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Program Evaluation of Iowa's Synar Program

by

Mark John Dougherty

A Creative Component submitted to the graduate faculty and external member  
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

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Program of Study Committee:  
Mack C. Shelley, II, Major Professor  
Sedahlia Jasper Crase  
Fredrick Lorenz

Iowa State University

Ames, Iowa

2010

## EXECUTIVE SUMMARY

The Iowa Department of Public Health's (IDPH) Synar compliance reports have met the targeted non-compliance rate for the last several years. This rate is 20% or lower of the actual percentage of purchases made by teenager compliance inspectors at Iowa's tobacco retailers. A program evaluation was conducted as part of a masters-level project through Iowa State University (ISU) with the objective of offering insight for public program enhancement purposes, i.e., to improve, or at least maintain, the current level of the tobacco non-compliance rate.

The research for this evaluation is a non-experimental design that used pre-existing data (Chen, 2005). Synar's data sets from the last nine years (2001-2009) were used to conduct quantitative statistical analysis of the recorded variables. ISU Statistics and Political Science Professor M. Shelley, Ph.D., randomized yearly samples from the data and assisted IDPH with data analysis.

Results indicated that with the variable of vendor types, (a) *grocery stores* and *convenience stores* were statistically significant when compared to the reference group, *tobacco outlets*, i.e., there were proportionally a statistically significantly greater rate of citations issued to both grocery stores and convenience stores, with grocery stores having the most citations; (b) there was no statistically significant difference in citations issued among the four different law enforcement jurisdictions that inspected Iowa's tobacco retailers when compared to the reference group, *Alcoholic and Beverages Division (ABD) officials*; and (c) of the eight regions as defined by the U.S. Department of Agriculture's rural-urban continuum coding (U.S. Department of Agriculture [USDA], 2003), *Regions 4 and 7* were statistically significantly different from the reference group, *Region 9*, i.e., *Regions 4 and 7* proportionally received more citations when



compared to the reference group (see Study Design). *Region 4* is defined as nonmetropolitan counties with an urban population of 20,000 or more, adjacent to a metropolitan (metro) area. *Region 7* is defined as nonmetropolitan counties with an urban population of 2,500-19,999, not adjacent to a metro area.

## INTRODUCTION

Many teenagers in the United States are smoking, with at least 13% of U.S. teenagers smoking at least once a month. It is important to look at smoking rates among teenagers since more than 90% of current adult smokers report that they began smoking as teenagers (Williams, 2009). As a result of smoking, estimated annual health-care costs in Iowa directly related to tobacco use now total \$1 billion (Iowa Department of Public Health [IDPH], Division of Tobacco, 2010).

As early as 1992, Congress enacted legislation to help reduce tobacco use by introducing the Synar Amendment to the Alcohol, Drug Abuse, and Mental Health Administration Reorganization Act of 1992 (P.L. 102-321). The Amendment (Section 1926), named after its sponsor, Congressman Mike Synar of Oklahoma, was aimed at decreasing access to tobacco products among individuals under 18 years old. By 1996, the Substance Abuse and Mental Health Services Administration (SAMHSA) clarified the part of the Synar Amendment requiring states to enact and enforce laws prohibiting any manufacturer, retailer, or distributor from selling or distributing tobacco products to minors. To accomplish this, the Synar legislation required states to conduct random, unannounced inspections of tobacco outlets and report these findings annually to the Food and Drug Administration (FDA) (IDPH, Federal Regulation, 2009). With the federally mandated annual compliance rate at 80% or more, states that cannot meet the 80% threshold risk losing part of their Substance Abuse Prevention and Treatment block grant (U.S.

Department of Health and Human Services [USDHHS], Synar Regulation Implementation [SRI], 2003; D. Nicholls-Bloome, personal communication, May 5, 2010).

Meeting the federally mandated compliance rate depends on a multi-agency collaboration effort among different jurisdictions. The following outline describes the agencies involved and their respective roles in contributing to the overall success of Iowa's Synar policy (see Table 1).

#### Federal Level

- Food and Drug Administration (FDA)-- collects all states' annual Synar reports
- U.S. Department of Health and Human Services (USDHHS)
  - Substance Abuse & Mental Health Services Administration (SAMHSA)-- ensures that states comply with Synar legislation
  - Center for Substance Abuse and Prevention (CSAP)-- offers technical support to IDPH

#### State Level

- Iowa Department of Public Health-- sends annual Synar reports to the FDA
  - Division of Health Promotion, Prevention, and Addictive Behaviors-- conducts administrative duties, planning, contract management, and annual reporting to SAMHSA
  - Division of Tobacco Use, Prevention, and Control-- provides community education and media strategies, and stores the citation database

#### Contracted Agencies

- Iowa Alcoholic and Beverages Division (ABD) is responsible for tobacco inspections
  - Iowa law enforcement-- contracted by ABD to inspect tobacco retailers and issue fines to retail clerks that are non-compliant
    - Police inspect city retailers
    - Sheriff deputies inspect rural retailers

- Iowa State Patrol inspects retailers where police and sheriff departments refuse
- ABD officers inspect retailers on a minimal basis
- Iowa State University statistician conducts both sampling and analysis of the data (USDHHS, SRI, 2003); (USDHHS, Annual Synar Report [ASR], 42 U.S.C. 300x-26: Iowa, 2009; State of Iowa Alcoholic Beverages Division [ABD], Tobacco Program Overview, 2010).

Pursuant to Iowa's Code Chapter 135, IDPH is responsible for submitting this state's annual Synar reports to the FDA (IDPH, Prevention, 2002). These reports indicate yearly compliance rates by Iowa's tobacco retailers. D. Nicholls-Bloome, Executive Officer of the Division of Behavioral Health, IDPH, currently is responsible for the Synar submissions (USDHHS, ASR, 42 U.S.C. 300x-26: Iowa, 2009). She was very receptive to a proposed program evaluation of the Synar program's effectiveness in Iowa and gave permission for this research evaluation of data covering the past nine years (2001-2009) to be conducted.

Nicholls-Bloome's other responsibilities include tobacco education throughout Iowa as a result of the 1998 Master Settlement Agreement (MSA) between six tobacco companies and 46 states (and five U.S. territories). Iowa was awarded \$1.9 billion over 25 years from this settlement. One of the contingencies of this settlement was to educate the public, with greater emphasis on teenagers, about the dangers of tobacco and to encourage smoking cessation (Evans, 2006).

Since a large portion of money from the MSA is intended for educational purposes, literature review of tobacco education was also included in the program evaluation, for one cannot separate the operant conditioning factors-- fining retailers who sell tobacco to minors (mitigating teenagers' accessibility) and educating teenagers about all aspects of tobacco use-- to attain the overall goal of reducing teenage tobacco use (Evans, 2006; Vander Zanden, 1981).

This evaluation used the performance assessment model from the outcome evaluation approach defined as reviewing a program's success in reaching its goals. It also incorporated components of *Background Information Provisional Strategy* by researching population characteristics, law enforcement jurisdictions, types of tobacco-selling vendors, and other variables used for analysis (see Study Design) (Chen, 2005).

### IOWA'S SYNAR PROJECT DESCRIPTION

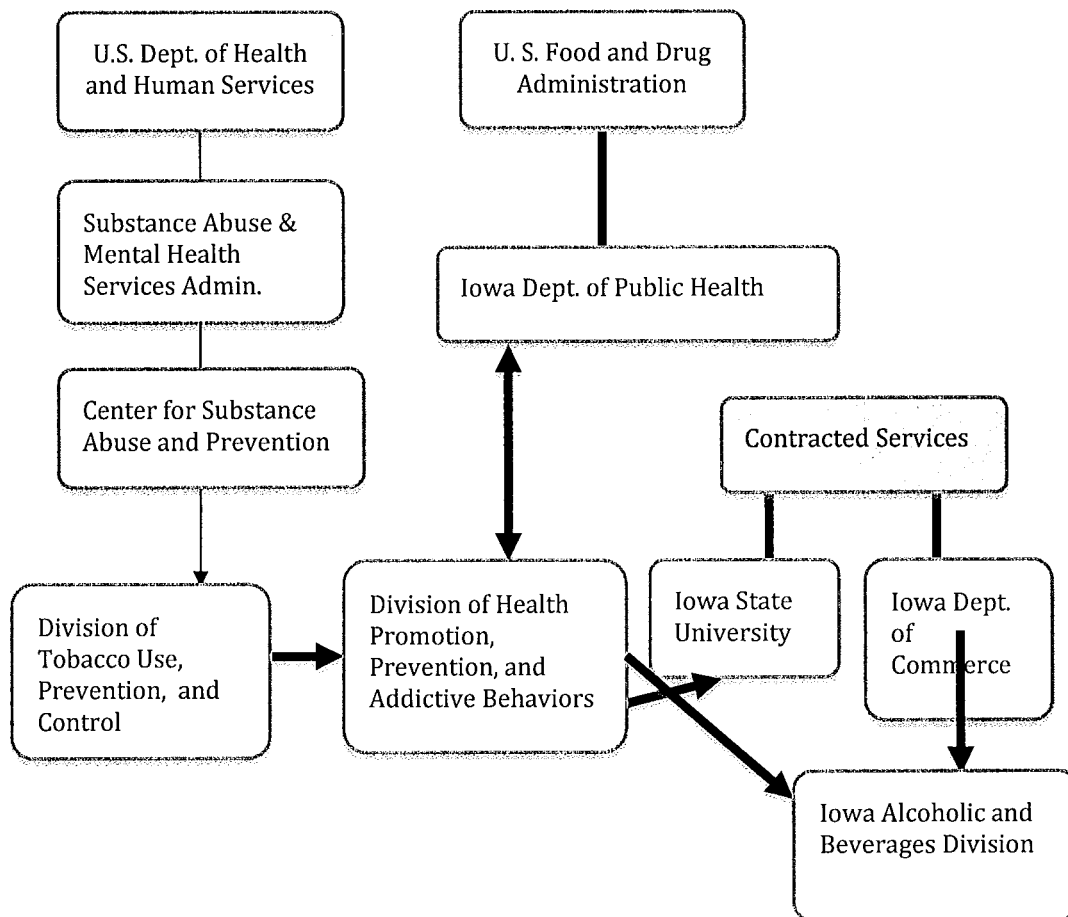
***Mission Statement:*** "The mission of the Division of Tobacco Use Prevention and Control is to establish a comprehensive partnership among state government, local communities, and the people of Iowa to foster a social and legal climate in which tobacco use becomes undesirable and unacceptable" (IDPH, Division of Tobacco, 2010, p. 1).

***Organizational Structure:*** The multi-agency structure that assists with Iowa's Synar program can be seen from Table 1. At the federal level, SAMHSA initiated the Synar legislation. CSAP is a division of SAMHSA that offers technical support to state agencies for assistance with regulation compliance. State Synar reports are sent to the FDA to be compiled with other states' Synar reports for federal review, with the assistance of USDHHS and its appropriate divisions (USDHHS, SRI, 2003).

At the state level, IDPH is responsible for overseeing the Synar program and submitting its annual reports to the FDA. This is accomplished by: the Division of Tobacco Use, Prevention, and Control, which is responsible for (a) community education, (b) media strategies, and (c) maintaining the citation database; and the Division of Health Promotion, Prevention, and Addictive Behaviors, which is responsible for (a) administration and planning, (b) contract management, and (c) annual reporting. The Division of Health Promotion, Prevention, and Addictive Behaviors contracts with ABD to conduct annual inspections (USDHHS, ASR, 42



U.S.C. 300x-26: Iowa, 2009). ABD, a division of Iowa's Commerce Department, is responsible for contracting with law enforcement agencies to conduct annual compliance checks with all of Iowa's approximately 5,000 tobacco retailers (ABD, Tobacco Penalty Outline , 2010). The data from reports completed by law enforcement officers is sent to ABD. ABD sends the data reports



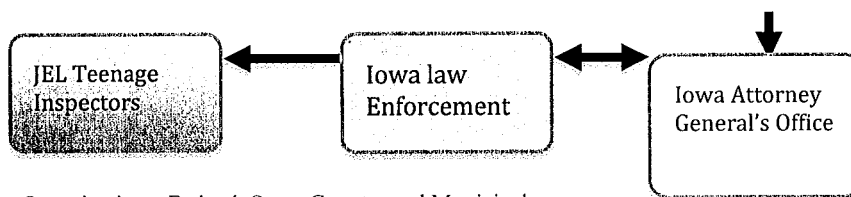


TABLE 1 Collaborative Organizations: Federal, State, County, and Municipal

to the Division of Health Promotion, Prevention, and Addictive Behaviors, which contracts with Iowa State University to conduct annual random sampling of the data and for its analysis using procedures outlined by SAMSHA. IDPH forwards this information to the FDA.

**Tobacco Inspections:** Law enforcement offices contract by ABD include city police departments, county sheriff departments, and the Iowa State Patrol (ABD, Tobacco Penalty Outline, 2010). S. Brown (personal communication, October 14, 2010), an ABD inspector for southwest Iowa, stated that for tobacco retailer inspections, he first contacts a town's police officer due to a city's dual jurisdiction of both the police and sheriff departments; then the sheriff's department for towns/area without a police force. If neither law enforcement officer wishes to participate in the compliance check, he will contact with that area's closest Iowa State Patrol Division for assistance, or in rare cases he conducts the inspections himself.

To conduct the tobacco inspections, a law officer hires a teenager who usually belongs to the organization, Just Eliminate Lies (JEL), which is funded by the CSAP (IDPH, Division of Tobacco, 2010; D. Nicholls-Bloome, personal communication, May 5, 2010). The teenager, referred to as a compliance inspector, usually wears a wireless transmitter so a law enforcement officer can hear the requested tobacco purchase from inside his/her car. If an illegal purchase is made, the law enforcement officer has up to 72 hours to fine the clerk with a simple misdemeanor. Law enforcement officers also notify the owner of the retail business if in non-

compliance. It is up to the city council of the vendor's location to decide whether or not to issue a fine to the retailer. If no fine is issued, the case is automatically referred to the Iowa Attorney General's Office, which will fine the retailers under civil penalty (S. Brown, personal communication, October 14, 2010; Iowa Department of Justice, 2004).

According to Iowa Code 453A, fines given to retail clerks for illegally selling tobacco to minors include the following:

- 1st violation-- \$100
- 2nd violation-- \$250
- 3rd and subsequent violations-- \$500

(ABD, Tobacco, 2003).

A retailer who sells tobacco products to an underage person faces the following civil penalties:

- 1st violation-- \$300 civil penalty
- 2nd violation-- (within two years) \$1,500 or 30-day suspension
- 3rd violation-- (within three years) \$1,500 and 30-day suspension
- 4th violation-- (within three years) \$1,500 and 60-day suspension
- 5th violation-- (within four years) revocation

(ABD, Tobacco, 2010).

***Iowa's Past & Present Synar Compliance Rate:*** Since the IDPH's goal for Synar was to have no greater than a 20% non-compliance rate by the year 2000, the effectiveness of the program's non-compliance rate had declined from 1995 to 2000, but not to the mandated 20% level (see Table 2). In 1999, IDPH's Center for Health Statistics director sought consultation from

### **1995-2000 Iowa's Synar Results**

	1995	1996	1997	1998	1999	2000
Non-compliance Rate	50%	40%	27%	36%	33%	29%

TABLE 2 1995-2000 Iowa's Synar Results (IDPH, SFY, 2000)

Iowa State University Professor of Statistics and Political Science, Mack Shelley. Shelley recommended a change in the sampling methodology. IDPH personnel had been sampling seven regions based on Managed Care Regions according to locations of substance-abuse prevention programs. Shelley advised that larger standard errors would exist with the current stratification in sparsely populated regions where fewer non-compliance checks were conducted (Synar Compliance Check [SFY], 2000). S. Brown (personal communication, October 14, 2010) stated that tobacco retailers were not taking the inspections very seriously from the onset of Synar. Shortly after 2000, ABD officials started to “crack down” (issue fines) on clerks and retailers who were non-compliant.

## Citation Percentages by Year

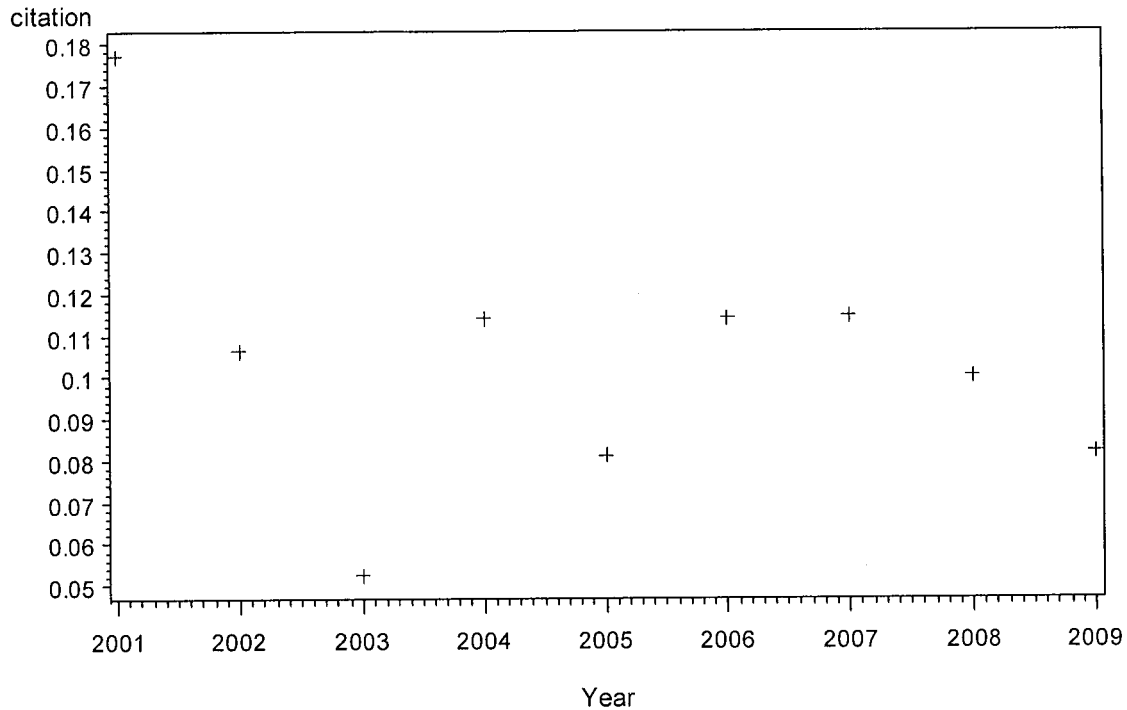


TABLE 3 Citation Percentages by Year (SAS)

Currently, the ABD reports that the non-compliance rate by Iowa's tobacco retailers is at 12% (ABD, Tobacco Program Overview, 2010). Table 3, which shows non-compliance Synar data from 2001 to 2009, the time frame used for this study, indicates that the non-compliance rate had declined over the nine-year period from the previous six-year period as a result of CSAP requiring a move away from regional sampling to single-statewide random sampling (M. Shelley, personal communication, November 19, 2010).

***Moderator/Mediator Effects:*** According to Chen (2005) and the International Agency for Research on Cancer ([IARC], 2008), using a moderating mechanism evaluation model mainly employs quantitative methods to construct models and analyze data. Synar uses tobacco-sales

compliance rates for its quantitative methods for analysis. Therefore, Synar is following the designs that have been established by international standards and experts.

Mediators, different from moderators, are variables situated at the causal pathway between a policy and its public health impact (see Table 4). For example, motivation not to start

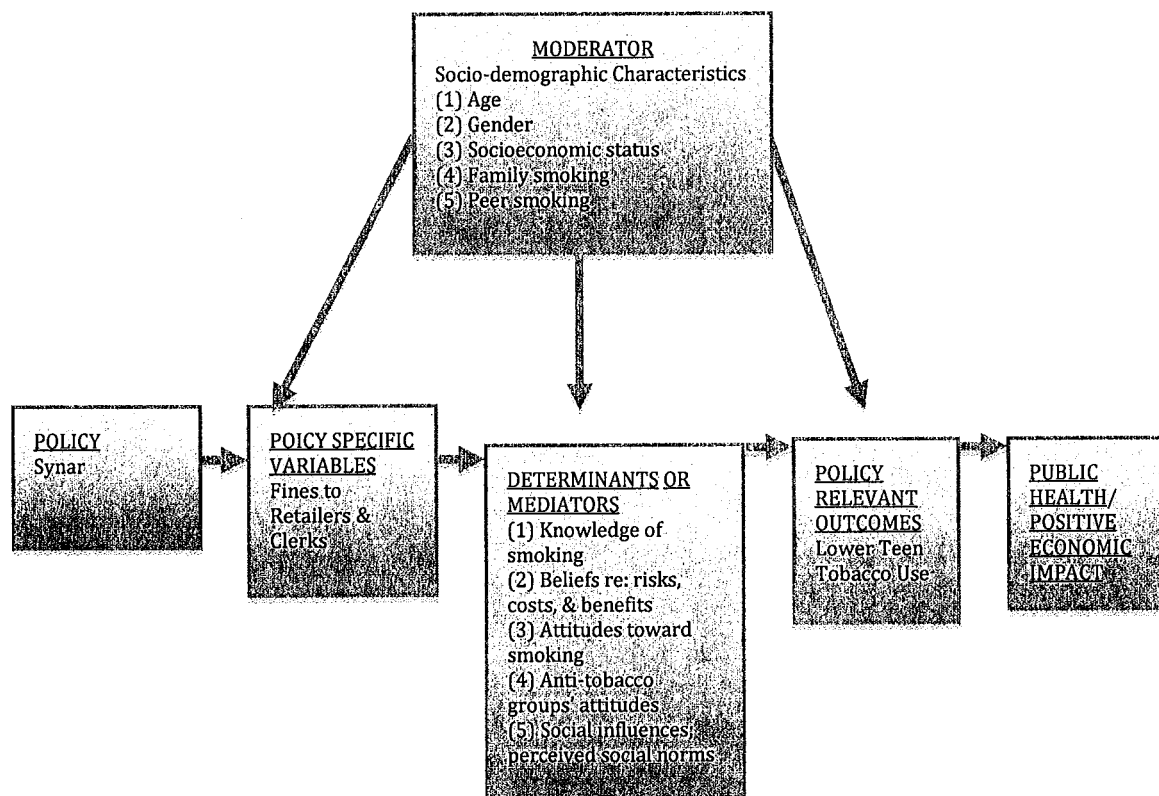


TABLE 4 Mediator & Moderator Effects (IARC, 2008)

smoking may increase after a training intervention to increase knowledge about the negative effects of tobacco use; and motivation, in turn, predicts whether teenagers will smoke.

Moderators are variables not directly affected by the specific policy under scrutiny, but are variables that influence the effect of that policy. For example, a training intervention (policy-

specific variable) may be effective among a certain age group, while being ineffective in another age group (IARC, 2008). Thus, the moderating variable in this example is age.

IARC (2008, pp. 109, 119) refers to the mediators as “cognitive variables” and moderators as “socio-demographic characteristics.” In the case of the Synar policy, knowledge of smoking and its risks and costs are two of many mediators in achieving a successful health outcome for the public at large. Psychosocial attributes of the public, which are strong determinants for smoking, are a few of many moderators that may not directly benefit the public at large through the Synar policy, yet will likely have some level of influence on that policy’s successful outcome (IARC, 2008). For example, if the public views smokers as using high-risk or reckless behaviors, then outcomes may result in attempts by some smokers to quit.

***Education to Retailers:*** Through the *Iowa Pledge Retailer Certification* program, funded by the MSA, ABD offers training to all tobacco retailers in the state of Iowa at no charge. The training focuses on how to identify false or altered identifications, as well as how to determine if a patron is old enough to purchase tobacco products. Training also covers penalties associated with illegal sales to minors and other regulations that govern tobacco permits in Iowa (ABD, Tobacco Education, 2010). After completion of the program, a retail clerk is issued a certification of completion (S. Brown, personal communication, October 14, 2010).

## LITERATURE REVIEW

***Assessments and Evaluations:*** According to IARC (2008, p. 2), the role of an evaluation is to “... determine the effects of the interventions, determine under what circumstances these effects occur, and help identify ways to make the interventions more effective. To do this

involves determining how the interventions work and diagnosing any problems that either prevent them from working as desired or diminishes their impact, in particular any differences of effects within the target population. Evaluation allows the most effective intervention to be maintained (and perhaps improved further) while less effective interventions are either improved or abandoned.”

Chen’s (2005) definition for evaluations is similar to that of IARC. He stated that it is essential, “... to grasp that evaluation’s ultimate task is to produce useful information that can enhance the knowledge and technology we employ to solve social problems and improve the quality of our lives” (Chen, 2005, p. 7).

From a cross-cultural perspective of worldwide tobacco programs, IARC (2008) found that methods based on quantitative measures can be used to gauge efforts (usually by the government) leading to enforcement. Any characterization of a policy intervention is not complete without assessing the actual enforcement of the measure. It simply is not enough to know that a policy intervention exists without knowing if it is being applied.

Monitoring systems could gather data on the existence of a clearly identified body in charge of enforcing the law and the staff of that specific agency or unit. A monitoring system should be assessed on its explanation of the measurement of enforcement used. The choice of approach and method must be explicit. For instance, some tobacco inspection programs use plain-clothed law enforcement officers to play the role of a clerk who documents both the number of illegal purchases made and those names of the under-aged teenagers who made such purchases. Other programs use different means to collect data and enforce the law (IARC, 2008).

Chen (2005) stated that effective policy evaluations isn’t just about collecting data; rather, evaluations must produce credible evidence for meeting internal and external validity, i.e.,



that states with Synar programs are actually measuring what they are supposed to be measuring with respect to program results. He added that randomization is still the most powerful technique for achieving internal validity when the goal is for evaluation effectiveness.

***Challenges to Iowa's Enforcement Effectiveness:*** Iowa's 2009 Synar report has a section named *Describe any Challenges the State Faces in Complying with the Synar Regulation*, with approximately 10 items that can be checked as problematic. Last year's report had the following item checked as a challenge for complying with Synar: "Geographic, demographic, and logistical considerations in conducting inspections" (USDHHS, ASR, 42 U.S.C. 300x-26: Iowa, 2009, p. 10). D. Nicholls-Bloome (personal communication, May 4, 2010) explained that in rural areas local tobacco retail personnel may know the law enforcement officer and/or the compliance inspector teen. As a result, she stated that accurate results could be compromised. ABD's S. Brown (personal communication, October 14, 2010) stated, however, that he takes extra precautions to avoid retailers identifying law enforcement officers and the teenagers by purposely contracting with a law enforcement officer two counties away from the inspection county. He added that most compliance inspector teens wear a wireless microphone, while law enforcement officers listen from inside the car. Brown stated that as a result of this procedure, compromising accurately inspected rural areas is mitigated.

Whether rural, urban, or suburban, the tobacco inspection process takes law enforcement officers and compliance inspection teenagers to many different types of vendors. The Centers for Disease Control and Prevention ([CDC], Point of Purchase, 2002), reported that convenience stores with gas, convenience stores without gas, and liquor stores offer environments where customers are exposed to higher levels of tobacco advertizing and promotional ads. The CDC (Point of Purchase, 2002) added that 75% of teenagers shop at convenience or convenience with

gas stores at least once a week. A recent compliance check in West Des Moines cited seven clerks with selling cigarettes to minors. The type of vendors, in descending order of frequency of citations issued, includes: three convenient stores, two grocery stores, one country club, and one pharmacy (Bolten, 2010).

***Education Effectiveness:*** According to Williams (2009), teenage smoking declined between the early 1990s and 2004. Since 2004, the rate has leveled off, or at least stalled. With those teenagers who continued smoking, girls increased at a faster rate than boys. Boys, on the other hand, have increased their use of smokeless tobacco products (CDC, Youth and Tobacco, 2010).

The initial decrease in teenage smoking was largely credited to higher cigarette prices and anti-smoking ads. In the last several years, however, there has been a decrease in anti-smoking ads, while cigarette advertizing is still allowed in grocery stores, convenience stores, and in magazines (Evans, 2006). Other important factors that contribute to teenagers' tobacco use include family members' tobacco use, peer groups' tobacco use, and one's socioeconomic status (Williams, 2009).

Parents who consistently disapprove of tobacco are less likely to have children who smoke (Williams, 2009). Williams (2009) found that parents who are positively engaged in their daughters' lives and have established rules and standards of behaviors have one-fourth the risk of their teens abusing substances when compared to parents who are not involved with their daughters.

Parents of teenagers who have a close relationship with their children may try to influence their children's friends, as Evans (2006) found peer groups to be a significant predictor of adolescent tobacco use. Teenagers with a peer group with at least half of the members who smoke are, likewise, more likely to smoke.

“Poor people smoke more than rich people...” (Williams, 2009, p. 74). Socioeconomic status is a factor in the prevalence for smoking. One in four teenagers in South Carolina smoke in any 30-day period. South Carolina is one of the poorest states and has an overall higher-than-average smoking rate (Williams, 2009).

Tobacco-use education is paramount, as Williams (2009) found that teenagers who regularly received anti-smoking messages were twice as likely not to smoke compared to teenagers who did not receive that exposure. Teenagers live in the present and many times feel indestructible. Therefore, successful education offers components related to the here-and-now when educating teenagers. For example, emphasizing the short-term consequences is most effective: yellow fingers and teeth, foul-smelling clothing and breath, and other negative health and cosmetic effects (Williams, 2009).

According to Williams (2009, p. 77), “... laughter is our best weapon in the war on teen smoking.” Humor has been found especially effective in communicating anti-smoking messages. Williams (2009) found that implementing humor is most effective when education emphasizes how the negative effects of smoking make teenagers less attractive to the great majority of the opposite sex.

## HYPOTHESES

As a result of the literature review and variables used in the Synar data set (see Methodology), the hypotheses include the following:

H1: The proportion of citations issued among the variable *vendors* selling tobacco will not significantly vary statistically from the reference group, after controlling for the variables of *clerkgender*, *stinggender*, *lawtype*, *region*, *county population*, *area*, and *year*.

H2: Due to the possibility of rural tobacco retailers personally knowing law enforcement officers, the proportion of citations issued by the interaction of the variables *sheriff* and rural *regions 8* and *9* will be statistically significantly lower than for other *regions*, after controlling for the variables *regions 2-7*, *clerkgender*, *stinggender*, *region*, *county population*, *area*, and *year* (USDA, 2003).

## STUDY DESIGN

Data for this research came from an existing, purposive sampling design, i.e., the original sampling was not at random (Rubin & Babbie, 1993). The original population was approximately 5,000 tobacco retailers in Iowa that were inspected by the ABD's annual comprehensive list of tobacco retailer licenses (ABD, Tobacco Education, 2010). The inspection sheets were given to an ISU statistician who used randomization to obtain completed data on approximately 610 to 732 (mean=671, excluding missing values) retailers per year between 2001 and 2009.

**Analysis:** Logistic regression was used to analyze the variables using the Statistical Analysis System (SAS) software package. The backward selection, reduced model comparison process was used obtain the best fitting model.

**The Sample:** The sample for this research came from annual, random sampling of data on retailers' tobacco-sales compliance rates during the nine years between 2001 and 2009, with a total of 7,106 cases. Missing cases (data) were not replaced using missing cases techniques, as it was not deemed necessary to achieve accurate proportional reporting of results using logistic regression. Reasons for missing data include:

- incomplete paperwork;
- retailer out of business;

- retailer did not renew tobacco license; and
- retailer seen as harmful for compliance inspector teen for reasons of it being a “strip joint” and/or “bikers’ bar” (S. Brown, personal communication, October 14, 2010).

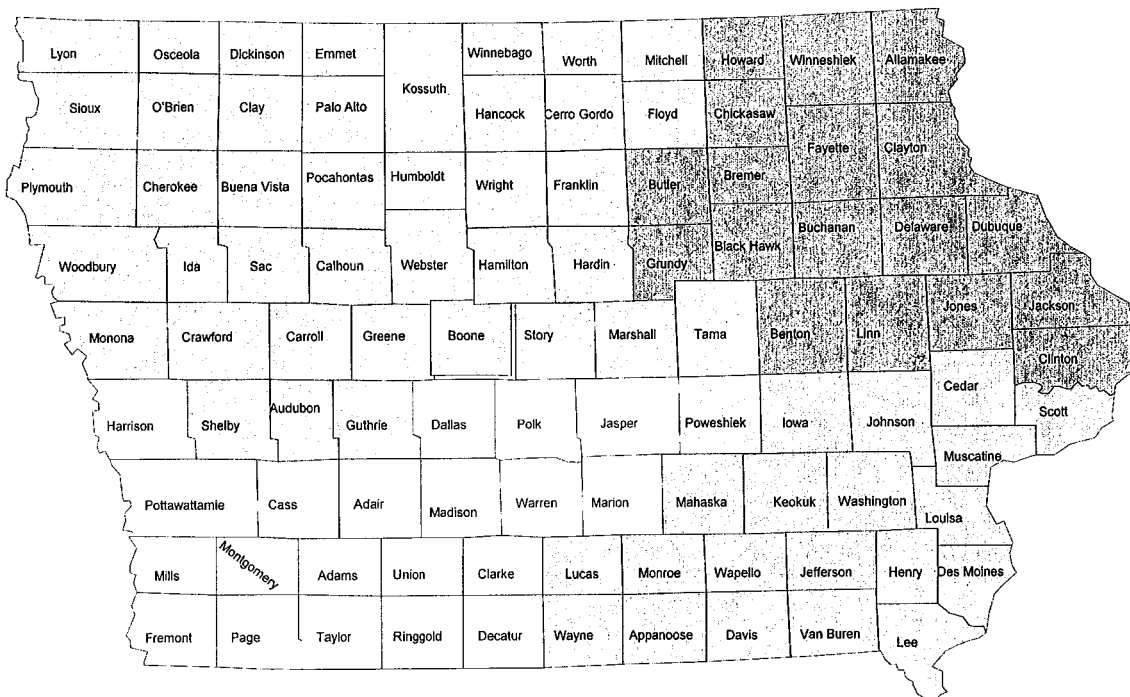
While the majority of missing cases came from the first three reasons, the fourth reason accounted for 25 missing cases according to the frequency table.

The response (dependent) variable used for analysis was *citation* per retailer: *citation*=1 or *no citation*=0. This variable was recoded from the original variable *compliance*, because a retailer may not have been in compliance, yet not issued a citation from the original *citation* variable. The predictor (independent) variables used for modeling purposes included the following:

- *year of inspection*
- *vendor*
- *county name* (recoded into 3 different variables)
- *issue authority*
- *clerk gender*
- *citation inspector gender*

*Issue authority* was recoded to *lawtype* as the following: 0=police, 1=sheriff, 2=state patrol, and 3=ABD official (two tests were run, one with ABD and one without ABD officials due to the low sample size of 106). *Vendor* (retailer type) was recoded into 10 categories: (a) stand alone bar, (b) liquor store, (c) grocery store and small grocery store, (d) convenience store with, and without gas, and gas station, (e) tobacco outlet, (f) entertainment, (g) department store, (h) hotel and motel, (i) pharmacy stores and drug stores and (j) other. *County names* were categorized into three different variables: *county population*, *areas*, and *regions*. *County*

population included the following three recodes: 0=under 10,000; 1=10,000 to 50,000; and 2=over 50,000. These codes were originally used for Synar's statistical analysis between July 1, 2005 and February 1, 2006 (IDPH, Coverage Study, 2005). *Areas* included geographic-specific counties per Iowa's Managed Care program that were used for Synar reporting between 1999 and 2001 (Iowa Legislative Fiscal Bureau, 1998). They include the following:



*northeast=NE, Northwest=NW, southeast=SE, southwest=SW, north central=NC, and central north=CN.*

*Regions* were categorized according to the United States Department of Agriculture's (USDA) Economic Research Service's measure of rural-urban continuum codes 1-9 (USDA, 2003). None of Iowa's counties fell into category 1 (county in metro areas of 1 million population or more). The other codes are 2=county in metro area of 250,000 to 1 million people; 3=county in metro area of fewer than 250,000 people; 4=non-metro county with urban population of 20,000 or more people, adjacent to a metro area; 5=nonmetro county with urban population of 20,000 or more, not adjacent to a metro area; 6=nonmetro county with urban

population of 2,500-19,999, adjacent to a metro area; 7=nonmetro county with urban population of 2,500-19,999, not adjacent to a metro area; 8=nonmetro county completely rural or less than 2,500 urban population, adjacent to a metro area; and 9=nonmetro county completely rural or less than 2,500 urban population, not adjacent to a metro area (USDA, 2003).

## RESULTS

Recoded variables used for analysis included the following: *vendor*, *lawtype*, *regions*, *areas*, *county populations*, *clerk gender*, *sting gender*, and *year* (see Appendix for descriptive statistics).

Using the backward selection, reduced model comparison, variables were omitted from each computed model if the model it exhibited extreme results at the 95% confidence level for the logarithm of the odds ratio (the difference of the logits of probabilities), i.e., an estimate ( $\beta$ ) and its probability

The LOGISTIC Procedure			
Type 3 Analysis of Effects			
Effect	DF	Chi-Square	Wald Pr > ChiSq
region	7	12.1188	0.0967
vendor	9	17.7067	0.0387
Year	7	27.6763	0.0003

TABLE 5 The Logistic Procedure (SAS)

value (*p*-value). The second-best-fitting model (see Table 5) had the following three variables: *region*, *vendor*, and *year*. The corresponding Wald Chi-Square *p*-values are 0.0967, 0.0387, and 0.0003, respectively; signifying that these three predictor variables have the best effect on the response variable *citation*. With *year* deleted from the model, Wald Chi-Square *p*-values were

### Wald Chi-Square Results: Region, Vendor, & Year

Parameter	DF	Est.	Std. Err	Wald Chi-sq	Pr>Chi-sq	Odds Ratio
Intercept	1	-2.45	0.119	421.686	<0.0001	Estimate
Region 2	1	0.018	0.098	0.033	0.855	0.886

Region 3	1	-0.005	0.098	0.002	0.963	0.867
Region 4	1	0.406	0.169	5.79	0.016**	1.307
Region 5	1	-0.315	0.18	3.062	0.080	0.636
Region 6	1	-0.008	0.109	0.006	0.938	0.863
Region 7	1	-0.258	0.121	4.565	0.033**	0.673
Region 8	1	0.023	0.177	0.017	0.896	0.891
Convenience	1	0.298	0.127	5.5	0.019**	1.318
Entertain	1	0.144	0.239	0.361	0.548	1.130
Grocery	1	0.467	0.153	9.387	0.002**	1.562
Liquor	1	0.136	0.305	0.197	0.657	1.121
Motel	1	-0.374	0.665	0.317	0.573	0.673
Other	1	0.157	0.192	0.669	0.413	1.145
Pharmacy	1	-0.148	0.283	0.273	0.601	0.844
Standing Bar	1	0.013	0.146	0.008	0.929	0.966
Store Dept	1	-0.688	0.425	2.624	0.105	0.492
2002	1	0.161	0.116	1.928	0.165	1.413
2003	1	-0.612	0.156	15.425	0.0001**	0.652
2004	1	-0.222	0.112	3.921	.047**	1.502
2005	1	-0.115	0.127	0.816	0.367	1.072
2006	1	0.223	0.113	3.885	0.049**	1.504
2007	1	-0.24	0.111	4.663	0.031**	1.529
2008	1	0.065	0.117	0.306	0.580	1.283
**p<0.05						

TABLE 6 Wald Chi-Square Results: Region, Vendor, &amp; Year

lower for *region* ( $\beta=11.978$ ,  $p=0.101$ ) and *vendor* ( $\beta=16.60$ ,  $p=0.055$ ). *Year* tended to act as the third-variable moderator.



The best-fitting model (not used) had the above variables with *area* added. Having two recoded variables (*region* and *area*) that both contained counties caused collinearity. All *areas*, except *CN*, presented themselves as statistically significant. From the frequency table, *area CN* did not include counties within *regions 3, 4, 5, 7, 8 and 9*. Since the variable *region* is based upon eight different USDA-specific standards, the aforementioned model was chosen.

As Table 6 indicates, with the intercept,  $\beta = -2.45$ , two *region*, two *vendor*, and two *year* variables were statistically significant. *Region 9* is the reference group the other regions are compared to. *Tobacco outlet* is the reference group for *vendor*. And *year 2009* is the reference group for *year* (2001 was deleted by the SAS due too many missing variables).

The interaction of proportion of citations in any *lawtype* and *region* was not statistically significant in relation to the models (with or without using *ABD* due to its low sample size,  $n=106$ ). The main effect of *lawtype* was not statistically significantly related to the proportion of citations in any models (with or without using *ABD* due to its low sample size,  $n=106$ ). For exploratory purposes, the interaction of *clerk gender* and *sting gender* was computed but were not statistically significant in relation to the proportion of citations in any models. The main effects of both *clerk gender* and *sting gender* were not statistically significant in relation to the proportion of citations in any models.

The variable *region* had two classifications that were statistically significant. The significant regions include *region 4* ( $\beta=0.406, p=0.016$ ), and *region 7* ( $\beta=-0.258, p=0.033$ ). *Region 4* includes the counties of Clinton, Marshall, and Muscatine; which are described by the USDA (2003) as nonmetropolitan counties with an urban population of 20,000 or more, adjacent to a metro area. *Region 7* includes the counties of Appanoose, Buena Vista, Carroll, Clay, Dickinson, Emmet, Floyd, Franklin, Hancock, Henry, Howard, Humboldt, Jefferson, Kossuth,

Mahaska, Mitchell, Monroe, O'Brien, Osceola, Page, Palo Alto, Poweshiek, Winnebago, Winneshiek, and Wright. The USDA (2003) describes these as nonmetropolitan counties with an urban population of 2,500-19,999, not adjacent to a metro area. At the 95% confidence level, both regions are statistically significant, i.e., they both received more citations than the reference group.

The variable *vendor* had two classifications that were statistically significantly different from the reference group. They include *convenience stores* ( $\beta=0.298, p=0.019$ ), and *grocery stores* ( $\beta=0.467, p=0.002$ ). At the 95% confidence level, *grocery store* is highly statistically significant, while *convenience store* is less strongly statistically significant (with a higher *p*-value), i.e., they both received more citations than the reference group.

Four *years* were significant. They include *2003* ( $\beta=-0.612, p=0.0001$ ); *2004* ( $\beta=-0.222, p=0.047$ ); *2006* ( $\beta=0.223, p=0.049$ ); and *2007* ( $\beta=-0.24, p=0.031$ ). At the 95% confidence level, *year 2003* is highly statistically significant, *2007* is moderately statistically significant, and both *2004* and *2006* have very weak statistically significant values. All four years received more citations than the reference group.

## SUMMARY

**Hypotheses:** *H1: The proportion of citations issued among vendors selling tobacco will not significantly vary statistically, after controlling for clerkgender, stinggender, lawtype, region, county population, area, and year.*

Results show that *grocery stores* and *convenience stores* were statistically significantly different when compared to the reference group, i.e., there were significantly more citations issued to both grocery stores and convenience stores, with grocery stores having a statistically significantly higher percentage of citations.

*H2: The proportion of citations issued due to the interaction of sheriff and the rural Regions 8 and 9 will be statistically significantly lower than other regions, after controlling for regions 2-7, clerktype, stinggender, region, county population, area, and year (USDA, 2003).*

Results showed that the interaction of *lawtype and region* was not statistically significantly related to the proportion of citations in any models. Also, the main effect of *lawtype* was not statistically significantly related to the proportion of citations in any models. Therefore, there was no statistically significant difference among the four types of law enforcement officers in proportion to the number of citations issued.

Other findings indicated that two *regions* were statistically significantly different when compared to the reference group, i.e., *regions 4 and 7* received proportionally more citations than the reference group. *Region 4* has an urban population of 20,000 or more, adjacent to a metro area; while *region 7* has an urban population of 2,500 to 19,999, not adjacent to a metro area (USDA, 2003). Also, the main effects of both *clerk gender* and *sting gender* were not statistically significant in relation to the proportion of citations in any models, i.e., gender combinations of clerks and compliance inspector teenagers made no difference in the proportional amount of citations issued.

## DISCUSSION

Literature review stated that tobacco advertizing is legal in both convenience sores and grocery stores, the former having the highest teenage customer base. S. Brown (personal communication, October 14, 2010) attributed the high citation rates for grocery stores to hiring very young employees, many being from high schools. The two statistically significant vendor types found in this study for higher citations could indicate a possible cause-and-effect for teenagers' higher purchases in convenience stores and grocery stores. Results from this study

show that there are more convenience stores ( $n=2,661$ ) than any other type of vendor, over 3 times that of grocery stores, with the second highest number ( $n=758$ ). This could influence results to a minimal degree.

Results from this study also indicated that there was no difference in the proportion of citations issued to non-compliant retailers among the different-jurisdictional, law enforcement inspectors. This confirms what one ABD inspector stated as taking precautions in order for the public in rural areas not to recognize either the law enforcement officers or the compliance inspector teenagers (S. Brown, personal communication, October 14, 2010).

Two regions were statistically significantly different when compared to the reference group. Although little literature review substantiates a reason for this, socio-economic status would be one variable to consider if incorporated into future USDA rural-urban continuum codes by the Economic Research Services (USDA, 2003).

Transformations were not performed on the Synar data of citations per year to estimate the trend for future results. S. Lund (personal communication, October 27, 2010), an ISU Statistics Ph.D. candidate, advised against it due to the low number of data points for analysis. If the trend of non-compliance citation rates continues as it has for the last several years, however, Synar's program will continue to perform very well.

***Validity & Reliability:*** Validity was high for this study as a large, randomized (per year) dataset was used. With the response variable being binary, logistic regression proved to be a good choice for analysis. Statistical significance was based on the 95% confidence level. Also, two ISU statistics students were available for consultation regarding SAS coding and logistic regression commands. Missing data, however, affecting variables' sizes, could have had a minimally negative impact on validity.

Data collected systematically by law enforcement officers of different jurisdictions, and analyzed by an ISU statistician, increased the integrity, and thus the validity, of the dataset. Adding to validity is that neither law enforcement officials nor the ISU statistician are major stakeholders in the yearly Synar outcomes (Chen, 2005).

There may be a causal relationship between the program and its intended effect that supports internal validity. Results from this study could also be inferred to the larger population inspected, which supports external validity (Chen, 2005).

Reliability is high due to multiple testing of data using the backward selection process during logistic regression computations. Lastly, SAS's GLIMMIX procedure may have provided different results if *year* could be classified as a random variable, with the added effect of analyzing all possible pairs (S. Lund, personal communication, October 27, 2010; Cerrito, 2010). Due to time constraints, this procedure was not used.

***Future Research:*** Future researchers should conduct studies with grocery and convenience stores to obtain data on clerks' behaviors when they are asking patrons for identification. Research could also focus narrowly on the effects of advertizing on teenage tobacco purchases. Additionally, future researchers could conduct updated studies to add specific socio-demographic information to the USDA's regional rural-urban continuum codes.

### **PROGRAM & POLICY RECOMMENDATIONS**

It appears as though the combination of tobacco education and Synar's citations/fines have been very successful these past several years. The last three years (2007 to 2009), in particular, show a sharp decline in non-compliance rates. Further efforts could be undertaken to conduct additional analyses.

Given the results in this study, the completeness of field data could be improved; lack of complete field data was most prevalent during the year 2001. Implementing a more rigorous public relations program aimed specifically at grocery store and convenience store retailers and their employees could prove to be useful in lowering non-compliance rates in the future. One ABD inspector shared that tobacco training will soon be available on-line (S. Brown, personal communication, October 14, 2010). It remains to be seen if this has a positive impact on non-compliance rates from the aforementioned vendors.

Literature review showed that tobacco use is detrimental to both genders. Tobacco education for teenagers could place more emphasis on both the detrimental effects of chewing tobacco and the fact that smoking is not a good choice for reducing one's weight for the following reasons: Williams (2009) stated that, although smoking has declined over the past and more recently has leveled off, boys switched from cigarette smoking to chewing tobacco; while, more specifically, smoking among Caucasian girls has increased. He stated that the pressure among teenage girls to be thin is related to their increased smoking. Lastly, using both humor in presentations and offering examples of human physical features from the negative effects of tobacco use could prove to have a more powerful impact with this age group (Williams, 2009; IARC, 2008).

Public policy implications include the possibility of eliminating tobacco-product advertisements in all stores. Raising fines for retailers and clerks could also lower teenagers' tobacco purchases. Reinvesting MSA money into billboard advertizing could prove to be beneficial. However, as Evans (2006) stated, this practice has declined drastically in many states.

#### **APPENDIX: Descriptive Statistics**

The number of *citations* was the dependent variable used for analysis. The nine-year sample data had a total of 7,106 cases. Sample sizes for each variable and variables' classifications represent the amount of available data with missing values removed.

The recoded *vendor* ( $n=4,672$ ) variables (retail types) has the following descriptive statistics for the proportion with citations: *convenience stores* ( $n=2,661$ ) mean=0.0797 and standard deviation (sd)=0.271; *department stores* ( $n=128$ ) mean=0.042 and sd=0.02; *tobacco outlet* ( $n=128$ ) mean=0.079 and sd=0.272; *entertainment* ( $n=287$ ) mean=0.088 and sd=0.285; *grocery stores* ( $n=758$ ) mean=0.121 and sd=0.326; *motels/hotels* ( $n=39$ ) mean=0.061 and sd=0.242; *pharmacy* ( $n=178$ ) mean=0.074 and sd=0.263; and *other* ( $n=493$ ) mean=0.093 and sd=0.291. Missing values=2,434.

*Lawtypes* ( $n=5,056$ ) has the following descriptive statistics: *police* ( $n=3,191$ ) mean=0.094 and sd=0.292; *sheriff* ( $n=1,368$ ) mean=0.096 and sd=0.294; *Iowa State Patrol* ( $n=391$ ) mean=0.093 and sd=0.290; and *ABD inspector* ( $n=106$ ) mean is 0.078 and sd=0.269. Missing values=2,050.

The descriptive statistics for *region* ( $n=5,978$ ) include the following: *region 2* ( $n=1,239$ ) mean=0.101 and sd=0.302; *region 3* ( $n=1,496$ ) mean=0.106 and sd=0.308; *region 4* ( $n=284$ ) mean=0.141 and sd=0.348; *region 5* ( $n=338$ ) mean=0.075 and sd=0.264; *region 6* ( $n=1,120$ ) mean of 0.109 and sd=0.312; *region 7* ( $n=944$ ) mean=0.092 and sd=0.289; *region 8* ( $n=317$ ) mean=0.107 and sd=0.309; and *region 9* ( $n=240$ ) mean=0.129 and sd=0.336. Missing values=1128.

The descriptive statistics for *county populations* ( $n=6,484$ ) included the following: *under 10,000* ( $n=364$ ) mean=0.116 and sd=0.320; *10,000 to 50,000* ( $n=3,505$ ) mean=0.099 and sd=0.299; *over 50,000* ( $n=2,615$ ) mean=0.101 and sd=0.302. Missing values=622.

The descriptive statistics for *area* ( $n=6,341$ ) included the following: *CN* ( $n=903$ ) mean=0.105 and sd=0.307; *NC* ( $n=722$ ) mean=0.130 and sd=0.337; *NE* ( $n=1,499$ ) mean=0.093 and sd=0.290; *NW* ( $n=1323$ ) mean=0.094 and sd=0.292; *SE* ( $n=1,250$ ) mean=0.113 and sd=0.316; *SW* ( $n=644$ ) mean=0.994 and sd=0.299. Missing values=765.

The descriptive statistics for *year* ( $n=6,367$ ) included the following: *2001* ( $n=610$ ) mean=0.177 and sd=0.382; *2002* ( $n=706$ ) mean=0.106 and sd=0.309; *2003* ( $n=708$ ) mean=0.052 and sd=0.223; *2004* ( $n=718$ ) mean=0.114 and sd=0.318; *2005* ( $n=728$ ) mean=0.081 sd=0.273; *2006* ( $n=702$ ) mean=0.114 and sd=0.317; *2007* ( $n=733$ ) mean=0.115 and sd=0.319; *2008* ( $n=730$ ) mean=0.10 and sd=0.30; *2009* ( $n=732$ ) mean=0.082 and sd=0.275. Missing values=739.

The descriptive statistics for *stinggender* included the following: *male* ( $n=3,323$ ) mean=0.104 and sd=0.305; *female* ( $n=3,040$ ) mean=0.103 and sd=0.304. Missing values=743.

The descriptive statistics for *clerkgender* included the following: *male* ( $n=1,935$ ) mean=0.095 and sd=0.293; *female* ( $n=3,741$ ) mean=0.096 and sd=0.295. Missing values=1,430.

The descriptive statistics for *citation* ( $n=6,367$ ) has a mean=0.103 and sd=0.304. *Citation=0* has  $n=5,709$  and *citation=1* has  $n=658$ . Missing values=739.

## REFERENCES

- Bolten, K. A. (2010, November 6). Seven cited for selling tobacco to minors. *The Des Moines Register*, p. 2B.



- Centers for Disease Control and Prevention. (2002). *Point of purchase tobacco environments and variations by store type—United States, 1999*. Retrieved from [http://cdc.gov/tobacco/research\\_data/advoadv/mmwr5109.highlights.htm](http://cdc.gov/tobacco/research_data/advoadv/mmwr5109.highlights.htm)
- Centers for Disease Control and Prevention. (2010). *Youth and tobacco use*. Retrieved from [http://www.cdc.gov/tobacco/data\\_statistics/fact\\_sheets/youth\\_data/tobacco\\_use/index.htm](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/youth_data/tobacco_use/index.htm)
- Cerrito, P. C. (2010). *From GLM to GLMMIX-which model to choose?* Retrieved from <http://www.technion.ac.il/usg/stat/SAS/SAS-Glimmix/From%20GLM%20to%20GLIMMIX-Which%20Model%20to%20Choose.pdf>
- Chen, H. (2005). *Practical program evaluation*. Thousand Oaks, CA: Sage Publishing.
- Evans, J. H. (2006). *The influence of risk perception on behavior: A study of adolescents and anti-tobacco campaigns* (Master's thesis). Available at Parks General Library. Iowa State University, Ames, IA.
- International Agency for Cancer Research. (2008). *Methods for evaluating tobacco control policies*. Lyon, France: International Agency for Research on Cancer.
- Iowa Department of Justice. (2004). *Summary of Iowa's tobacco law*. Retrieved from <http://gao.gov/news.items/do274.pdf>
- Iowa Department of Public Health (2000). *Chronology of Synar compliance check*. SFY 2000.
- Iowa Department of Public Health. (2005). *Coverage study*. Retrieved from <http://www.idph.state.ia.us/tobacco/>
- Iowa Department of Public Health. (2010). *Division of tobacco use prevention and control*. Retrieved from <http://www.idph.state.ia.us/tobacco/>

Iowa Department of Public Health. (2009). FDA-state and local authority. *Federal regulation of tobacco: Impact on state and local authority*. Retrieved from

[http://www.idph.state.ia.us/tobacco/common/pdf/fda\\_state-local-authority.pdf](http://www.idph.state.ia.us/tobacco/common/pdf/fda_state-local-authority.pdf)

Iowa Department of Public Health. (2002). *Prevention & addictive behaviors (28E Agreement, #28E-2003TE01)*. Retrieve from <http://www.legis.state.ia.us/IACODE/2003/>

Iowa Legislative Fiscal Bureau. (1998). *The Iowa plan for behavioral health*. Retrieved from

<https://docs.google.com/a/iastate.edu/viewer?a=v&pid=gmail&attid=0.1&thid=12ad2fcae4d4855d&mt=application/pdf&url=https://mail.google.com/a/iastate.edu/?ui%3D2%26ik%3Da74f0266fa%26view%3Datt%26th%3D12ad2fcae4d4855d%26attid%3D0.1%26disp%3Datt%26zw&sig=AHIEtbT8k7TczeRA9nvsZ6oELtTECjP4ag&AuthEventSource=SSO>

Rubin, A., & Babbie, E. (1993). *Research methods for Social work*. Pacific Grove, CA:

Brooks/Cole Publishing Company.

State of Iowa Alcoholic Beverages Division (2010). *Tobacco education*. Retrieved from

<http://iowaabd.com/tobacco/compliance/education>

State of Iowa Alcoholic Beverages Division (2010). *Tobacco penalty outline*. Retrieved from

[http://iowaabd.com/files/client\\_files/933/339/Tobacco\\_Penalties\\_2003.PDF](http://iowaabd.com/files/client_files/933/339/Tobacco_Penalties_2003.PDF)

State of Iowa Alcoholic Beverages Division (2010). *Tobacco program overview*. Retrieved from

[http://iowaabd.com/tobacco/compliance/program\\_overview](http://iowaabd.com/tobacco/compliance/program_overview)

U.S. Department of Agriculture. (2003). *Economic Research Services: 2003 Rural-urban continuum codes for Iowa*. Retrieved from

<http://www.ers.usda.gov/Data/RuaralUrbanContinuumCodes/2003/LookUpRUCC>

U.S. Department of Health and Human Services. (2009). *Annual Synar report. FFY 2010 State of Iowa* (42 U.S.C. 300x-26).

U.S. Department of Health and Human Services. (2003). *Synar survey estimation system. User manual* (June 11, Version 1.0).

U.S. Department of Health and Human Services. (1998). *Synar regulation implementation. Report to Congress of FFY 1997 state compliance* (DHHS Publication No. 97-3145).

Vander Zanden, J. W. (1981). *Human development*. New York, NY: Alfred A. Knopf.

Williams, R. (2009). *Teen smoking*. Farmington Hills, MI: Greenhaven Press.

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