any school facility or building	Policy specifies prohibition within all school-owned buildings.
	On school grounds, athletic grounds or parking lots.	Policy specifies prohibition on grounds, including athletic grounds or parking lots. References to "premises" include both buildings and grounds, and thus cover this criteria.
	School-sponsored events off campus	Policy specifies prohibition at off-campus events sponsored by the school.
	Enforcement is discussed	Policy mentions enforcement; can reference who is responsible, by what means the policy will be enforced, or consequences of violation.
	At all times (24/7)	Policy specifies prohibition is in effect at all times; can include such terminology as "24 hours a day," "365 days a year," "at all times."
Visitors	All tobacco (tobacco free only)	Policy prohibits use of all forms of tobacco, not just cigarettes/smoking.
	In any school facility or building	Policy specifies prohibition within all school-owned buildings.
	On school grounds, athletic grounds or parking lots.	Policy specifies prohibition on grounds, including athletic grounds or parking lots. References to "premises" include both buildings and grounds, and thus cover this criteria.
	School-sponsored events off campus	Policy specifies prohibition at off-campus events sponsored by the school.
	Enforcement is discussed	Policy mentions enforcement; can reference who is responsible, by what means the policy will be enforced, or consequences of violation.
	At all times (24/7)	Policy specifies prohibition is in effect at all times; can include such terminology as "24 hours a day," "365 days a year," "at all times."
General	Rationale for policy	Policy provides a rationale or reasoning behind establishing a policy.
	All vehicles owned, rented, or leased by school district	Policy specifies that prohibition includes school vehicles, buses, etc.
	Educational reinforcement	Policy discusses educational component to supplement policy; can include references to tobacco prevention programming for students.
	Communication of policy or signage	Policy mentions how policy will be conveyed; posting of signs, placement in student and employee handbooks, etc.

Appendix B: List of Tier 1 Core Public Health Competencies Met

Domain #1: Analytic/Assessment
Identify the health status of populations and their related determinants of health and illness (e.g., factors contributing to health promotion and disease prevention, the quality, availability and use of health services)
Describe the characteristics of a population-based health problem (e.g., equity, social determinants, environment)
Use variables that measure public health conditions
Use methods and instruments for collecting valid and reliable quantitative and qualitative data
Identify sources of public health data and information
Recognize the integrity and comparability of data
Identify gaps in data sources
Adhere to ethical principles in the collection, maintenance, use, and dissemination of data and information
Describe the public health applications of quantitative and qualitative data
Use information technology to collect, store, and retrieve data
Describe how data are used to address scientific, political, ethical, and social public health issues
Domain #2: Policy Development and Program Planning
Gather information relevant to specific public health policy issues
Describe how policy options can influence public health programs
Explain the expected outcomes of policy options (e.g., health, fiscal, administrative, legal, ethical, social, political)
Gather information that will inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political)
Identify mechanisms to monitor and evaluate programs for their effectiveness and quality
Domain #3: Communication
Communicate in writing and orally, in person, and through electronic means, with linguistic and cultural proficiency
Participate in the development of demographic, statistical, programmatic and scientific presentations
Domain #4: Cultural Competency
Recognize the role of cultural, social, and behavioral factors in the accessibility, availability, acceptability and delivery of public health services
Domain #5: Community Dimensions of Practice
Recognize community linkages and relationships among multiple factors (or determinants) affecting health (e.g., The Socio-Ecological Model)
Demonstrate the capacity to work in community-based participatory research efforts
Identify stakeholders
Collaborate with community partners to promote the health of the population
Identify community assets and resources
Domain #6:Public Health Sciences
Identify prominent events in the history of the public health profession
Retrieve scientific evidence from a variety of text and electronic sources
Discuss the limitations of research findings (e.g., limitations of data sources, importance of observations and interrelationships)
Describe the laws, regulations, policies and procedures for the ethical conduct of research (e.g., patient confidentiality, human subject processes)
Partner with other public health professionals in building the scientific base of public health
Domain #7: Financial Planning and Management- N/A
Domain #8: Leadership and Systems Thinking
Incorporate ethical standards of practice as the basis of all interactions with organizations, communities, and individuals
Participate with stakeholders in identifying key public health values and a shared public health vision as guiding principles for community action