Wyoming's 2010 Synar Tobacco Compliance Report:

Coverage and Inspection Studies

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Coverage and Inspection Studies

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1. Executive Summary

The Synar Amendment, enacted in 1992, requires states to enact and enforce laws prohibiting the sale and distribution of tobacco products to individuals under the age of 18 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2010). The SAMHSA regulation implementing the Synar Amendment requires states to conduct annual, random, and unannounced inspections to ensure compliance with tobacco sales laws.

Since 2003, the Wyoming Department of Health, Mental Health and Substance Abuse Services Division (MHSASD) has contracted with the Wyoming Survey & Analysis Center (WYSAC) at the University of Wyoming to conduct the Synar compliance inspections. WYSAC recruits minor buyers (15-, 16-, and 17-year-old youth) each summer to conduct these inspections, under adult supervision, on a stratified random sample of tobacco retail outlets in Wyoming. The overall weighted retailer violation rate (RVR) in 2010 was 7.3%, well below the federally stipulated maximum of 20.0%.

> *In 2010, the overall weighted retailer violation rate was 7.3%*

WYSAC created a logistic regression model to determine which factors were most influential in predicting whether a clerk would attempt to sell tobacco products to minors. Controlling for other variables, key findings from our analysis include the following:

- A clerk failing to ask for an ID was the greatest predictor of an attempted sell; clerks who failed to ask for an ID were much more likely to attempt a sale than were clerks who asked for an ID.
- Clerks were more likely to attempt to sell to minor buyers who looked 18 or older than to minor buyers who looked younger than 18.
- Clerks were more likely to attempt to sell to female buyers than to male buyers.

Pearson Chi-Square tests revealed the following results:

- Clerks in small Wyoming towns asked for ID less often than did clerks in large Wyoming towns.
- Clerks asked for ID less frequently for buyers who appeared 18 or older.
- Tobacco retail outlets in small Wyoming towns posted anti-tobacco signs less often than did outlets in large Wyoming towns.

This year, WYSAC also conducted an extensive coverage study to determine how well the state's tobacco retailer list frame (used to conduct the Synar inspection study) reflects the actual composition of tobacco retail outlets in the state. The overall weighted coverage rate was 88.6%, above the federally stipulated minimum of 80.0%.

> *In 2010, the overall weighted coverage rate was 88.6%*

2. Introduction
2.1. Background

In 1992, Congress enacted the Alcohol, Drug Abuse, and Mental Health Administration Reorganization Act, which includes an amendment (section 1926) aimed at decreasing youth access to tobacco. This amendment, named for its sponsor, former Congressman Mike Synar of Oklahoma, requires states to adopt and enforce laws prohibiting the sale of tobacco to youth under the age of 18. To be in compliance, states must also conduct annual, random, and unannounced inspections to ensure compliance with the law and develop a strategy and timeframe for achieving a retailer violation rate (RVR) of less than 20.0% (SAMHSA, 2010). SAMHSA also requires states to conduct a coverage study every three years to determine the completeness and accuracy of the tobacco retailer list frame.

Since 2003, the Wyoming Department of Health, Mental Health and Substance Abuse Services Division (MHSASD) has contracted with the Wyoming Survey & Analysis Center (WYSAC) at the University of Wyoming to conduct Wyoming's annual Synar compliance inspections. In 2007 and again this year, 2010, MHSASD contracted with WYSAC to conduct a coverage study.

2.2. Organization of this Report

This document contains five additional sections. Section 3 describes the methods and key findings of the coverage study. Section 4 describes the methods and key findings of the inspection study. Section 5 provides conclusions and gives recommendations for future Synar inspections. Section 6 contains reference citations. Section 7 contains two appendices. Appendix A presents the results for each question on the 2010 Synar Inspection Form. Appendix B presents detailed calculations for the coverage study, the inspection sampling design, the retailer violation rate, and the logistic regression model.

3. Coverage Study
3.1. Coverage Study Methods

SAMHSA requires states to conduct a coverage study every three years (SAMHSA, 2006). The purpose of the coverage study is to assess how well the state's tobacco retailer list frame (used to conduct the Synar inspection study) reflects the full roster of tobacco retail outlets in the state. Low coverage list frames may bias the estimate of the retailer violation rate because the unlisted outlets may differ from those on the list with respect to their likelihood of selling tobacco to minors (SAMHSA, 2006). Therefore, to comply with SAMHSA requirements, WYSAC conducted an extensive coverage study in 2007 (WYSAC, 2007) and did so again, with this study, in 2010.

3.1.1. Coverage Study Sampling Design

To conduct the coverage study, WYSAC followed SAMHSA protocol as outlined in their *Guide for a Synar Sampling Frame Coverage Study* (2006). We used census tracts (defined by the U.S. Census Bureau) to define the geographical areas for the coverage study. To reduce costs and improve efficiency, we used a stratified sampling design by dividing the census tracts into two strata (or categories). Because census tracts are based on population (e.g., tracts smaller in land area have a higher population density), we defined *urban* census tracts as containing a land area smaller than 6.0 square miles and *rural* census tracts as containing a land area of 6.0 square miles or more.[1] We then

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[1] WYSAC eliminated one tract (F.E. Warren Air Force Base) because it is completely inaccessible to the general public.

sampled 13 tracts from the urban stratum and 12 tracts from the rural stratum. Because rural tracts are more costly to canvass, we oversampled urban tracts and under-sampled rural tracts. As recommended by SAMSHA, we sampled a total of 25 tracts to encompass an estimated 120 tobacco retail outlets.

3.1.2. Coverage Study Protocol

Once we drew the sample, we hired several qualified drivers to conduct the coverage study. We trained them on how to canvass each census tract, noting *all* stores that sold tobacco *and* were accessible to minors.[2] WYSAC sent two drivers on each coverage study trip so that one could navigate and look for stores while the other drove. We instructed drivers *not* to canvass unpaved roads and any area that was inaccessible to the public (e.g., state or national parks where one must pay an entrance fee). Per SAMHSA protocol, drivers did not use any lists to identify outlets.

Nine potential outlets were closed when the drivers located them and could not be evaluated for eligibility. WYSAC called these outlets to determine their eligibility and, when appropriate, included them in the sample. WYSAC also eliminated several stores from the final coverage list because, upon further inspection, they were considered to be in Grand Teton National Park and subject to federal, not state, jurisdiction.[3] The final coverage list contained 135 outlets.

3.1.3. Coverage Study Analysis

To determine the coverage rate, WYSAC carefully compared the list of outlets discovered during the coverage study to the outlets on the tobacco retailer list frame. If the outlet found during the coverage study was on the tobacco retailer list frame with matching or similar addresses, the outlet was considered *covered* by the tobacco retailer list frame. WYSAC then determined if the address on the tobacco retailer list frame was 100% accurate.

After WYSAC checked all canvassed outlets against the list frame, we determined an overall weighted coverage rate of 88.6%. When calculating the coverage rate, WYSAC accounted for the use of a stratified sampling design to conduct the coverage study. We used a sampling weight for each sample area (i.e., urban or rural). We also calculated a weighted accuracy rate, excluding stores that were not covered by the inspection list, to determine the accuracy of the tobacco retailer list frame. To calculate the accuracy of the tobacco retailer list frame, WYSAC compared the coverage study results to the list frame. We followed SAMHSA's definition of accuracy: we considered an outlet's information 100% accurate if the tobacco retailer list frame information would allow field workers to easily locate the outlet. If the address from the coverage study and the address from the list frame were identical, we determined that the list information on the outlet was accurate. If the coverage study listed a different *name* than the name on the list frame, we still considered the information on the outlet accurate because the name change would not prevent somebody from locating it. Appendix B presents detailed information about our coverage study sample size, sample allocation, weighted coverage, and weighted accuracy rate calculations.

3.2. Coverage Study Key Findings

WYSAC found an overall weighted coverage rate of 88.6%. (See Appendix B for calculations.) SAMHSA *requires* a coverage rate of at least 80.0% but *recommends* a coverage rate of at least 90.0%

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[2] Bars and liquor stores are not legally accessible to minors in Wyoming (without a parent or guardian) so canvassers did not note these types of retailers.
[3] Stores in the towns of Moose and Moran Junction are in Grand Teton National Park.

(SAMHSA, 2006). Therefore, the coverage of the tobacco retailer list frame exceeded SAMHSA's required coverage rate but did not exceed the recommended coverage rate (Figure 1). The urban stratum had a coverage rate of 90.4% and the rural stratum had a coverage rate of 88.0%. The coverage rates for each stratum were not significantly different, χ^2 (1, $N = 731.5$) = 0.8, $p = 0.363$.

WYSAC also calculated the accuracy of the tobacco retailer list frame. The overall accuracy rate for the tobacco retailer list frame was 88.1%. As with the coverage rate, the accuracy rates for the urban (89.4%) and rural (87.7%) strata were not significantly different, χ^2 (1, $N = 648.0$) = 0.3, $p = 0.556$.

Figure 1. Tobacco Retailer List Frame Coverage and Accuracy Rates
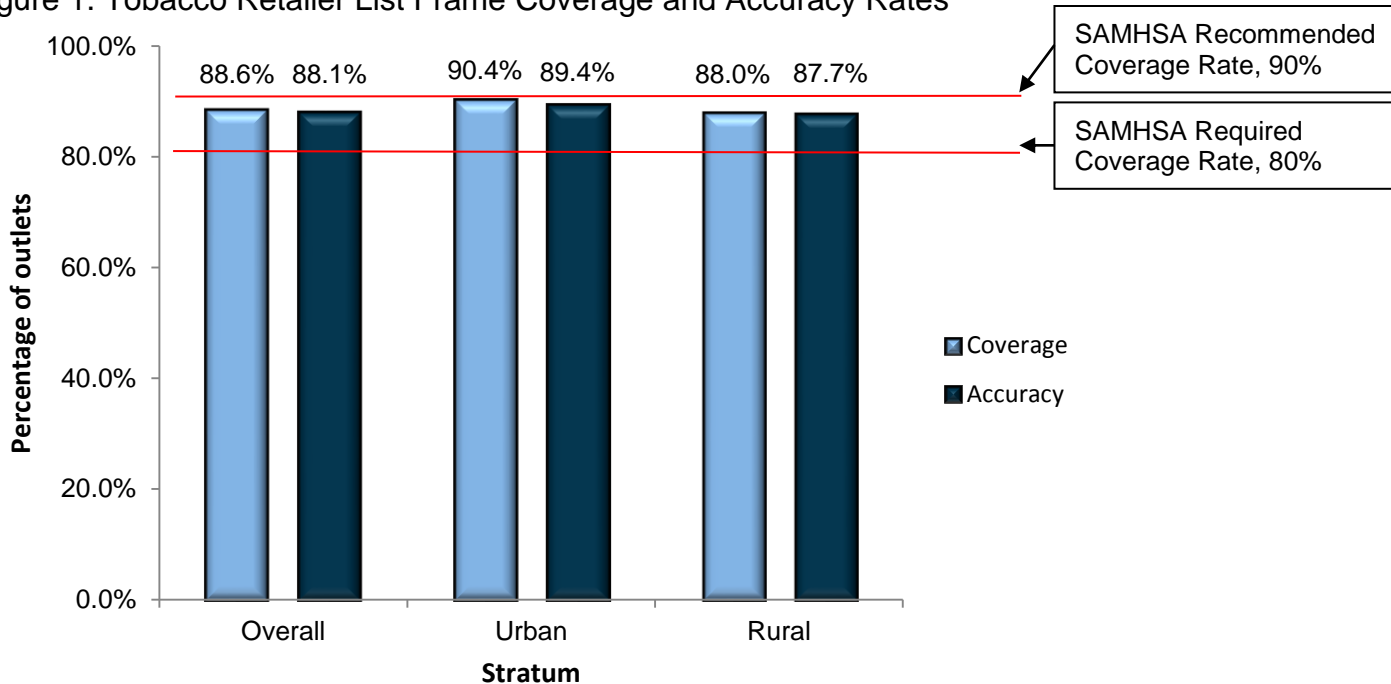
4. Inspection Study

4.1. Inspection Study Methods

4.1.1. Inspection Study Sampling Design

To ensure we had a comprehensive list of tobacco retail outlets in Wyoming, WYSAC developed the 2010 tobacco retailer list frame from four sources:

1. The list frame from the 2009 Synar inspections (WYSAC, 2009b),
2. The list of tobacco retailers updated for the 2008 Operation Storefront Study, which tracks tobacco advertising in Wyoming (WYSAC, 2009a),
3. A list of tobacco retail outlets provided by MHSASD, and
4. Lists from the three Wyoming towns that require local licensing of tobacco retailers (Cheyenne, Ten Sleep, and La Barge).

By combining all these lists and removing ineligible stores (e.g., stores that were on the Wind River Indian Reservation), WYSAC created a list with 604 outlets.

As in previous years, we categorized each tobacco retail outlet into one of two strata based on its location in either an *urban* town (population 3,000 or greater) or a *rural* town (population less than 3,000). The list frame had 416 outlets in the urban stratum and 188 outlets in the rural stratum. We

used the Synar Survey Estimation System, Version 4.0 (SSES) to determine the sample size for each stratum. (See Appendix B for more information about the SSES sampling.) SSES yielded a sample size of 180 for the urban stratum and a sample size of 158 for the rural stratum resulting in a total sample of 338 outlets. WYSAC drew a random sample for each stratum using PASW Statistics Version 18.0.

4.1.2. Inspection Study Protocol

The 2010 Synar inspections began on June 17, 2010, and ended on August 12, 2010. Eight teams completed the inspections. The teams consisted of one adult supervisor/driver, two minor buyers, and one law enforcement officer.

As required by the Wyoming Attorney General, a local law enforcement officer was available for every inspection. The primary role of the law enforcement officers was to observe the inspection; they did not issue any citations for noncompliance. WYSAC collaborated with the Wyoming Association of Sheriffs and Chiefs of Police (WASCOP) to find and coordinate with local officers who had jurisdiction over the areas in which the teams conducted inspections.

WYSAC recruited students from the University of Wyoming to be the adult supervisors. Prior to hiring the adult supervisors, WYSAC conducted criminal background checks and reviewed driving records. We trained all adult supervisors in Synar protocol. The adult supervisors were then responsible for training the minor buyers.

WYSAC recruited most minor buyers by asking previous buyers to participate again (if they were still at the age of eligibility) or to provide referrals. Program managers in the Tobacco-Free Wyoming Communities Program also provided contacts. We first contacted potential minor buyers via telephone to describe the project and speak with one of their parents or guardians. Once the minor buyer and the parent/guardian expressed interest, we sent them a written description of the project, a parent permission form, and hiring forms. We required completed parent permission forms before any youth could participate. Four 15-year-olds, four 16-year-olds, and eight 17-year-olds participated in the 2010 Synar inspection study. Each of the eight teams included both a male and female minor buyer.

All minor buyers resided within the area they inspected, thereby reducing travel time and eliminating the need for overnight stays. To ensure consistency in buying procedure, all youth followed a written script and role-played with the adult supervisors until they mastered the buying procedure. Adult supervisors also trained minor buyers to look for certain elements while in the store (i.e., the location of tobacco products, the approximate age of the clerk, gender of the clerk, and the presence of anti-tobacco messages).

Upon arriving at an outlet, one minor buyer (alternating between male and female buyers) entered the outlet and, following the buyer script, attempted to purchase tobacco. This year we began conducting inspections for chewing tobacco. Every fifth inspection, the minor buyers (male or female) asked for Skoal or Copenhagen. For cigarette inspections, minor buyers asked to purchase Marlboro Lights, Camel Lights,[4] or Camels. Law enforcement officers did not accompany the minor buyers into the store. When minor buyers knew anyone in the store, they left the store without

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[4] As of June 22, 1010, (while WYSAC was conducting Synar inspections), the FDA began to restrict terms such as light and low tar. Stores were allowed to continue to sell existing stock of products labeled with these terms (FDA, 2010b).

attempting a purchase and returned to the car. If the second minor buyer did not know anyone in the store, he or she attempted the buy. If both minor buyers knew someone in the store, the team returned later to attempt the buy.

Survey protocol required minor buyers to leave their identification in the car with the adult supervisors or to leave it at home. This strategy allowed minor buyers to answer honestly, "I don't have it on me," if a clerk asked for identification. Similarly, if asked their age, minor buyers were trained to answer honestly. The buyers each carried approximately $1.00 in cash, so if a sale was attempted, they could produce too little cash to pay for the tobacco. In accordance with protocol, no purchase attempts were consummated. The inspection was completed either by a clerk's refusal to sell or by an attempt to sell.

Immediately following each inspection, minor buyers returned to the vehicle and reported the details of the attempted purchase to the adult supervisors, who then entered this information on a data form. Reported information included minor buyer name, age, and gender; store name and address; inspection date and time; completion status of the inspection; approximated clerk age; clerk gender; type and brand of tobacco product requested; location of tobacco products in the store; outcome of the buy attempt; and the presence of any visible anti-tobacco messages (e.g., Got ID?). WYSAC collected the forms at the end of each inspection trip.

New to Synar this year, we took photographs of minor buyers on their first day of inspections. When the inspections were complete, we had 12 raters, unfamiliar with the Synar project, guess the age of each minor buyer. We then averaged the 12 ratings to identify a mean perceived age for each buyer. We used these ratings to assess whether the minor buyers actually look their age, as SAMHSA recommends (SAMHSA, 2010). It also allows us to statistically test whether the minor buyers who *look* 18 or older were able to make more successful purchase attempts. The lowest perceived age was 15.9 and the highest perceived age was 23.5. Of the 16 buyers, six had perceived ages of 18 or older and 10 had perceived ages younger than 18.

4.1.3. Inspected Outlets

Of the 338 outlets in the sample, we had 45 ineligible outlets. These outlets were ineligible for the following reasons: out of business (19), did not sell tobacco products (19), inaccessible to youth (3), duplicate entry on the list (2), temporary closure (1), and sold cigars only (1). Thus, the total number of *eligible* stores was 293. Another nine outlets were eligible, but *not inspected*. These outlets were not inspected for the following reasons: in a federal park (4), in operation but closed at time of visit (3), tobacco out of stock (1), and presence of police (1). WYSAC *inspected* 284 outlets, or 97.9% of the eligible outlets in the sample. Of these, 161 outlets were in the urban stratum and 123 outlets were in the rural stratum.

4.1.4. Inspection Study Analysis

To determine which factors were most influential in predicting whether a clerk would attempt to sell, we ran a logistic regression using PASW version 18.0. (See Appendix B for more information on the logistic regression model.) Using attempted sale as the dependent variable, we initially examined each independent variable (i.e., type of store, location of tobacco, presence of anti-tobacco signs, clerk gender, approximate age of clerk, type of tobacco requested, clerk ask for ID, and clerk ask for age) by itself to determine its effect on sale attempts. Two variables were significant (at the α = 0.05 level) in the Chi-Square tests: perceived buyer age and clerk ask for ID. We then tested different models using these two variables along with different combinations of variables that were

included in the 2009 logistic regression model. Based on the results of these analyses, we created a final model with four independent variables: stratum, buyer gender, clerk ask for ID, and perceived buyer age. This final model had the best goodness of fit and a high level of predictive power. We also conducted Pearson Chi-Square tests for several independent variables to determine relationships with attempted sale and other variables of interest (such as stratum). One limitation of our logistic regression model is that we had low cell counts on several variables, especially buy attempt (92.7% of attempts were unsuccessful) and clerk ask for ID (91.4% of clerks asked for ID). Low cell counts can increase variability in the model thereby increasing confidence intervals. We report significant differences when $p < 0.05$, suggesting that we can say with 95% confidence that our results are not due to chance.

4.2. Inspection Study Key Findings

4.2.1. Retailer Violation Rate (RVR)

The noncompliance rate or retailer violation rate (RVR) is the percentage of clerks who attempted to sell to a minor. We weighted the overall RVR to account for our stratified sampling design. (See Appendix B for the RVR formula.) In 2010, the overall weighted RVR was 7.3%.

SSES provided a summary table of Synar survey estimates and sample sizes (Table 1). The standard error was ±1.0%, which meets the SAMHSA precision requirement of ±3.0%. Because we drew a sample of outlets and did not inspect *all* outlets in Wyoming, SSES calculated a 95% confidence interval. Therefore, as shown in Table 1, we can be 95% confident that the true value of the RVR is between 5.2% and 9.3%. When accounting for error, the likely maximum RVR (9.3%) is still well below the 20.0% noncompliance standard set by SAMHSA. Wyoming's RVR has been below this 20.0% maximum since 2000 (Table 2). Before comprehensive educational and enforcement efforts were implemented in 2000, the RVR was as high as 55.8%

4.2.2. Factors Contributing to Attempted Sales

This section describes the variables we included in our logistic regression model. Although not all variables in our model are statistically significant, accounting for all them provides the best description of the factors contributing to a clerk attempting to sell tobacco to a minor. Appendix B presents the variables and statistics associated with our logistic regression model. We report significant differences when $p < 0.05$, suggesting that we can determine with 95% confidence that our results are not due to chance.

Municipality Size (Strata)
Because we stratified our sample by municipality size (towns with fewer than 3,000 people were in the rural strata and towns with at least 3,000 people were in the urban strata), we controlled for strata in our logistic regression model. When controlling for other variables, town size was *not* a significant predictor of attempting to sell; clerks in small towns were no more likely to attempt to sell to minors than were clerks in large towns, odds ratio = 0.6, $p = 0.628$, 95% CI [0.1, 4.0]. Additionally, a chi-square test also showed this relationship as non-significant, χ^2 (1, $N = 284$) = 3.1, $p = 0.076$.

Table 1. Synar Survey Estimates and Sample Sizes

SAMHSA-SYNAR REPORT

State	WY
Federal Fiscal Year (FFY)	2011
Date	9/16/2010 11:32
Data	SYNAR 2010 SSES.xlsx
Analysis Option	Stratified SRS with FPC
Estimates	
Unweighted Retailer Violation Rate	8.1%
Weighted Retailer Violation Rate	7.3%
Standard Error	1.0%
Is SAMHSA Precision Requirement met?	YES
Right-sided 95% Confidence Interval	[0.0%, 9.0%]
Two-sided 95% Confidence Interval	[5.2%, 9.3%]
Design Effect	1.0
Accuracy Rate (unweighted)	85.8%
Accuracy Rate (weighted)	87.2%
Completion Rate (unweighted)	97.9%
Sample Size for Current Year	
Effective Sample Size	267
Target (Minimum) Sample Size	267
Original Sample Size	338
Eligible Sample Size	290
Final Sample Size	284
Overall Sampling Rate	55.0%

Table 2. Retailer Violation Rates, 1996–2010*

Synar Survey Year	Retailer Violation Rate (in %)	95% Confidence Interval (in %)
1996	42.0	NA
1997	28.5	NA
1998	45.6	NA
1999	55.8	NA
2000	8.9	6.5–11.3
2001	9.5	7.0–11.8
2002	8.2	5.2–11.2
2003	8.0	2.2–13.8
2004	8.7	5.5–11.9
2005	7.0	6.5–11.3
2006	6.5	4.3–8.7
2007	7.7	5.7–9.7
2008	9.0	6.6–11.4
2009	9.6	6.9–12.3
2010	7.3	5.2–9.3

*Confidence intervals are not available for 1996–1999.

Clerk Request for ID

The most sizable and significant predictor of attempting to sell was failing to ask for identification. Controlling for all other variables in the model, clerks who failed to ask for an ID had 1,042.0 times higher odds of attempting to sell to minors than clerks who asked for an ID, $p < 0.000$, 95% CI [84.3, 12,884.0]. Figure 2 shows the relationship between sale attempts and asking for an ID; 83.3% of clerks who did not ask for an ID attempted to sell, compared to only 1.2% of clerks who asked for an ID.

Figure 2. Relationship between Clerks Asking for ID and Attempts to Sell
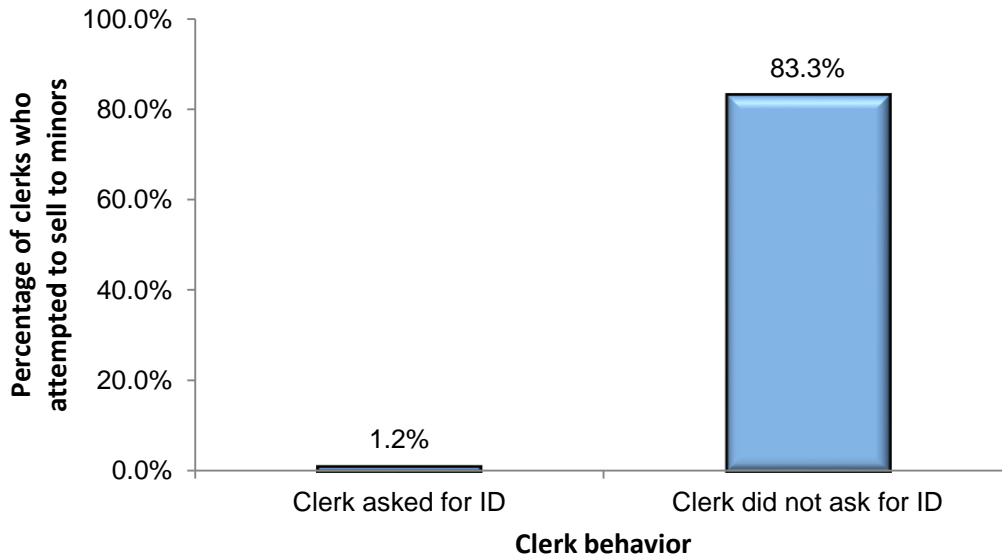
Perceived Buyer Age

SAMHSA recommends that minor buyers look their age (SAMHSA, 2010). To test this concept, we had 12 raters, unfamiliar with the Synar project, guess the age of each minor buyer based on photographs taken on the first day of inspections. We then averaged the 12 ratings to identify a mean perceived age for each buyer. Controlling for all other variables in the model, perceived buyer age was a significant predictor of attempting to sell. Clerks were more likely to attempt to sell to minor buyers who looked 18 or older than to buyers who looked younger than 18, odds ratio = 0.5, $p = 0.005$; 95% CI [0.0, 0.4]. Figure 3 shows that 21.3% of inspections completed by minor buyers who looked 18 or older resulted in a sale attempt, compared to 2.1% of inspections by minor buyers who looked younger than 18.

Buyer Gender

Controlling for all other variables in the model, female buyers had 11.6 times higher odds of an attempted sale than did male buyers, $p = 0.042$, 95% CI [1.1, 123.5]. Additionally, we found that buyer gender and perceived age were highly correlated (67.7% of the male buyers looked 18 or older, compared to only 32.3% of the female buyers, χ^2 (1, $N = 328$) = 17.1, $p < 0.000$). Therefore, when we control for perceived age in our model, females are more likely to experience an attempted sale than are males.

Figure 3. Relationship between Perceived Buyer Age and Attempts to Sell
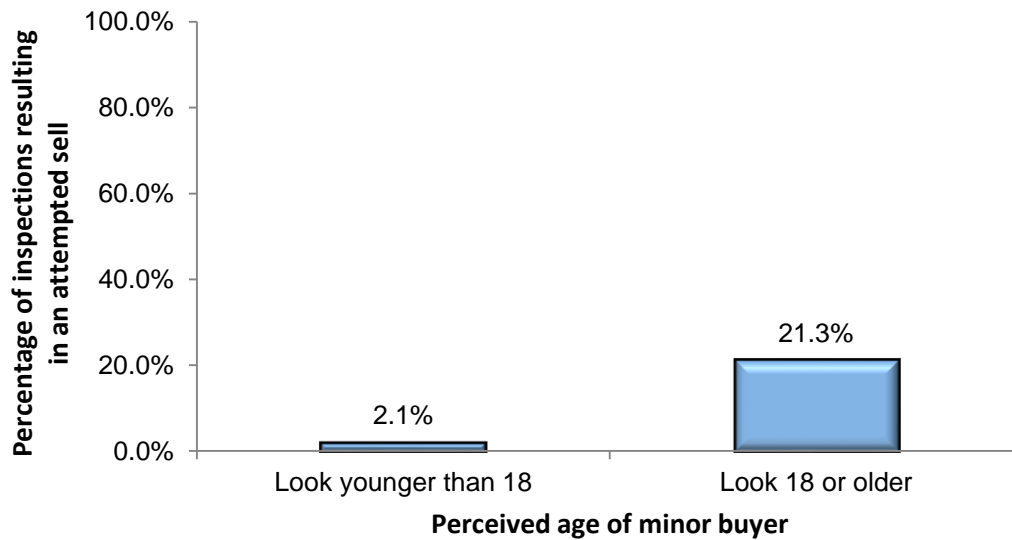
4.2.3.　Significant Correlations and Other Findings

When calculating correlations, we discovered additional findings that have impact on Wyoming's compliance with the Synar amendment.

Type of Tobacco Requested and Sale Attempt

Because this year was our first to conduct chewing tobacco inspections, we examined whether the type of tobacco requested had a significant impact on attempt to sell. We found that chewing tobacco inspections were no more likely to result in a successful sell attempt than were cigarette inspections, χ^2 (1, N = 284) = 2.0, p = 0.155. We also examined whether the gender of the buyer and the type of tobacco requested significantly influenced the likelihood of an attempted sale (with the hypothesis that clerks would attempt to sell chewing tobacco more often to males than to females). For chewing tobacco inspections, we found no association between gender and attempted sale.[5] Only two chewing tobacco inspections resulted in an attempt to sell; one of these inspections was completed by a male buyer and one was completed by a female buyer.

Clerk Ask for ID and Stratum

We found a significant difference between stratum and clerks asking for ID; 87.6% of clerks in small towns asked for ID, compared to 94.3% of clerks in large towns (Figure 4), χ^2 (1, N = 280) = 4.0, p = 0.046.

Clerk Ask for ID and Perceived Buyer Age

Clerks asked for an ID less frequently for buyers who appeared 18 or older. For buyers who looked younger than 18, 96.9% of clerks asked for an ID; for buyers who looked 18 or older, 79.8% of clerks asked for an ID (Figure 5), χ^2 (1, N = 280) = 22.6, p < 0.000.

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[5] Cell counts were two low to conduct a Chi-Square test on this relationship.

Figure 4. Relationship between Clerks Asking for ID and Stratum

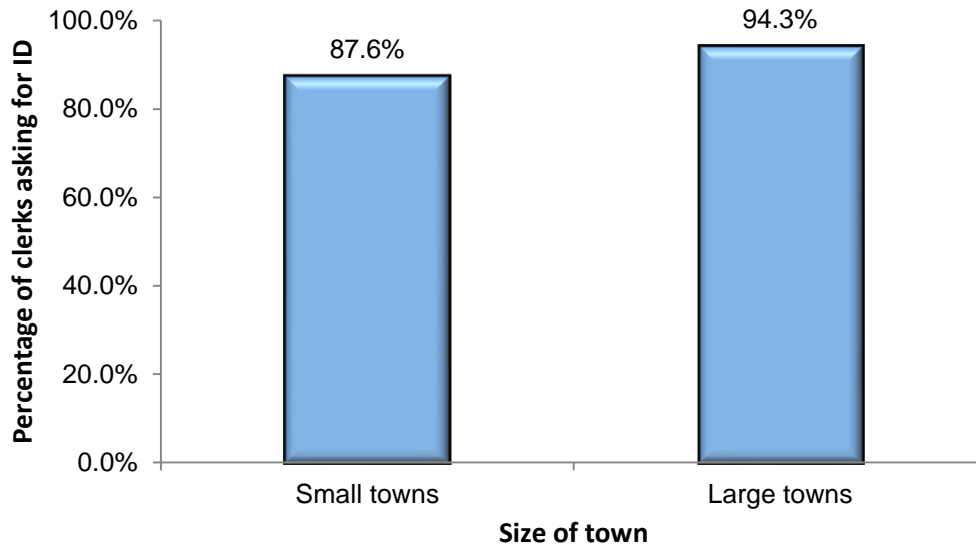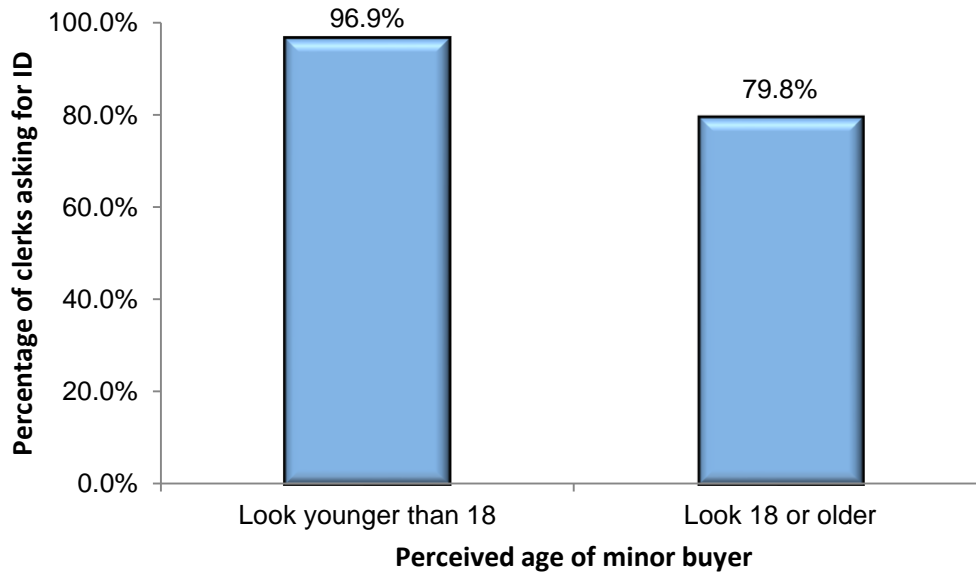Figure 5. Relationship between Clerks Asking for ID and Perceived Buyer Age

Presence of Anti-Tobacco Signs and Stratum

Tobacco retailers in large Wyoming towns had at least one anti-tobacco sign present more often than retailers in small towns; 82.6% of small town retailers had at least one anti-tobacco sign, compared to 94.9% of large town retailers (Figure 6), χ^2 (1, N = 279) = 11.1, p = 0.001.

Figure 6. Relationship between Presence of Anti-Tobacco Signs and Stratum
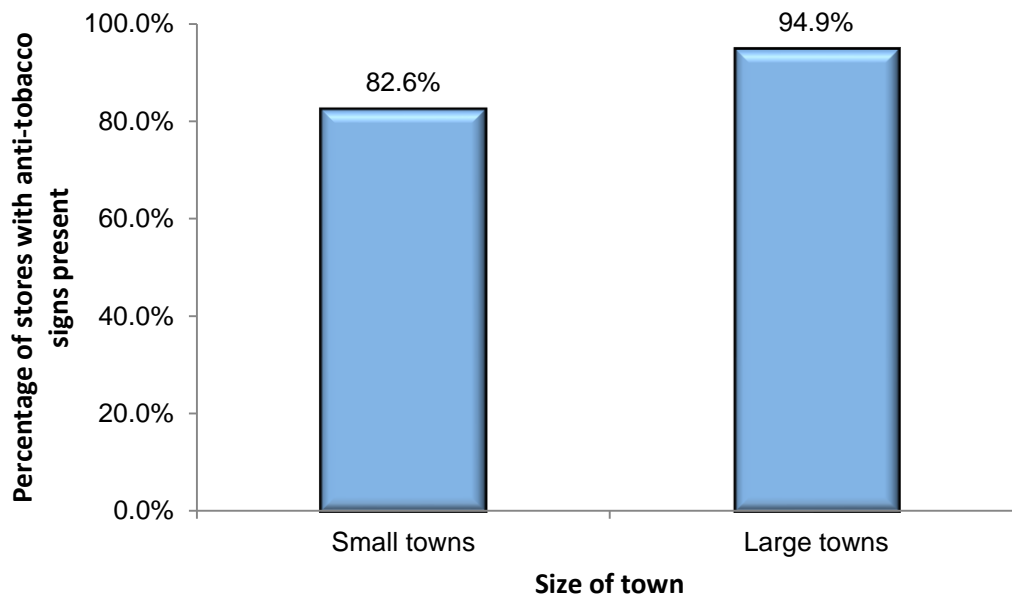
5. Conclusions

SAMHSA *requires* that states have at least an 80.0% coverage rate, and *recommends* that states have at least a 90.0% coverage rate (SAMHSA, 2006). Wyoming's rate of 88.6% exceeds the required rate, but it does not exceed the recommended rate. According to SAMHSA's guidelines, Wyoming can continue to use the tobacco retailer list frame to conduct the Synar inspections and will need to conduct another coverage study in 2013.

The results of the 2010 Synar Inspection Study showed an overall weighted retailer violation rate (RVR) of 7.3% with a 95% confidence interval of 5.2% to 9.3%. When accounting for error, the likely maximum RVR (9.3%) is still well below the 20.0% noncompliance standard set by SAMHSA. Wyoming's RVR has been below this 20.0% maximum since 2000. Before comprehensive educational and enforcement efforts were implemented in 2000, the RVR was as high as 55.8%. These low rates suggest that tobacco sales to minors are infrequent and that compliance is high. The low rates also highlight the success of Wyoming's continued efforts on educating tobacco merchants about the illegality of selling tobacco to minors.

The strongest predictor of attempting to sell was the clerk failing to ask the minor buyer for an ID. In the 2010 inspection study, only 1.2% of clerks who asked for an ID attempted to sell. This finding suggests that clerks who ask for an ID almost never sell to minors. Attempt to sell was also influenced by the perceived age of minor buyers: clerks were more likely to attempt to sell to buyers who looked 18 or older than to buyers who looked younger than 18 (all minor buyers were in fact younger than 18). Buyer gender was also a significant predictor of sale attempt; controlling for other variables, clerks were more likely to attempt to sell to females than to males.

In addition to the perceived buyer age being a significant predictor of an attempted sale, perceived age was also highly correlated with whether clerks asked for ID. Although all of the minor buyers were 15-, 16-, or 17-years-old, six buyers *appeared* 18 or older. In this study, clerks did not always ask

for ID from these older-looking youth and were more likely to attempt to sell to them. As of June 22, 2010, clerks are required to verify age with a photo ID for all customers who look younger than 26 (FDA, 2010a). According to our perceived age ratings, none of our minor buyers appeared older than 26. Therefore, additional education among tobacco retailers about requesting and verifying ID and not selling to minors (regardless of old they look) may help reduce the RVR even more.

Clerks in large Wyoming towns asked for ID more often than did clerks in small towns. Because failing to ask for ID is such a strong predictor of noncompliance, Wyoming could target educational efforts toward clerks in small towns. All clerks, regardless of their rural status, should ask for and verify ID consistently. Tobacco retailers in small towns also displayed fewer anti-tobacco signs. This finding suggests that Wyoming should support efforts to place anti-tobacco messages about tobacco sales to minors in Wyoming's small towns.

In June 2009, the FDA became the regulatory authority in the manufacturing, marketing, and sale of tobacco products (H. Res 1256, 2009). This regulatory authority will have significant impact on Wyoming's future Synar inspections. Before conducting the Synar inspections in 2011, we anticipate carefully reviewing the regulatory changes and adjusting the Synar protocol accordingly. For example, the FDA now limits the use of terms such as light and low tar (FDA, 2010b). Currently, the minor buyers ask for Camel Lights or Marlboro Lights. The FDA also regulates the placement of tobacco products in retail stores (we currently assess tobacco placement during Synar inspections) and is implementing rules on asking for identification (FDA, 2010a).

In May 2010, representatives from SAMHSA visited Wyoming to conduct an extensive system review of Synar. For Synar 2011, WYSAC, MHSASD, and WASCOP should review the recommendations from that system review and implement appropriate changes.

6. References

H. Res. 1256, 111th Cong., Cong. Rec. H6630-H6660 (2009) (enacted).

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7. Appendices

Appendix A. Synar Inspection Study Results

This appendix provides the frequencies for every question on the 2010 Synar Inspection Form. For every question (except 12 and 13), we only report information for the 284 *inspected* stores. For questions 12 and 13 (questions about eligibility and inspection status), we provide information on the 338 stores in the sample. Because of rounding, not all percentages add to 100.0%.

1. Inspection Month

	Frequency	Valid percent
June	68	23.9
July	83	29.2
August	133	46.8
Valid total	284	100.0

2. Time of Visit

	Frequency	Valid percent
AM	109	38.4
PM	175	61.6
Valid total	284	100.0

3. Age of Minor Buyer

	Frequency	Valid percent
Stores inspected by 15-year-olds	69	24.3
Stores inspected by 16-year-olds	67	23.6
Stores inspected by 17-year-olds	148	52.1
Valid total	284	100.0

4. Gender of Minor Buyer

	Frequency	Valid percent
Stores inspected by females	136	47.9
Stores inspected by males	148	52.1
Valid total	284	100.0

5. Outlet County

	Frequency	Valid percent
Laramie	33	11.6
Natrona	24	8.5
Fremont	22	7.7
Albany	19	6.7
Sweetwater	19	6.7
Campbell	16	5.6
Carbon	15	5.3
Lincoln	15	5.3
Uinta	15	5.3
Sheridan	14	4.9
Sublette	12	4.2
Big Horn	11	3.9
Crook	11	3.9
Park	11	3.9
Teton	11	3.9
Converse	8	2.8
Platte	7	2.5
Washakie	5	1.8
Goshen	4	1.4
Weston	4	1.4
Hot Springs	3	1.1
Niobrara	3	1.1
Johnson	2	0.7
Total	284	100

6. Type of Store

	Frequency	Valid percent
Convenience (with gas)	190	66.9
Grocery store	45	15.8
Convenience (no gas)	11	3.9
Discount / Superstore (e.g., Wal-Mart, Target)	9	3.2
Other (specify): *see below*	8	2.8
Tobacco store	8	2.8
Pharmacy / Drug store	8	2.8
Restaurant / Cafe	5	1.8
Valid total	284	100.0

"Other" responses:
- Pawn shop
- Variety store
- Bowling alley
- Sporty goods and liquor store

- Newspaper/magazine store
- Tobacco and gas
- Truck stop with gas and restaurant
- Truck stop with gas and travel information

7. Location of Cigarettes

	Frequency	Valid percent
Not accessible (customers require assistance from an employee to obtain cigarettes)	261	98.5
Accessible (customers can pick up a pack of cigarettes without the assistance of an employee)	4	1.5
Valid total	265	100.0
No answer (may have been a chew inspection)	19	
Total	284	

8. Location of Chewing Tobacco

	Frequency	Valid percent
Not accessible (customers require assistance from an employee to obtain cigarettes)	208	97.2
Accessible (customers can pick up a pack of cigarettes without the assistance of an employee)	6	2.8
Valid total	214	100.0
No answer (may have been a cigarette inspection)	70	
Total	284	

9. Were there any anti-tobacco signs present in the store? (e.g. "No Sales to Minors")

	Frequency	Valid percent
Yes	250	89.6
No	29	10.4
Valid total	279	100.0
No answer	5	
Total	284	

10. Clerk Gender

	Frequency	Valid percent
Female	210	73.8
Male	74	26.2
Valid total	284	100.0

11. Approximate Age of Clerk

	Frequency	Valid percent
18–24	70	24.6
25–34	70	24.6
35–44	59	20.8
45–54	58	20.4
55–70	27	9.5
Valid total	284	100.0

12. Was the outlet (store) eligible for an inspection?

	Frequency	Valid percent
Yes	293	86.7
No	45	13.3
Valid total*	338	100.0

* Includes all tobacco retailers in the sample

12a. If NO, mark one of the following reasons the store was ineligible for inspection:

	Frequency	Valid percent
Out of business	19	42.2
Does not sell tobacco products	19	42.2
Inaccessible to youth	3	6.7
Duplicate	2	4.5
Other (specify): *see below*	1	2.2
Temporary closure	1	2.2
Valid total	45	100.0

"Other" responses:
  • Sold cigars only (1)

13. If outlet is eligible, was inspection completed?

	Frequency	Valid percent
Yes	284	96.9
No	9	3.1
Valid total	293	100.0
Ineligible	45	
Total*	338	

* Includes all tobacco retailers in the sample

13a. If NO, mark one of the following reasons the inspection was not completed:

	Frequency	Valid percent
Other (specify): *see below*	4	44.5
In operation, but closed at time of visit	3	33.3
Tobacco out of stock	1	1.1
Presence of police	1	1.1
Valid total	9	100.0

"Other" responses:
- Federal park (4)

14. If inspection was completed, was buy attempt successful?

	Frequency	Valid percent (not weighted)
Yes	23	8.1
No	261	91.9
Valid total	284	100.0

14a. If YES, how much was the pack of cigarettes?

	Frequency	Valid percent
$3.00-3.99	1	4.8
$4.00-4.99	9	42.9
$5.00-5.99	8	38.1
$6.00-6.99	2	9.5
$7.00-7.99	1	4.8
Valid total	21	100.0

14a. If YES, how much was the can of chewing tobacco?

	Frequency	Valid percent
$3.00-3.99	1	50.0
$4.00-4.99	1	50.0
Valid total	2	100.0

15. What type of tobacco did the youth inspector ask for? (Every fifth inspection should be for chewing tobacco.)

Tobacco type	Frequency	Valid percent
Cigarettes	227	79.9
Chewing Tobacco	57	20.1
Valid total	284	100.0

16. What tobacco brand was attempted to be purchased?

Tobacco brand	Frequency	Valid percent
Marlboro Lights	193	68.7
Skoal	49	17.4
Camel Lights	31	11.0
Copenhagen	6	2.1
Marlboro	1	0.4
Other brand (specify): *see below*	1	0.4
Valid total	281	100.0
No answer	3	
Total	284	

"Other brand" responses:
- Prince Albert

17. Did the clerk ask for youth's ID?

	Frequency	Valid percent
Yes	256	91.4
No	24	8.6
Valid total	280	100.00
No answer	4	
Total	284	

18. Did the clerk ask for youth's age?

	Frequency	Valid percent
Yes	15	5.6
No	254	94.4
Valid total	269	100.0
No answer	15	
Total	284	

Appendix B. Detailed Calculations for the Coverage and Inspection Studies

B.1. Coverage Study Formulas

WYSAC used the instructions and formulas presented in SAMHSA's *CSAP Guide for a Synar Sampling Frame Coverage Study* (2006, p. 13-14) to allocate the sample to two strata and optimize costs:

$$n_{urban} = n \frac{N_{urban} * S_{urban}}{N_{urban} * S_{urban} + \frac{N_{rural} S_{rural}}{\sqrt{a^{-1}}}}$$

and

$$n_{rural} = n - n_{urban}$$

where

$$a^{-1} = \frac{cost_{rural}}{cost_{urban}}$$

In this equation, *n* is the target sample size, n_{urban} is the sample size for the urban strata, N_{urban} is the estimated population size for the urban stratum, S_{urban} is the standard deviation in the urban stratum, N_{rural} is the estimated population size for the rural stratum, S_{rural} is the standard deviation in the rural stratum, and a^{-1} is the cost ratio of canvassing a rural tract over the cost of canvassing an urban tract.

Consistent with SAMHSA's guidance on total sample size (2006, p. 11), WYSAC set the target sample size at 120 outlets. Substituting the estimated values for the 2010 coverage study, we found

$$n_{urban} = 120 \frac{257 * 0.395}{257 * 0.395 + \frac{338*0.479}{\sqrt{\frac{3}{1}}}} = 62.4$$

and

$$n_{rural} = 120 - 62.4 = 57.6$$

Using the 2009 Synar tobacco retailer list frame, we determined that Wyoming has an average of 4.8 tobacco retail outlets per census tract. Extrapolating the above target sample sizes to target sample sizes in census tracts and rounding to whole numbers, we found

$$\frac{62.4 \; urban \; outlets}{4.8 \; outlets \; per \; tract} = 13 \; urban \; tracts; \; \frac{57.6 \; rural \; outlets}{4.8 \; outlets \; per \; tract} = 12 \; rural \; tracts$$

and sampled accordingly.

The un-weighted coverage formula from the *CSAP Guide for a Synar Sampling Frame Coverage Study* (2006, p. 15) is given by the following general equation:

$$C = 100 \times \frac{b}{n}$$

In this equation, b is the number of outlets from the tobacco retailer list frame found by the coverage study and n is the total number of outlets found by the coverage study (regardless of whether they were on the list frame). Because the 2010 coverage study used a stratified sample, we needed to calculate a weighted coverage rate. The equation with weighting is (SAMHSA, 2006, p 15):

$$C = 100 \times \frac{\sum_{i=1}^{k} w_i b_i}{\sum_{i=1}^{k} w_i n_i}$$

In this equation, b_i is the number of outlets from the tobacco retailer list frame found in each stratum, n_i is the number of outlets found by the coverage study in each stratum, and w_i is the stratum weight, calculated by the following equation (SAMHSA, 2006, p 15):

$$w_i = \frac{K_i}{k_i}$$

In this equation, k_i is the number of areas selected for coverage in a stratum and K_i is the number of areas in the stratum.

For the 2010 coverage study, the equation expanded as follows:

$$C = 100 \times \frac{w_{urban} b_{urban} + w_{rural} b_{rural}}{w_{urban} n_{urban} + w_{rural} n_{rural}}$$

or

$$C = 100 \times \frac{\frac{K_{urban}}{k_{urban}} \times b_{urban} + \frac{K_{rural}}{k_{rural}} \times b_{rural}}{\frac{K_{urban}}{k_{urban}} \times n_{urban} + \frac{K_{rural}}{k_{rural}} \times n_{rural}}$$

WYSAC calculated the 2010 Synar weighted coverage rate:

$$C = 100 \times \frac{\frac{48}{13} \times 47 + \frac{78}{12} \times 73}{\frac{48}{13} \times 52 + \frac{78}{12} \times 83} = 88.6\%$$

This equation gave a final weighted coverage rate of 88.6%, with a 95% confidence interval of 83.5% to 93.7%, above the SAMHSA required threshold of 80.0% (SAMHSA, 2006).

WYSAC also calculated separate coverage rates for each stratum:

$$C_{urban} = 100 \times \frac{b_{urban}}{n_{urban}} = \frac{47}{52} = 90.4\%$$

$$C_{rural} = 100 \times \frac{b_{rural}}{n_{rural}} = \frac{73}{83} = 88.0\%$$

The coverage rate for each stratum was above the SAMHSA required threshold of 80.0%. The rates for the two stratum were not significantly different, χ^2 (1, N = 731.5) = 0.8, p = 0.363.

To calculate the accuracy of the tobacco retailer list frame, WYSAC compared the coverage study results to the list frame. We followed SAMHSA's definition of accuracy: we considered an outlet's information 100% accurate if the tobacco retailer list frame information would allow field workers to easily locate the outlet. While calculating accuracy, we only included outlets covered by the inspection list frame. If the coverage study address and the list frame address were identical, the outlet was accurate. If the coverage study listed a different *name* than the list frame, we still considered the outlet accurate because the name change would not prevent somebody from locating it. The un-weighted accuracy is given by the following equation:

$$A = 100 \times \frac{a}{b}$$

In this equation, A is the un-weighted accuracy of tobacco retailer list frame addresses, a is the number of stores found by the coverage study with accurate addresses, and b is the number of outlets from the tobacco retailer list frame found by the coverage study (the coverage rate formulas above). Because the coverage study used a stratified sample, we needed to calculate a weighted accuracy rate. Thus, WYSAC calculated a weighted accuracy for the list frame addresses with the following equation, based on the weighted coverage rate equation for the coverage study (above):

$$A = 100 \times \frac{w_{urban}a_{urban} + w_{rural}a_{rural}}{w_{urban}b_{urban} + w_{rural}b_{rural}}$$

or

$$A = 100 \times \frac{\frac{K_{urban}}{k_{urban}} \times a_{urban} + \frac{K_{rural}}{k_{rural}} \times a_{rural}}{\frac{K_{urban}}{k_{urban}} \times b_{urban} + \frac{K_{rural}}{k_{rural}} \times b_{rural}}$$

In this equation, k_i is the number of areas selected for coverage in a stratum, K_i is the number of areas in the stratum, a_i is the number of outlets with accurate list frame addresses found by the coverage study in each stratum, and b_i is the number of outlets from the tobacco retailer list frame found in each stratum (the coverage rate formulas above). Substituting the values for the coverage study, we found:

$$A = 100 \times \frac{\frac{48}{13} \times 42 + \frac{78}{12} \times 64}{\frac{48}{13} \times 47 + \frac{78}{12} \times 73} = 88.1\%$$

Thus, the weighted accuracy for the list frame was 88.1%, with a 95% confidence interval of 82.7% to 93.7%. WYSAC also calculated accuracy rates specific to each stratum using the following equations:

$$A_{urban} = 100 \times \frac{a_{urban}}{b_{urban}} = \frac{42}{47} = 89.4\%$$

$$A_{rural} = 100 \times \frac{a_{rural}}{b_{rural}} = \frac{64}{73} = 87.7$$

As in the weighted coverage rate, the list frame information was slightly less accurate for the rural stratum. However, the difference was not statistically significant, χ^2 (1, N = 648.0) = 0.3, p = 0.556.

B.2. Inspection Study Sampling Design

Tables D-1 and D-2 provide information on the sample sizes for the two strata, depicting output from the SSES Sample Size Calculator. WYSAC entered several variables (under "Input Information" in each table). An explanation of each variable follows:

- **One-sided option for 95% Confidence Interval** meets the same precision requirement with a smaller sample size than the two-sided choice.
- **Outlet Frame Size** represents the total population of tobacco retail stores on the list frame. Because we conducted the sample size calculations separately for each stratum, the outlet frame size is specific to the stratum (urban or rural). The original list frame had 416 urban municipality outlets and 188 rural municipality outlets.
- **Expected Retailer Violation Rate (RVR)** is the weighted RVR from last year's survey. Again, the weighted RVR is specific for each stratum. The rural municipality RVR from last year was 13.3% and the urban municipality RVR from last year was 8.0%.
- **Design Effect** is estimated from last year's survey. The design effect normally accounts for the loss of effectiveness by using a sampling design other than a simple random sample. Because we conducted the sample size calculations separately and conducted a simple random sample within each stratum, the design effect for both strata was 1.
- **Expected Accuracy Rate** is the percentage of outlets whose information was accurate on last year's list frame. This rate provides an estimate of the proportion of outlets on the list frame that are eligible for the Synar survey. This percentage is specific to each stratum.
- **Expected Completion Rate** is the percentage of stores inspected by last year's inspection teams. The numerator is the percentage of outlets visited; the denominator is the number of outlets drawn for the sample. This percentage is specific to each stratum.
- **Safety Margin Used** is the percentage by which the sample size is inflated to ensure a large enough sample size. A safety margin allows us to account for ineligible outlets (e.g., businesses that had closed, were not accessible to minors, or did not sell tobacco) on the list frame. We used a safety margin of 10.0% for each stratum.

Once we entered this information, SSES provided three outputs: effective sample size, target sample size, and planned original sample size. Definitions for each of these outputs follow.

- **Effective Sample Size** is the sample size needed to meet the SAMHSA precision requirement under simple random sampling.
- **Target (Minimum) Sample Size** is the sample size needed to achieve the desired precision requirement with a complex sampling design. This number is the product of the effective sample size and the design effect. Because our design effect for both strata is 1, our effective sample size is the same as our target sample size.

- **Planned Original Sample Size** is the actual sample size we used to draw the sample. To compute this number, SSES inflates the target sample size using the accuracy and completion rates and incorporates the safety margin.

Table B-1. SSES Sample Size Output for the *Rural* Sampling Frame

Synar Survey

State	WY
FFY	2011
Date	6/7/2010 10:19

Input Information

Option for 95% Confidence Interval	One-Sided
Outlet Frame Size	188
Expected Retailer Violation Rate	13.3%
Design Effect	1
Expected Accuracy Rate	90.5%
Expected Completion Rate	94.4%
Safety Margin Used	10.0%

Sample Size

Effective Sample Size	122
Target(Minimum) Sample Size	122
Planned Original Sample Size	158

Table B-2. SSES Sample Size Output for the *Urban* Sampling Frame

Synar Survey

State	WY
FFY	2011
Date	6/7/2010 10:19

Input Information

Option for 95% Confidence Interval	One-Sided
Outlet Frame Size	416
Expected Retailer Violation Rate	8.0%
Design Effect	1
Expected Accuracy Rate	92.2%
Expected Completion Rate	96.2%
Safety Margin Used	10.0%

Sample Size

Effective Sample Size	145
Target(Minimum) Sample Size	145
Planned Original Sample Size	180

Based on the 2010 Synar results, the input values for the 2011 Synar inspections are as follows:
- Rural stratum
    - Expected RVR = 11.4%
    - Expected accuracy rate = 81.0%
    - Expected completion rate = 96.1%
- Urban stratum
    - Expected RVR = 5.6%
    - Expected accuracy rate = 90.0%
    - Expected completion rate = 99.4%

B.3. RVR Calculations

We estimated the number of total outlets eligible for inspection in the list frame by

$$N_{total} = N_{large}\left(\frac{n_{1\ large}}{n_{large}}\right) + N_{small}\left(\frac{n_{1\ small}}{n_{small}}\right)$$

where

N_{total} = the estimated number of total outlets eligible for inspection in the list frame
N_{large} = the number of urban stratum outlets on the list frame
$n_{1\ large}$ = the number of outlets eligible for inspection within the urban stratum
n_{large} = the number of outlets in the original sample within the urban stratum
N_{small} = the number of rural stratum outlets on the list frame
$n_{1\ small}$ = the number of outlets eligible for inspection within the rural stratum
n_{small} = the number of outlets in the original sample within the rural stratum

This gives an estimated number of total outlets eligible for inspection:

$$416\ \frac{162}{180} + 188\ \frac{128}{158} = 526.70$$

We estimated the weighted RVR by

$$\left(\frac{x_{large}}{n_{2\ large}}\right)\left(\frac{n_{1\ large}}{n_{large}}\right)\left(\frac{N_{large}}{N_{total}}\right) + \left(\frac{x_{small}}{n_{2\ small}}\right)\left(\frac{n_{1\ small}}{n_{small}}\right)\left(\frac{N_{small}}{N_{total}}\right)$$

Where, in addition to the variables defined above

x_{large} = the number of noncompliant outlets within the urban stratum
$n_{2\ large}$ = the number of outlets inspected within the urban stratum
x_{small} = the number of noncompliant outlets within the rural stratum
$n_{2\ small}$ = the number of outlets inspected within the rural stratum

Thus, the weighted noncompliance rate for the 2010 Synar inspection study was

$$\left(\frac{9}{161}\right)\left(\frac{162}{180}\right)\left(\frac{416}{526.70}\right) + \left(\frac{14}{123}\right)\left(\frac{128}{158}\right)\left(\frac{188}{526.70}\right) = \ 0.073 \ or \ 7.3\%$$

B.4. Logistic Regression Methods

WYSAC modeled the data using logistic regression because we had a binary response variable with multiple explanatory variables. We examined the following explanatory variables: clerk ask for ID, clerk age, buyer age, perceived buyer age, stratum, clerk gender, clerk ask for age, buyer gender, store type, location of tobacco, and presence of anti-tobacco signs. Initially, we ran Pearson Chi-Square tests for each of these variables against buy attempt. Two variables were significant (at the $\alpha = 0.05$ level) in the Chi-Square tests: perceived buyer age and clerk ask for ID. We then tested different models using these two variables along with different combinations of variables that were included in the 2009 logistic regression model. We checked all predictors for multicollinearity by calculating Pearson correlations.

To test for goodness of fit for our regression model, we used Akaike's Information Criterion (AIC). Buyer gender became a significant predictor in the model after we controlled for perceived buyer age, clerk asking for ID, and stratum. We included stratum in the model to account for our stratified sampling design. The final model with the lowest AIC (indicating a good fit) included four predictors: clerk ask for ID, perceived buyer age, buyer gender, and stratum. This model indicates a high level of predictive power with 98.6% of all attempted sales correctly classified. One limitation of our logistic regression model is that we had low cell counts on several variables, especially buy attempt (92.7% of attempts were unsuccessful) and clerk ask for ID (91.4% of clerks asked for ID). Low cell counts can increase variability in the model thereby increasing confidence intervals. The low cell counts in our model also prevented us from properly testing interaction effects. Table D-3 provides the full logistic regression model.

Table B-3. Logistic Regression Model

Variable (reference value)	Coefficient	Standard Error	Significance	Odds Ratio	95% Confidence Interval (lower, upper)
Stratum (1)	-0.455	0.939	0.628	0.634	0.101, 3.995
Buyer gender (1)	2.455	1.205	0.042	11.647	1.098, 123.505
Clerk ask for ID (1)	6.949	1.283	0.000	1042.020	84.275, 12884.017
Perceived buyer age (1)	-3.009	1.069	0.005	0.049	0.006, 0.401

Coding:
Stratum 1=urban, 0=rural
Buyer gender 1=male, 0=female
Clerk ask for ID 1=yes, 0=no
Perceived buyer age 1=18 and older, 0=younger than 18

AIC = -2log likelihood + 2 (# of parameters)
AIC = 41.05 + 2 (5) = 51.05