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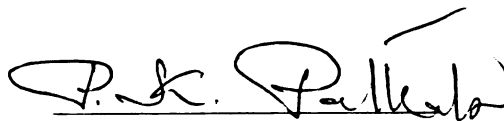
ESTIMATION OF SMALL AREA SMOKING PREVALENCE IN PRIMARY
CARE MEDICAL PRACTICES: A LOGISTIC MODEL

presented by

David P. Weismantel, M.D.

has been accepted towards fulfillment
of the requirements for

M.S. degree in Epidemiology



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ESTIMATION OF SMALL AREA SMOKING PREVALENCE IN PRIMARY CARE
MEDICAL PRACTICES: A LOGISTIC MODEL

By

David Paul Weismantel, M.D.

A THESIS

Submitted to
Michigan State University
In partial fulfillment of the requirements
For the degree of

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2003

ABSTRACT

ESTIMATION OF SMALL AREA SMOKING PREVALENCE IN PRIMARY CARE MEDICAL PRACTICES: A LOGISTIC MODEL

By

David Paul Weismantel, M.D.

Data from a controlled trial within 87 primary care medical practices, the U.S. Bureau of the Census, and the Michigan Department of Community Health was used to estimate a small area smoking prevalence for each participating site.

The smoking prevalence within this medical practice cohort as estimated from a one-day exit survey was $18.6 \pm 1.8\%$ (95% confidence interval, CI) with a range of 0% to 60%, significantly lower than the reported statewide smoking prevalence in Michigan of $26.1 \pm 1.8\%$ (95% CI). With a binomial proportion of smokers obtained from the patient exit survey within each of the practices serving as the dependent variable, a multivariate logistic regression model was constructed. Significant predictors of practice-level smoking prevalence within the final model were the estimated regional smoking prevalence from the community health department, proportion uninsured and Medicaid coverage within each of the practices, and the average patient age as determined from the exit survey. After application of the resultant regression coefficients to individual practice site data, the overall estimated smoking prevalence remained 18.6%, but with decreased range of 8.8% to 38.4%. These results should be viewed and interpreted with caution as this model has not been validated against more precise determinations of smoking prevalence at the practice level.

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INTRODUCTION

Tobacco smoking is an important risk factor for many diseases including coronary artery disease, peripheral vascular disease, chronic obstructive pulmonary disease, and transitional cell carcinoma of the bladder. The direct cost in human suffering caused by tobacco related diseases is quite evident to patients, families, and physicians. The World Health Organization (WHO) estimates that 90% of lung cancer, up to 20% of other cancers, 75% of chronic bronchitis and emphysema, and 25% of deaths from cardiovascular disease at ages 35 to 69 years are attributable to tobacco (1). The financial burden of these illnesses is shared by all of society. An analysis by the Centers for Disease Control and Prevention and the University of California estimated \$50 billion were spent on direct medical costs attributable to tobacco use. This does not include medical care for diseases caused by second-hand smoke, fetal complications of smoking in pregnancy, or burn care for smoking-related fires (2). Indirect costs to society arise from lost economic productivity due to illness and premature death (3).

Smoking cessation interventions have been shown to be both efficacious and cost-effective in primary care settings according to a systematic review of controlled studies undertaken by the task force for the Agency for Health Care Research and Quality (AHRQ) guidelines on smoking cessation (4). These guidelines substantiate the value of identifying all smokers, advising them to quit, assisting those who are ready to quit, and eventually arranging follow-up care. Brief smoking cessation advice by the physician alone results in long-term smoking quit rates of less than ten percent. Smoking risk identification and cessation rates are enhanced by more systematic approaches in primary medical care (5).

Cognitive behavioral therapies, delivered primarily in groups and supplemented with nicotine replacement, report some of the highest long-term cessation rates in practice (6,7). These services typically offer coping strategies to prevent relapse and attend to follow-up care; however, less than 5% of smokers will ultimately accept a referral and attend group sessions (8).

Surveys of primary care physicians demonstrate that they understand the importance of smoking cessation and espouse its value, yet the actual implementation of the key elements of practice-based methods for smoking cessation remains quite limited in primary care medical settings (9,10). Prior to the AHRQ guidelines, the National Cancer Institute advocated the value of brief counseling for smoking cessation (11). In 1989, Cummings et. al. reported that many physicians in both private and managed care practices never use these recommended strategies, with 33-44% never advising on quit dates, 27-48% never assisting with self-help materials, and 68-75% never arranging follow-up care (9). A subsequent national survey of office-based physicians in 1998 showed little interim change in physician practice patterns regarding smoking cessation (10). The physicians identified patient smoking status at only 67% of visits and showed no change between 1991 and 1996. Specialist physicians generally performed worse than primary care physicians on the recommended components. Although follow-up care clearly enhances long-term success rates, physicians rarely schedule smokers for follow-up smoking cessation visits. These clinical performance surveys clearly demonstrate that physicians fall short of the AHRQ guidelines and the national goals for a more healthy American population.

A new model for enhanced primary care (12) may be needed for physicians to meet advocated standards in smoking cessation and other preventive health measures. Systematic reviews of interventions to improve physician behavior in health screening and preventive

services do not suggest a single or simple solution. Traditional continuing medical education (CME) programs improve short-term knowledge and performance, yet long-term behavior remains unaffected (13). Provision of office-based systems, team support, and specific feedback information on actual performance in preventive care have been shown to enhance the long-term performance of physicians (14-16).

Several community and health system-based studies have demonstrated that relatively high long-term smoking cessation rates of 20-36% may be achieved by combining physician identification, advice, and referral for follow-up care with a telephone-support counseling service (17-20). These services not only offer proactive follow-up care, but also integrate some elements of relapse prevention counseling known to be helpful in cognitive group therapy. By combining the systematic supports of an organized health care system with accessible counseling services and specific feedback on referral rates and outcomes, physicians will be more able to meet the AHRQ guidelines on smoking cessation. Promoting maintenance of behavior change in large populations is best delivered by an integrated and comprehensive approach across a system of care.

Specific feedback to providers regarding referral rates to smoking cessation counseling services requires rather specific practice- and provider-level information. Work intensity and a practice-level smoking prevalence are essential variables needed to construct a valid measure of smoker contact opportunities for intervention or referral. Although providers are able to accurately estimate a simple number of patients seen in a day or number of days worked in a typical week, they have a limited sense of the smoking prevalence within their own practices. The literature is limited regarding the estimation of any health behavior at the medical practice level.

Previously described risk factors or predictors of smoking are race, gender, age, and socioeconomic status. Tobacco use and smoking also vary within and among racial and ethnic groups: American Indians have the highest prevalence; African American and Southeast Asian men also have a relatively high prevalence of smoking. Asian American and Hispanic women have the lowest prevalence. In most racial/ethnic groups, men have a higher prevalence of cigarette smoking (21-23). Smoking prevalence is noted to decrease with increasing age. Although lower socioeconomic status has been found to be one of the best predictors of smoking prevalence, there exists a complex interaction of race with socioeconomic status (23-28). Any attempt to predict or focus effort upon populations at increased of smoking should first account for those members with lower educational and socioeconomic status.

METHODS

Objectives

The principle objectives of this study are to identify the significant risk factors for smoking within a cohort of primary care medical practices and then model these associations within a binomial logistic model to provide a refined small area or practice-level smoking prevalence estimate for each practice. Furthermore these model estimates of smoking prevalence will be compared to the initial exit survey estimates in order to describe the potential effect of this procedure.

Data Management & Statistical Analysis

All data management, transformations, and analyses were conducted using SAS version 8.2 (SAS Institute Inc, Cary, NC).

The LOGISTIC procedure was used to build, refine, and apply the binomial logistic regression model of practice smoking prevalence. The MI and MIANALYZE procedures were used to multiply impute missing data and appropriately combine the model parameter estimates from each of the imputed data sets.

The frequencies of responses for categorical variables and the means, standard deviations, and distributions for continuous variables were initially determined. The frequency of unknown or missing responses was counted for each variable, and steps were taken to assess patterns of missing data to determine if methods should be used to exclude cases or fields as they were, or impute additional information using standard procedures.

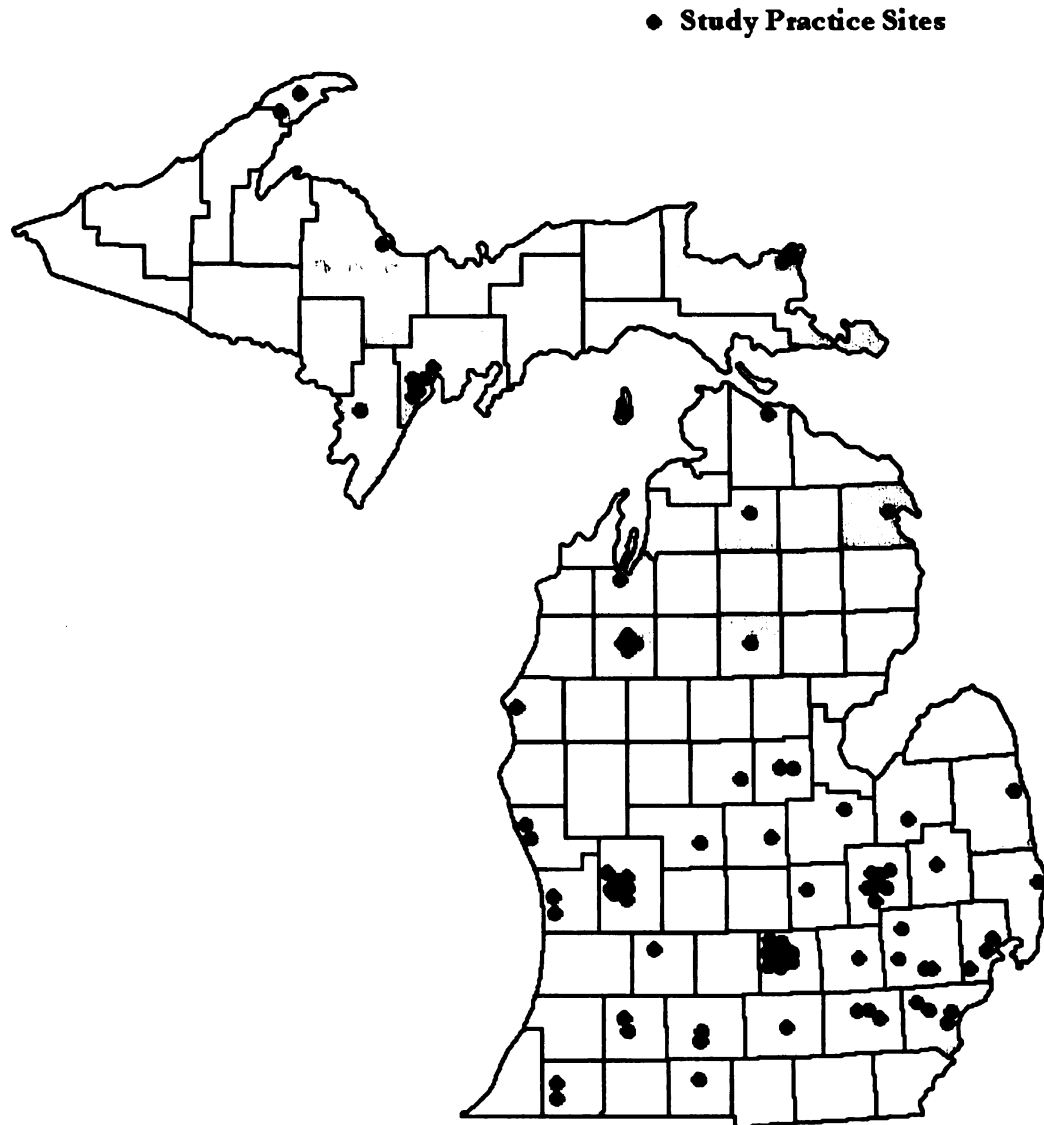
Protection of Human Subjects

The study protocol (# 01-789) was reviewed and approved by the Michigan State University Committee on Research Involving Human Subjects (UCRIHS). (Appendix 1)

Study Design

This exercise was completed within the Evaluation of Organizational Changes to Promote Smoking Cessation within Managed Care Study (Robert Wood Johnson Foundation: Grant # 43968), a collaborative effort of Michigan State University and Blue Cross Blue Shield of Michigan. The study is an 18-month, community-based, randomized, and controlled trial designed to evaluate the effect of a targeted and comparative provider feedback intervention upon smoking cessation counseling and referral behaviors within primary care medical practices. Figure 1 illustrates the geographic distribution of participating practices within the state of Michigan.

Figure 1.
Geographic Distribution of Study Practice Sites within Michigan



A total of 87 primary care practices including 308 providers in 39 counties were ultimately enrolled in the study.

Practice, provider, and one-day patient exit surveys (Appendices 2 - 4) were completed for each participating practice during a 6-month period prior to the start of the randomized intervention in January 2003. The practice surveys were completed by the business or practice managers while the provider surveys were completed by the participating physicians, nurse practitioners, and physician assistants. The one-day patient exit survey attempted to query all patients presenting to a participating clinic after their clinic visits.

The primary study measure is the number of referrals to a designated telephone smoking cessation counseling service with the medical practice as the primary unit of analysis. Although the referrals are pooled for analysis between groups, a quarterly feedback report was designed to reflect individual provider behavior and practice patterns. To this end, an estimated referral rate was designed to report the number of referrals completed for every 100 smoker visits. The numerator, or number of referrals, is obtained from BCBSM on a quarterly basis for each provider within the study. The denominator, or estimated smoker visits per quarter, is a synthesis of information obtained through survey of each provider and an estimate of a practice-level smoking prevalence. The following formulas describe the calculation of this denominator:

Quarterly Smoker Visits =

Adjusted Adult Visits/Day * Days Worked/Quarter * Smoking Prevalence

with

Adjusted Adult Visits = Total Visits - Pediatric Visits - (0.25 * Obstetric Visits)

The adjustment for obstetrics is designed to correct for the relatively increased frequency of visits by obstetrics patients as compared to the more general primary care medical population.

Model Selection

Although the exit survey queried patients regarding their smoking status, the relatively small sample sizes in many of the practice sites limited its use as a practice-level estimate of smoking prevalence. The provider survey queried physicians regarding their estimate of smoking prevalence within the practice, yet this correlated poorly with regional and exit survey results. In order to calculate more specific and accurate referral rates, a small area smoking prevalence was estimated for each practice site through the application of a binomial logistic regression model.

Smoking prevalence, most commonly viewed as a binary variable, lends itself to analysis through logistic regression, investigating the relationship between discrete responses and a set of explanatory variables. For binary response models, the response, Y , of an individual may take one of two possible discrete values. Suppose x is a vector of explanatory variables and $p = \Pr(Y = 1 \mid x)$ is the response probability to be modeled. The linear logistic model has the general form:

$$\text{logit}(p) \equiv \log\left(\frac{p}{1-p}\right) = \alpha + \beta'x$$

where α is the intercept parameter and β is the vector of slope parameters. Logistic models enable the specification of both continuous and categorical explanatory variables. It should be noted the response probability p within a logistic model is bounded by the values of 0 and 1. For these reasons and since the unit of analysis for the smoking prevalence is the medical practice, a logistic regression model was used to calculate the parameter estimates and odds ratios for a variety of potential explanatory variables and their association with a practice-level smoking prevalence.

Variable Selection

Potential explanatory variables were assembled from several levels with regard to the primary care medical practice:

1. 2000 U.S. Census Data (29)
 - a. Per Capita Income (\$)
 - i. County
 - ii. City
 - b. Prevalence of Poverty (%)
 - i. County
 - ii. City
 - c. Population Density (Persons per Square Mile)
2. Michigan Department of Community Health (MDCH) Behavioral Risk Factor Surveillance System (30)
 - a. Designated Health Region
(Categorical: 1-12)
 - b. Regional Smoking Prevalence 1995-99 (%)
3. Practice Survey
 - a. Practice Type
(Categorical: Solo vs. Group)
 - b. Practice Specialty
(Categorical: Family Practice, Internal Medicine, Obstetrics/Gynecology)
 - c. Estimation of Population Age
(Proportion Adults ≥ 65 Years of Age)
 - d. Estimated Proportions of Race/Ethnicity within the Practice
(White, African American, Hispanic)
 - e. Estimated Proportions of Insurance Coverage within the Practice
(Private Prepaid, Private Fee-For-Service, Medicare, Medicaid, Uninsured)
4. Patient Exit Survey
 - a. Current Smoking Status
(Categorical: Yes / No)
 - b. Age (Years)
 - c. Gender
(Categorical: Male/Female)
 - d. Race/Ethnicity
(Categorical: White, African American, Hispanic, Asian, Native American)

After logarithmic or square root transformation of some positively-skewed variables to better approximate a normal distribution, all potential continuous and categorical explanatory variables were evaluated within a univariate logistic model to screen for potential inclusion within a subsequent multivariate model. All variables with a threshold value of $P \leq 0.25$ were initially entered into the model, with variables of highest variance removed one at a time in a backward fashion and the model recalculated until all remaining variables had $P \leq 0.05$. The null hypothesis that the odds ratio of the variable was equal to 1 was rejected if the probability P of the association was found to be equal or less than 0.05 in this analysis ($\alpha=0.05$). Confidence intervals for the regression parameters and odds ratios were calculated based on the profile likelihood function (31,32).

Multiple Imputation of Missing Values

Since 75 of the 87 practice site units were missing data for at least one of the significant variables and were excluded from the initial analysis as incomplete cases in a list-wise fashion, a method to complete the data set and further refine the smoking prevalence estimates was needed. A potential strategy for handling missing data is simple imputation, in which one substitutes a value for each missing value. For example, each missing value can be imputed with the variable mean of the completed cases, or it can be imputed with the variable mean conditional on observed values of other variables. This approach treats missing values as if they were known in the complete-data analysis. Single imputation does not convey the uncertainty about the predictions of the unknown missing values, and the resulting estimated variances of the parameter estimates will be biased toward zero (33-39).

Instead of filling in a single value for each missing value, multiple imputation replaces each missing value with a set of plausible values that represent the uncertainty about

the correct value to impute. The multiply imputed data sets are then analyzed by using standard procedures for complete data and combining the results of these analyses. Multiple imputation does not attempt to estimate each missing value through simulated values but rather to represent a random sample of the missing values. This process results in valid statistical inferences that appropriately reflect the uncertainty due to missing values; for example, confidence intervals with the correct probability coverage. It should be noted that a base assumption for multiple imputation is that the data is missing at random (MAR). By definition, the missing data for variable Y are missing at random if the probability of missing data on Y is unrelated to the value of Y , after controlling for other variables in the analysis. Multiple imputation inference involves three distinct phases:

1. The missing data are filled in m times to generate m complete data sets.
2. The m complete data sets are analyzed by using standard statistical analyses.
3. The results from the m complete data sets are combined to produce inferential results.

With m imputations, m different sets of the point and variance estimates for a parameter Q can be computed. Let $\hat{Q}_i$ and $\hat{U}_i$ be the point and variance estimates from the i -th imputed data set, $i=1, 2, \dots, m$. Then the combined point estimate for Q from multiple imputation is the average of the m complete-data estimates:

$$\bar{Q} = \frac{1}{m} \sum_{i=1}^m \hat{Q}_i$$

Let $\bar{U}$ be the within-imputation variance which is the average of the m complete-data estimates:

$$\bar{U} = \frac{1}{m} \sum_{i=1}^m \hat{U}_i$$

and B be the between imputation variance

$$B = \frac{1}{m-1} \sum_{i=1}^m (\hat{Q}_i - \bar{Q})^2$$

Then the variance estimate associated with Q is the total variance

$$T = \bar{U} + (1 + \frac{1}{m})B$$

The degrees of freedom v_m depends on m and the ratio

$$r = \frac{(1 + m^{-1})B}{\bar{U}}$$

The ratio r is called the relative increase in variance due to nonresponse. When there is no missing information about Q the values of r and B are both zero. With a large value of m or a small value of r , the degrees of freedom v will be large. Another useful statistic is the fraction of missing information about Q

$$\hat{\lambda} = \frac{r + 2/(v + 3)}{r + 1}$$

The relative efficiency (RE) of using the finite m imputation estimator, rather than using an infinite number for the fully efficient imputation, in units of variance, is approximately a function of m and λ

$$RE = (1 + \frac{\lambda}{m})^{-1}$$

The following table shows the relative efficiencies with different values of m and λ . For cases with little missing information, only a small number of imputations are necessary.

Table 1.
Relative Efficiency of Multiple Imputation

<i>m</i>	λ				
	10%	20%	30%	50%	70%
3	0.9677	0.9375	0.9091	0.8571	0.8108
5	0.9804	0.9615	0.9434	0.9091	0.8772
10	0.9901	0.9804	0.9709	0.9524	0.9346
20	0.9950	0.9901	0.9852	0.9756	0.9662

With approximately 10% (N=11) of the variable for uninsured & Medicaid status missing and the values of exit survey variables from a single practice, multiple imputation was performed with the MI procedure with the number of imputations $m=10$. All other variables with significant association to the dependent variable of smoking prevalence with $P \leq 0.25$ were included in the imputation procedure. The MIANALYZE procedure was then used to combine the results of individual binomial logistic regression analyses for the 10 multiply imputed data sets.

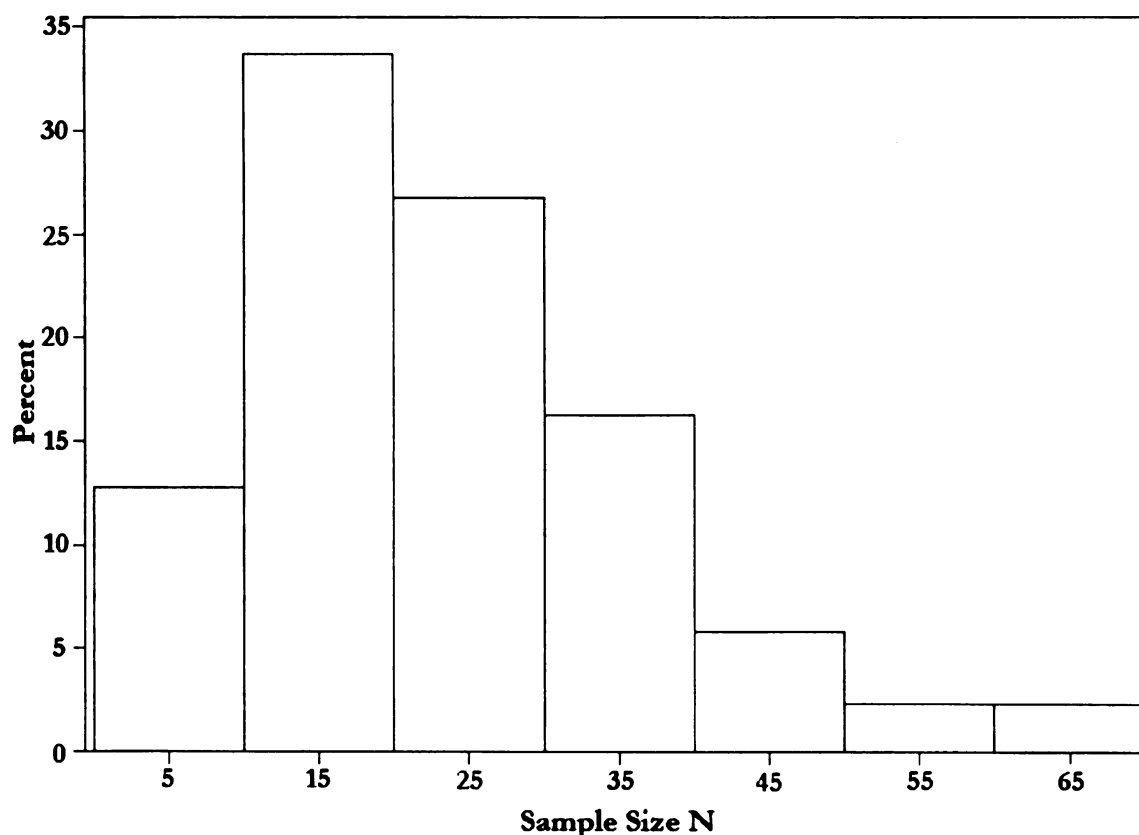
Calculation of Practice-Level Smoking Prevalence

The resultant parameter estimates were then applied to each individual practice site in order to calculate a model estimate smoking prevalence. Subsequently, this model estimate was directly compared to the initial exit survey estimate, and the baseline provider referral counts were used to calculate referral rates based upon a uniform or model estimate smoking prevalence.

RESULTS

The exit survey in 86 of the 87 participating primary care practices yielded the proportion of smokers, the dependent variable upon which potentially predictive variables were modeled. Of the 3,619 eligible adults present during the 1-day survey, a total of 3,180 (87.9%) were approached and 1,966 (54.3%) agreed to complete the exit survey. Figure 1 illustrates the wide range and distribution of the exit survey sample size within these primary care practices.

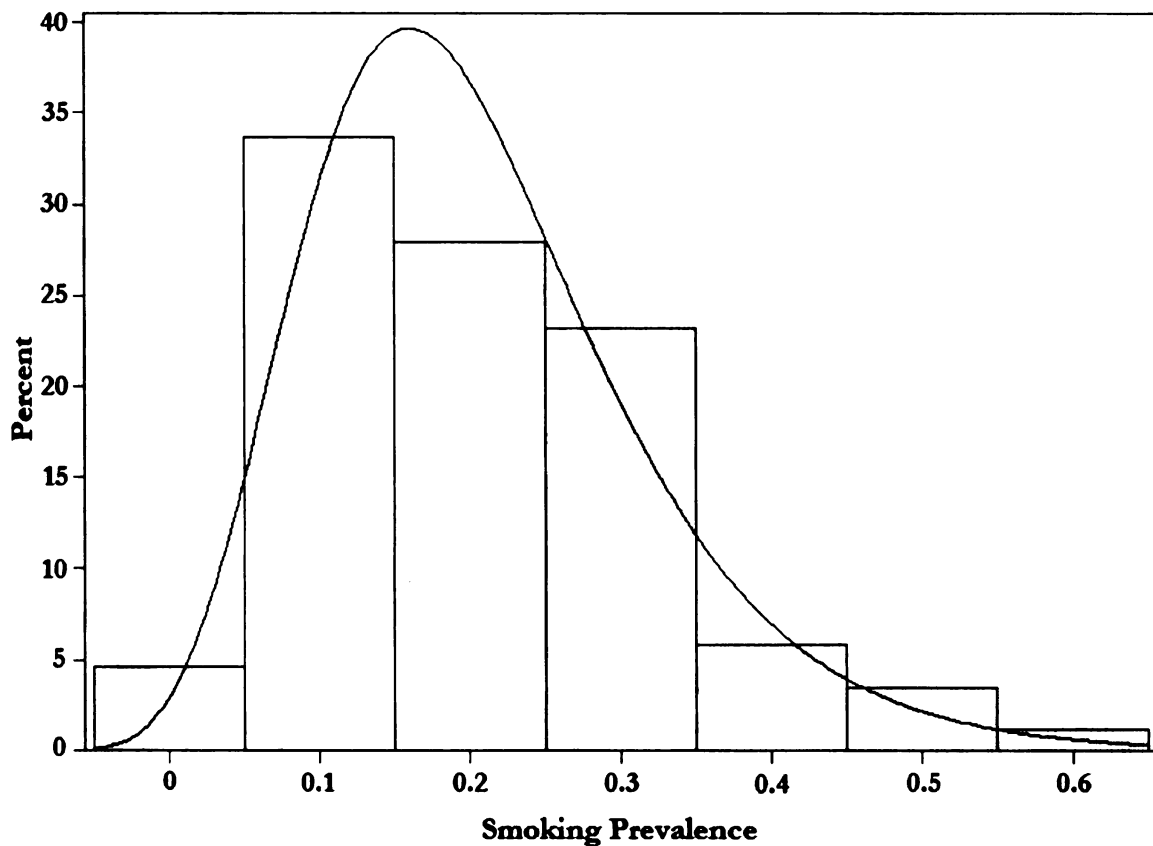
Figure 2.
Distribution of Exit Survey Sample Size



Sample (N)	Mean Sample Size	Standard Deviation	Minimum	Maximum
86	22.9	13.6	4	65

Evaluation and analysis of the practice smoking prevalence revealed a distribution approximating lognormal with a weighted mean of 0.186 and an estimate of 0 for 2 of the 86 surveyed practice sites (Figure 2).

Figure 3.
Distribution of Survey Smoking Prevalence within Primary Care Medical Practices



Sample (N)	Weighted Mean	Standard Deviation	Minimum	Maximum
86	0.186	0.047	0	0.6

A natural log transformation of the odds (logit) of the surveyed smoking status of patients within each of the practice sites demonstrated a nearly symmetric distribution approximating normality (Figure 3). It is to this distribution that a binomial logistic regression model of potential risk factors may be fit.

Figure 4.
Log Odds (Logit) Transformation of Exit Survey Smoking Prevalence

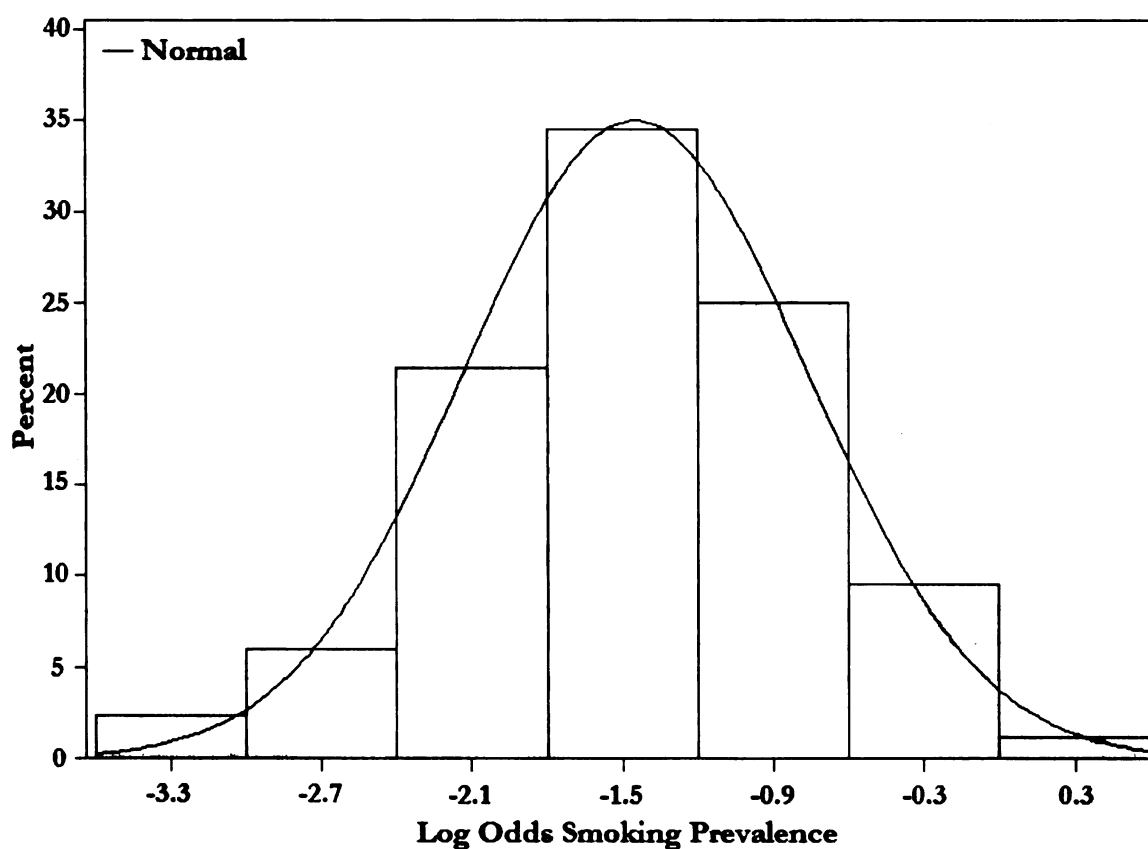


Table 2 summarizes the information obtained from the U.S. Bureau of the Census and includes income and poverty measured at both county and city levels.

Table 2.

U.S. Census 2000 Demographic Variables for Practice Site (N=87)

	N	Mean	Standard Deviation	Minimum	Maximum
Per Capita Income, County { \$ }	87	20790	3684	15078	32534
Per Capita Income, City { \$ }	87	19354	4567	12691	32622
Poverty % - County	87	10.7	3.5	3.4	20.4
Poverty % - City	87	14.1	8.5	3.2	37.2
Population Density { Pr Sq Mile }	87	532.2	741.0	24.3	3356.1

The Behavioral Risk Factor Survey (BRFS) administered annually by the Michigan Department of Community Health provided estimates of smoking prevalence for each of 12 designated health regions as demonstrated in Table 3.

Table 3.

Michigan Department of Community Health Variables for Practice Location (N=87)

	N	Mean	Standard Deviation	Minimum	Maximum
Smoking Prevalence %	87	25.5	2.9	18.1	30.1

Health Region	N (%)	Smoking Prevalence (%)
1	16 (18.4)	26.6
2	8 (9.2)	30.1
3	1 (1.1)	22.2
4	14 (16.1)	23.4
5	5 (5.8)	24.3
6	2 (2.3)	25.9
7	10 (11.5)	24.6
8	7 (8.0)	28.1
9	5 (5.8)	23.4
10	3 (3.4)	26.5
11	4 (4.6)	23.7
12	12 (13.8)	27.5

Table 4 summarizes the demographic information as obtained from the practice surveys. The specialty of well over half of the participating offices is family practice. Each of the five medical insurance categories is well represented within this cohort of primary care medical practices.

Table 4.
Practice Survey Demographic Variables

	N	Mean	Std Dev	Minimum	Maximum
Participating Providers	87	3.5	2.6	1	10
Race (Estimated Percent)					
White	82	80.0	21.4	0	100
African American	82	10.4	13.8	0	65
Hispanic	82	4.9	6.7	0	40
Insurance					
Private Prepaid	76	20.3	22.1	0	96
Private Fee For Service	76	30.5	21.2	0	85
Medicare	77	23.2	17.9	0	70
Medicaid	76	16.0	15.9	0	85
Uninsured	76	5.3	8.8	0	70

	N	Percent %
Specialty		
Family Practice	51	58.6
Internal Medicine	20	23.0
Obstetrics/Gynecology	16	18.4
Practice Type		
Solo	13	14.9
Group	74	85.1

Table 4 summarizes the patient demographic information from the exit surveys. The study population is noted to be predominately white with a majority of women participants.

Table 5.
Patient Exit Survey Demographic Variables

	N (%)	Mean	Std Dev	Minimum	Maximum
Age, Individual {Years}	1937	47.6	18.4	18	98
Age, Practice Mean {Years}	86	47.2	9.3	22.4	66.6
Gender {%}					
Male	597 (31.0)	30.5	20.8	0	85.2
Female	1330 (69.0)	69.5	20.8	14.8	100
Race (%)					
White	1712 (88.8)	86.6	20.2	0	100
African American	111 (5.8)	7.5	15.7	0	85.7
Hispanic	35 (1.8)	2.2	5.4	0	37.5
Asian	22 (1.1)	1.3	4.5	0	36.4
Native American	19 (1.0)	1.1	3.2	0	22.2
Other	28 (1.5)	1.3	2.5	0	12.5

Each of the identified continuous and categorical variables was then individually assessed within a univariate logistic regression model with the binomial proportion of smokers as the dependent variable. For the practice-level estimate of proportion insurance coverage, linear combinations of the categories were constructed and also tested for potential significance; the combined category of uninsured and Medicaid was found to be more predictive than either category alone. A composite listing of each factor and its associated regression coefficient, standard error, and significance levels P is reported in Table 5.

Table 6.

Univariate Analysis of Factors within a Binomial Logistic Regression Model of Practice Smoking Prevalence

U.S. Census 2000	N	β	Standard Error	P
Income (County)	86	-0.00006	0.00002	0.0022
Log Transformation*	86	-1.23710	0.39278	0.0016
Income (City)	86			
Log Transformation*	86			0.0395
Poverty % (County)	86	0.01110	0.01750	0.0524
Poverty % (City)	86	-0.00205	0.00670	0.7595
Population Density	86	0.00002	0.00010	0.8447
Log Transformation*	86	-0.08680	0.04760	0.0680
Race (Percent)				
White*	86	0.00967	0.00628	0.1240
African American	86	-0.07500	0.00740	0.3111
Hispanic*	86	-0.05220	0.02560	0.0413
Asian*	86	-0.10750	0.03890	0.0057
Native American	86	0.04130	0.04150	0.3199
MDCH	N	β	Standard Error	P
Smoking Prevalence (MDCH)*	86	0.04660	0.02040	0.0223
MDCH Region	86			0.2837
Practice Survey	N	β	Standard Error	P
Specialty*	86			0.0006
Practice Type (Solo vs. Group)	86			0.8855
Age (Proportion Adults ≥ 65 Years)	72	-0.31920	0.34160	0.3501
Race (Estimated %)				
White	81	0.00068	0.00349	0.8449
African American	81	-0.00240	0.00520	0.6439
Hispanic	81	-0.00861	0.01180	0.4667
Insurance (Estimated %)				
Private Prepaid	75	-0.00094	0.00280	0.7376
Private Fee For Service*	75	-0.00392	0.00292	0.1797
Medicare*	76	-0.01050	0.00372	0.0047
Medicaid*	75	0.01890	0.00395	0.0001
Uninsured*	75	0.03440	0.01410	0.0150
Uninsured & Medicaid*	75	0.01740	0.00358	0.0001
Square Root Transformation	75	0.14190	0.03150	0.0001
Exit Survey	N	β	Standard Error	P
Age (Average Age)*	86	-0.02310	0.00601	0.3472
Gender (Percent Male)	86	-0.00322	0.00293	0.2716
Race (Percent)				
White	86	-0.00267	0.00390	0.4931
African American	86	0.00475	0.00523	0.3639
Hispanic	86	-0.00152	0.01520	0.9204
Asian	86	-0.01040	0.01890	0.5811
Native American	86	0.01680	0.01920	0.3808
Other	86	0.00083	0.02530	0.9738

* indicates those variables significant at the $p \leq 0.25$ level.

Analysis within a multivariate binomial logistic regression model yielded the parameter estimates as shown in Table 7. The remaining variables include the estimated regional smoking prevalence, proportion uninsured and Medicaid, and the average patient age as determined from the exit survey.

Table 7.
Initial Multivariate Regression Model of Practice Smoking Prevalence
with Parameter Estimates (N=75)

	β	95% CI		P
Intercept	-2.399	-3.648	-1.176	0.0001
Smoking Prevalence (MDCH) {%}	0.056	0.014	0.010	0.0100
Uninsured & Medicaid (Practice) {%}				
Square Root Transformation	0.106	0.040	0.173	0.0018
Average Age (Exit) {Years}	-0.019	-0.034	-0.005	0.0096

Since 11 practice sites were missing the estimates of insurance coverage and another the average age of patient per exit survey, multiple imputation was undertaken to replace this missing data and allow the model estimation of smoking prevalence in all 87 participating practices. A summary of multiple imputation variance information is provided in Table 8.

Table 8.
Multiple Imputation Variance Information

	Variance			DF	Relative Increase in Variance	Fraction Missing Information
	Between	Within	Total			
Intercept	0.01106	0.34067	0.35284	7562.2	0.0357	0.0348
Smoking Prevalence (MDCH)	0.00001	0.00044	0.00045	8251.4	0.0342	0.0333
Uninsured & Medicaid (Practice)						
Square Root Transformation	0.00010	0.00098	0.00110	829.9	0.1162	0.1063
Average Age (Exit)	0.00000	0.00005	0.00005	4383.1	0.0475	0.0457

The final multiple imputation model parameter estimates, odds ratios, and significance levels P are reported in Table 9. There is only minimal change noted in these estimates after multiple imputation.

Table 9.

Final Multivariate Regression Model of Practice Smoking Prevalence with Multiple Imputation Parameter Estimates and Odds Ratios (N=87)

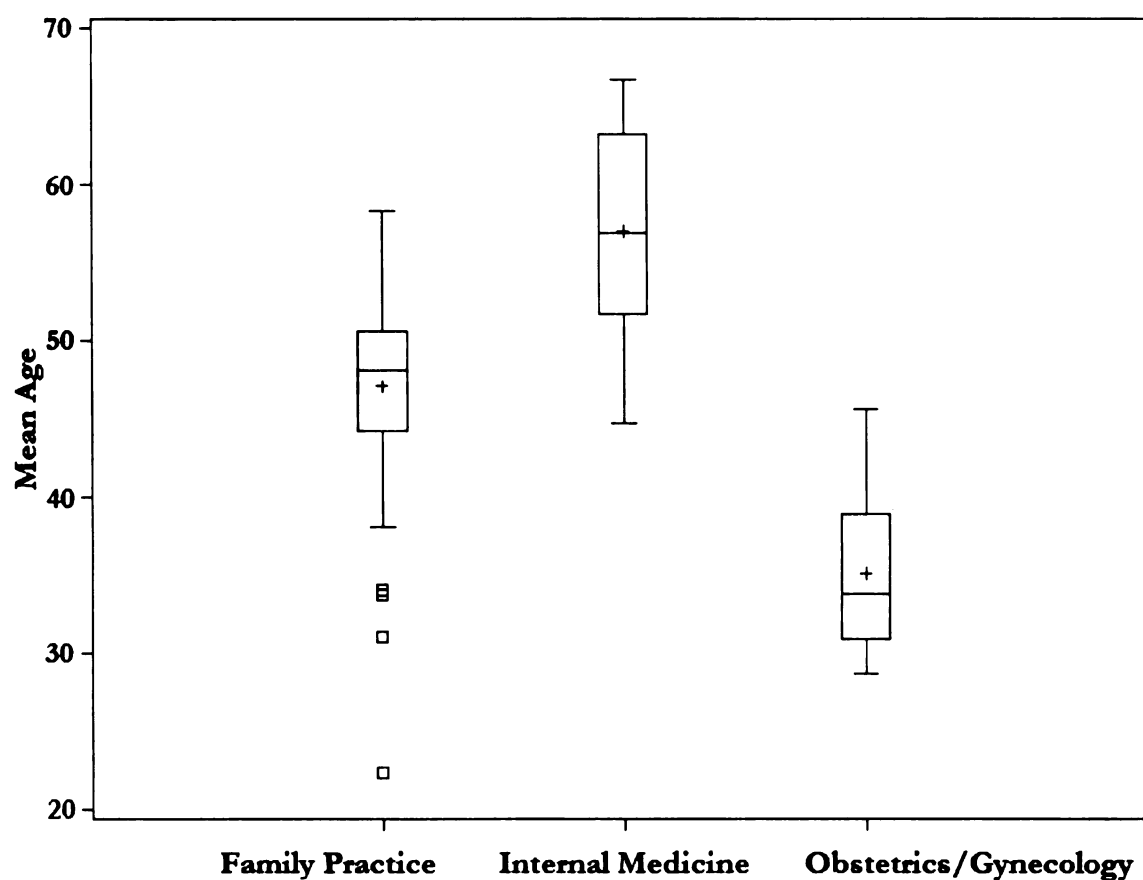
	β	95% CI		P
Intercept	-2.410	-3.574	-1.245	0.0001
Smoking Prevalence (MDCH) {%}	0.056	0.014	0.098	0.0087
Uninsured & Medicaid (Practice) {%}				
Square Root Transformation	0.103	0.038	0.168	0.0019
Average Age (Exit) {Years}	-0.018	-0.032	-0.005	0.0077

	Odds Ratio	95% CI	
Smoking Prevalence (MDCH) {%}	1.058	1.014	1.105
Uninsured & Medicaid (Practice) {%}			
Square Root Transformation	1.112	1.041	1.189
Average Age (Exit) {Years}	0.981	0.966	0.995

The association of age with practice specialty is illustrated in Figure 5 with the internal medicine patient population significantly older than the family practice and obstetrics/gynecology populations.

Figure 5.

Age of Practice Population as a Function of Practice Specialty

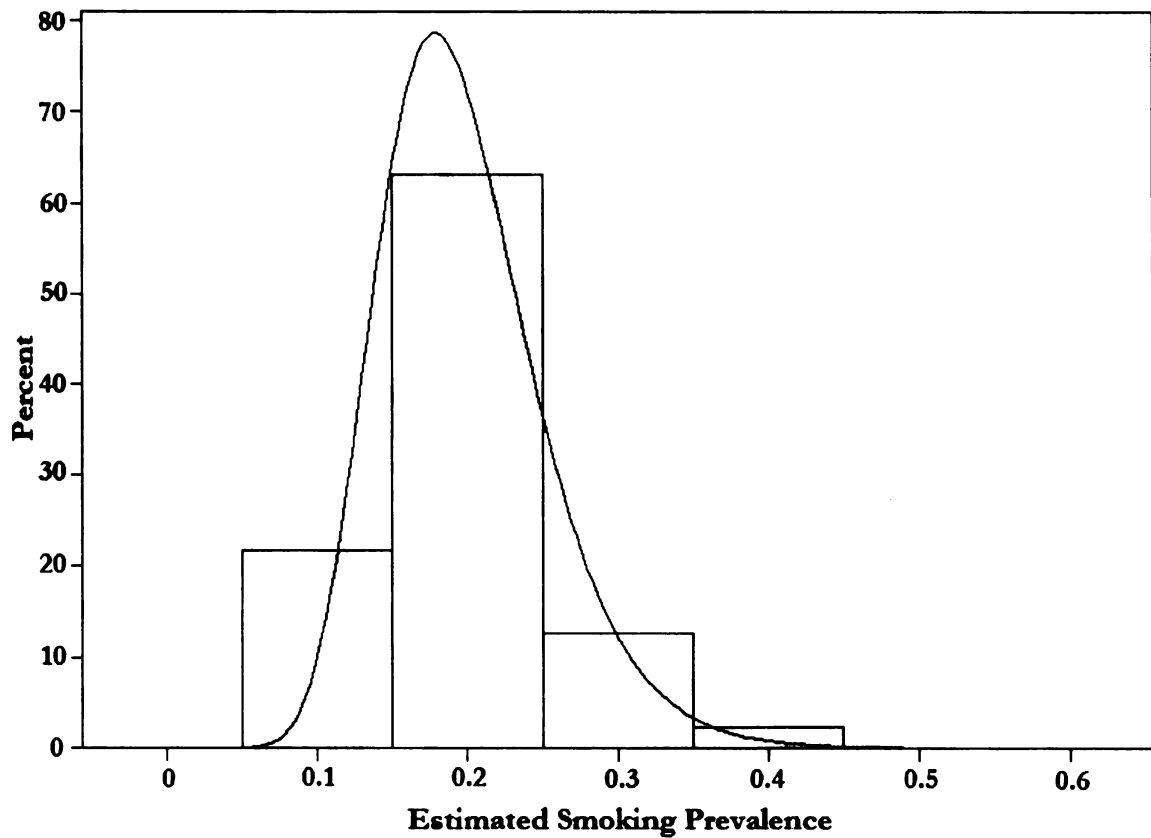


	N	Mean Age	Standard Deviation	Minimum	Maximum
Specialty					
Family Practice	51	47.1	6.7	22.4	58.3
Internal Medicine	20	57.0	6.1	44.7	66.6
Obstetrics/Gynecology	16	35.1	5.2	28.7	45.6

ANOVA : P <0.0001 with a significant difference between each of the groups.

The distribution of the logistic model estimate smoking prevalence shown in Figure 6 is again approximates a lognormal distribution but with a significantly decreased range and variance.

Figure 6.
Practice Smoking Prevalence – Logistic Model Estimate



Sample (N)	Weighted Mean	Standard Deviation	Minimum	Maximum
87	0.186	0.025	0.088	0.384

Figure 7 illustrates the model deviance residuals versus the predicted smoking prevalence for each practice site.

Figure 7.

Logistic Model Deviance Residual Values vs. Predicted Smoking Prevalence

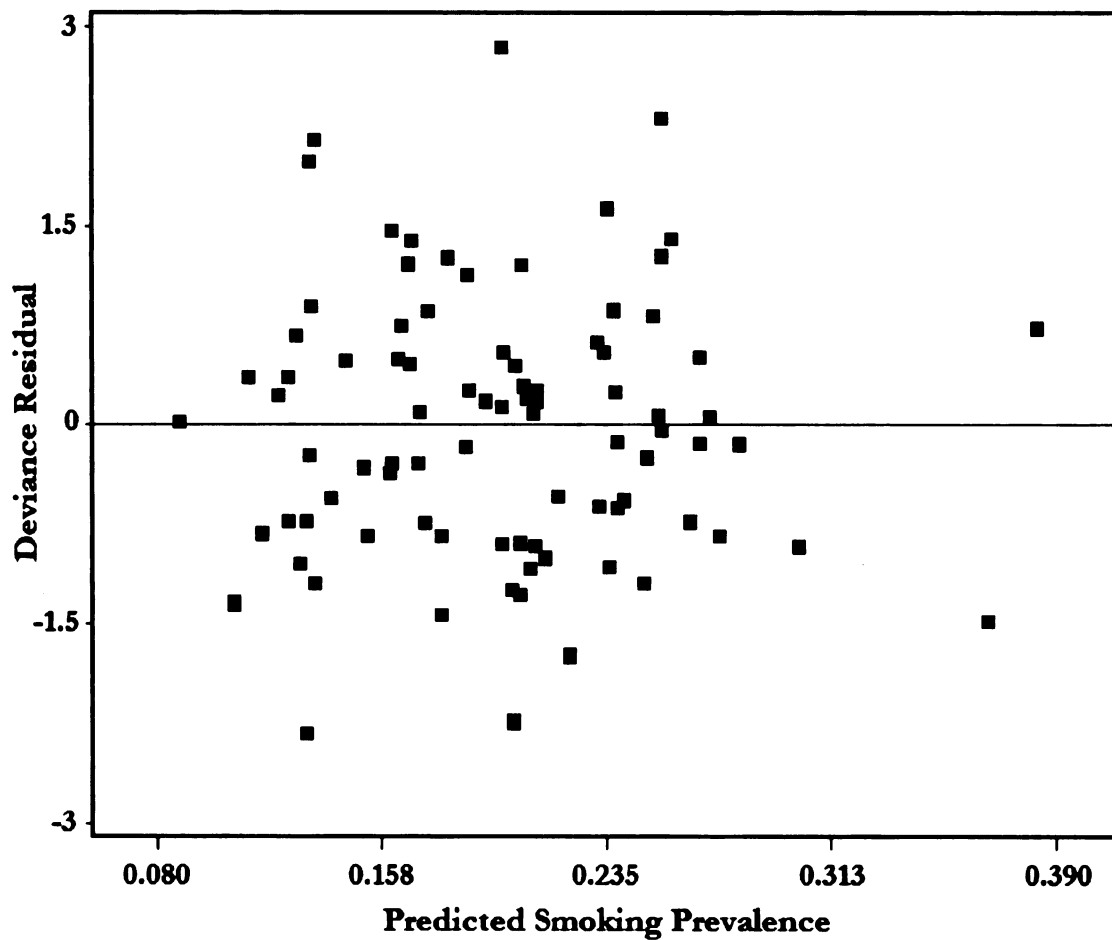


Figure 8 is a graphical representation of the decreased range and variance of the model estimate as compared to the exit survey determination of smoking prevalence.

Figure 8.
Distribution of Exit Survey and Model Estimate Smoking Prevalence by Survey Sample Size

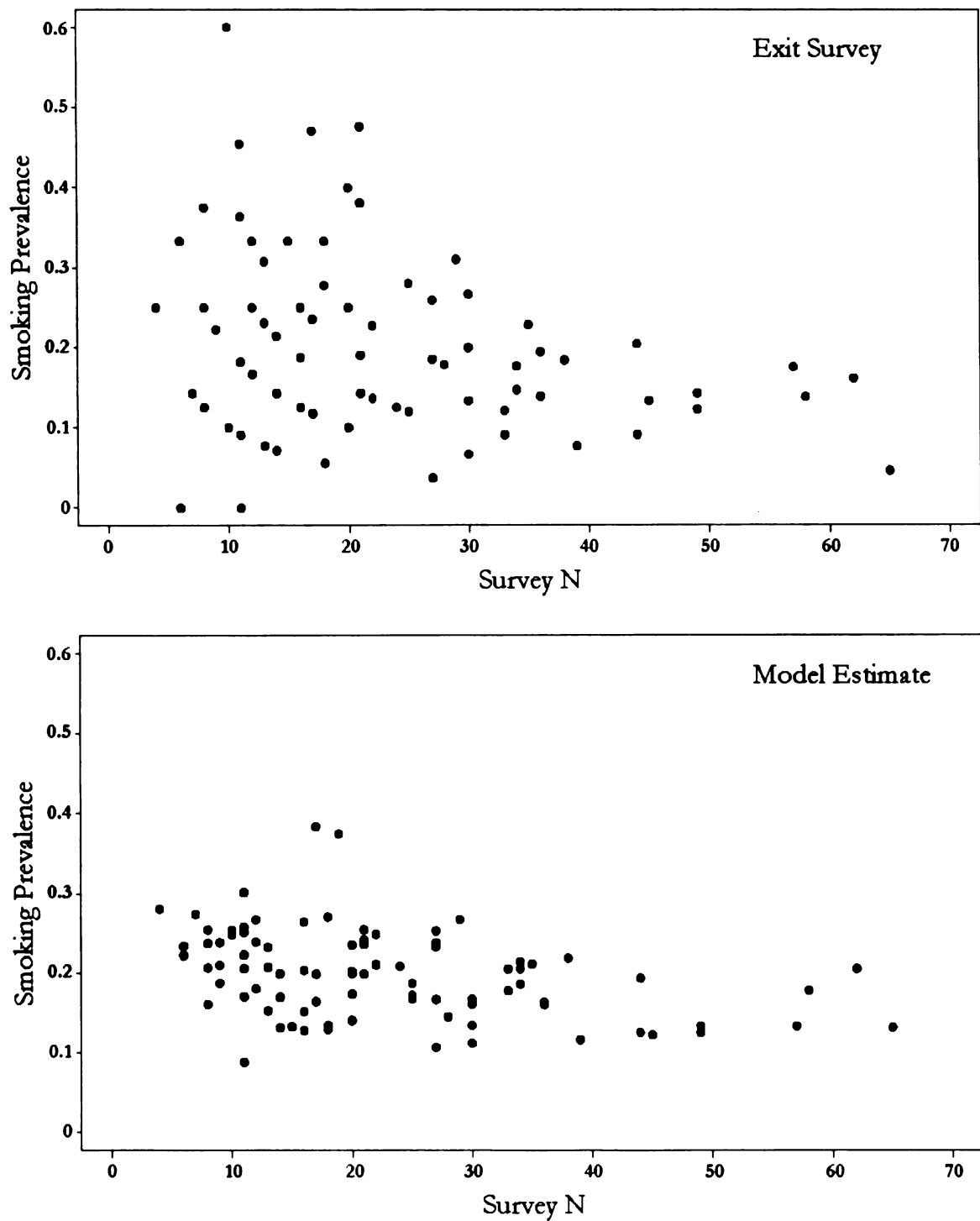
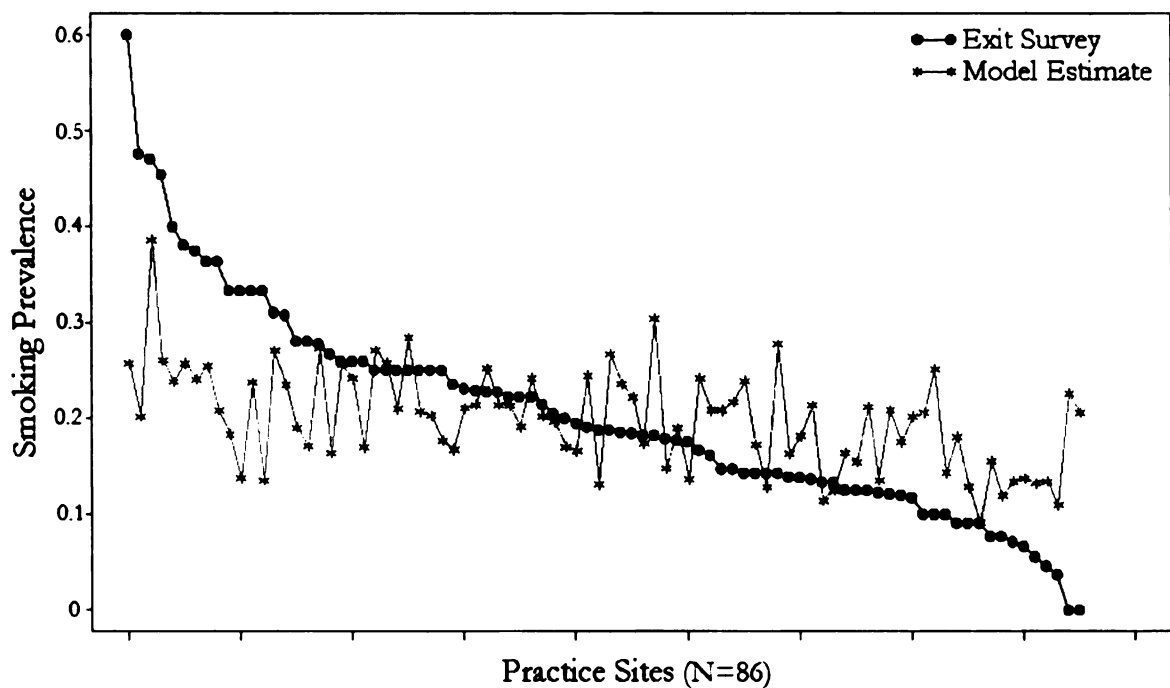


Figure 9 offers a direct comparison of the model and exit survey estimates of smoking prevalence; the Pearson correlation coefficient r is 0.52. The greatest variance is observed at the extremes of exit survey prevalence values, as these were much more likely to have smaller sample sizes and less precise point estimates of smoking prevalence.

Figure 9.
Smoking Prevalence by Practice Site: Exit Survey and Model Estimates



The individual contributions of each of the independent risk factors to the model estimate smoking prevalence are illustrated and summarized in Figures 10-12. It should be noted that each of the factors covers an estimated smoking prevalence change of 0.10-0.15 for a plausible set of risk factor values. The minimum model estimate smoking prevalence would be approximately 0.078 with an MDCH regional smoking prevalence estimate of 20%, no uninsured or Medicaid coverage, and an average adult patient age of 65 years. Likewise, the maximum model estimate smoking prevalence would be approximately 0.463 with an MDCH regional smoking prevalence estimate of 30%, total proportion uninsured or Medicaid coverage of 100%, and an average adult patient age of 25 years.

Figure 10.
Model Estimate Smoking Prevalence as a Function of MDCH Regional Smoking Prevalence Estimate

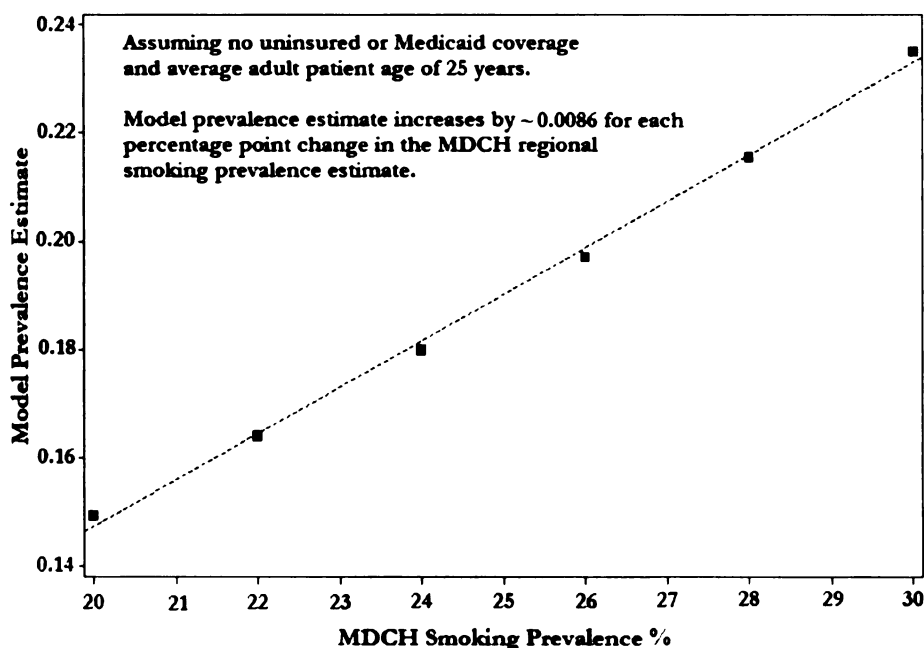


Figure 11.

Model Estimate Smoking Prevalence as a Function of Uninsured & Medicaid Proportion Coverage

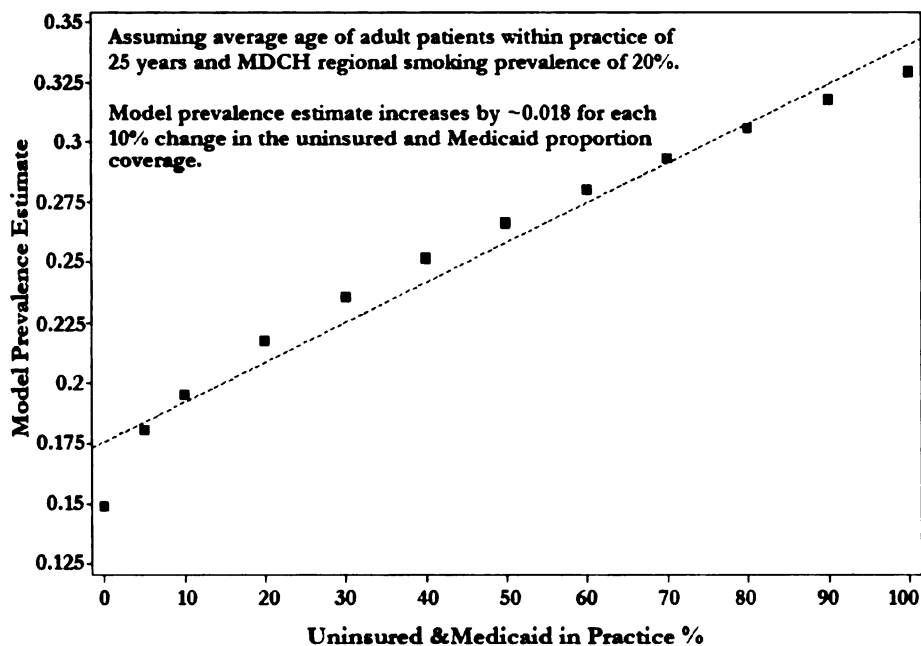


Figure 12.

Model Estimate Smoking Prevalence as a Function of Average Age of Adult Patients Within Practice

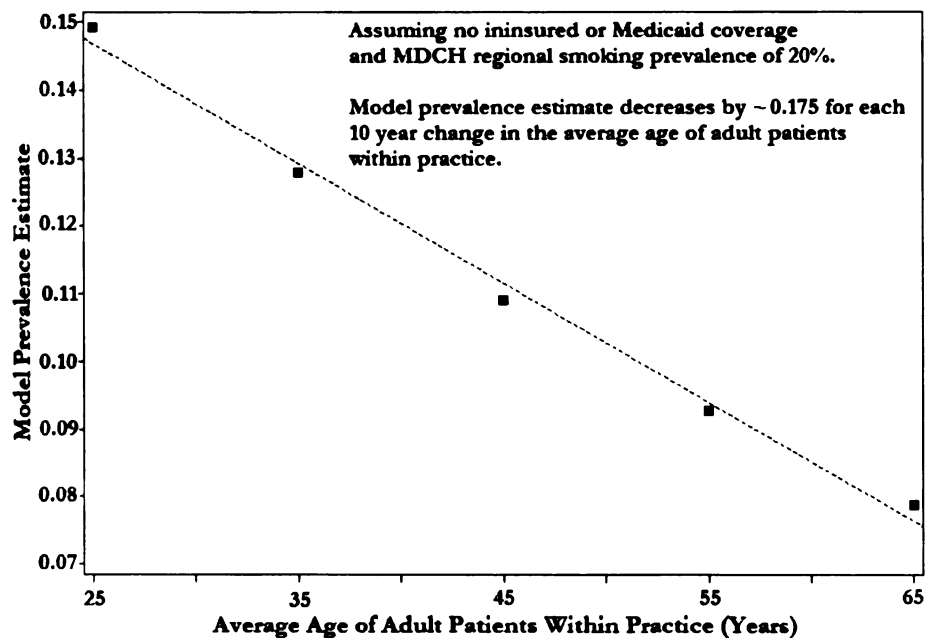
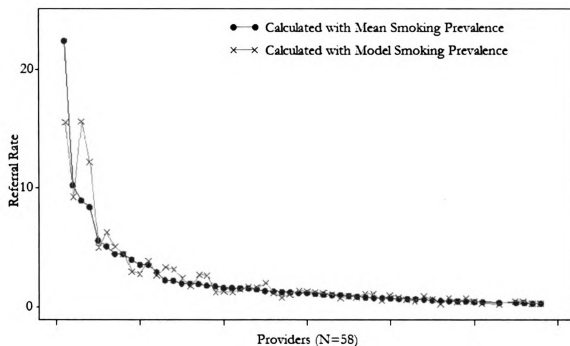


Figure 13 demonstrates the initial effect upon the baseline referral rates of the 58 providers recording at least one referral; the comparison rates are calculated using the mean (0.186) or the model estimate smoking prevalence. The overall Pearson correlation coefficient r is 0.92, although there does appear to be some decreasing correlation as the referral rate increases.

Figure 13.

Baseline Provider Referral Rates by Practice Site: Exit Survey and Model Estimates



DISCUSSION

This exercise has resulted in a model to estimate a small area health behavior, primary care practice smoking prevalence, given a small survey sample at each site and modeling these binomial proportions with possible predictive variables to further refine and calibrate the initial survey estimate.

The smoking prevalence determined by exit survey is significantly lower than that reported by MDCH for the year 2001. The average smoking prevalence among adults within the participating practices was $18.6 \pm 1.8\%$ (95% confidence interval, CI) as compared to the reported statewide smoking prevalence of $26.1 \pm 1.6\%$ (95% CI). (47) This discrepancy could in fact be due to a relatively decreased absolute prevalence of smoking in primary care medical practices as a result of inherent age and socioeconomic differences. Yet one must consider the possibility of a differential sampling bias with only a 54% effective survey response rate.

The measure of uninsured and Medicaid status within the medical practice is a strong predictor of smoking prevalence. This is almost certainly due to its ability to act as a proxy for income or socioeconomic status. Interestingly, Medicare status within the practice was replaced within the multivariate model by average age of the adult patient population; so in this case, a defined insurance status is serving as a proxy for age. Furthermore, the uninsured and Medicaid status replaced the U.S. Census estimates of income at both the county and city levels; this would seem to be appropriate as a more refined measure of the small area versus surrounding community socioeconomic status.

Contrary to the general principle of measures taken in more geographic proximity to the population of interest being more accurate, the income as measured at the county level

was a stronger univariate predictor of smoking prevalence than that measured at the city level. A possible explanation is that a medical practice often draws from a larger geographic region than its immediate vicinity; therefore, any measure within the practice is likely to reflect a composite of its catchment area rather than a more focused description of its more immediate neighborhood or municipality. This may in fact be the reason that the MDCH smoking prevalence regional estimate remains significant despite adjustment for socioeconomic status and age within the multivariate model.

Comparison of the exit survey and model smoking prevalence estimates reveals only a moderate correlation, with the greatest variance noted at the extremes of the initial exit survey estimates (Figure 9). This is in all likelihood a result of the decreased precision associated with the relatively small sample sizes for these estimates. There is very little effect of the model estimate upon the individually calculated baseline provider referral rates (Figure 13). However, there does appear to be decreased correlation between the rates based upon mean and model prevalence estimates as referral rates increase. This would suggest that if this exercise was of limited initial utility, it may in fact offer a better description of provider referral behavior if the primary study intervention is effective.

Each of the three risk factors included in the final model may individually alter the smoking prevalence estimate by 0.010 - 0.015 (Figures 10-12). There does not appear to be a dominant factor, but a web of demographic and socioeconomic influence upon the primary care practice smoking prevalence.

Several other strategies have been employed to estimate a health behavior at the small area level. The most trusted and reliable approach is to perform a large survey to establish more accurate point estimates with narrow confidence intervals. This would certainly be best for establishing an estimate for a limited number of sites, but the time and

expense become prohibitive when applied to multiple sites. Another approach is to apply careful weighting of pre-existing demographic information from larger surveys in order to draw valid inferences about a nested small area population (40-44). This would almost certainly be ineffective within our current study population as it has been demonstrated that the most proximal measures may not in fact be the most predictive for primary care patient populations. In fact, Twigg & Moon have developed a multilevel predictive model based upon weighting of survey data; the model performed quite well in predicting smoking prevalence, yet correlated less well with increased alcohol consumption (44-45). As there is a growing interest in attempting to alter potentially harmful lifestyle behaviors, it is becoming increasingly important to be able to measure or estimate these at a small area or clinic level.

The model developed within this study is actually a composite of both approaches. The small survey served to calibrate and refine the estimates of smoking prevalence otherwise determined through the modeling of known risk factors and regional prevalence estimates. If needed, this model could be adapted for use in other settings and with other variables. As demonstrated in the modeling process, many variables are associated with smoking prevalence at the primary care practice level and, if missing, would likely be replaced with another established risk factor or significant proxy.

These results should be viewed with caution as this model has yet to be validated against established surveys of smoking prevalence at the primary care practice level. The multivariate model was also unable to establish any racial or ethnic influence, although this may be a result of the limited power to detect these differences in this practice cohort with only 13.4% minority patient representation. Despite these limitations, this model offers a potential alternative to the estimation of a small area health behavior without extensive local survey data.

CONCLUSIONS

Several conclusions may be drawn from this study of smoking prevalence within primary care medical practices:

1. The average smoking prevalence among adults within the participating practices was $18.6 \pm 1.8\%$ (95% CI). This is significantly lower than the reported statewide smoking prevalence of $26.1 \pm 1.6\%$ (95% CI); this may be a consequence of inherent population differences in age or socioeconomic status or sampling bias from differential survey participation.
2. Significant univariate predictors of the small area smoking prevalence included:
 - a. Per capita income at both county and city levels (U.S. Census)
 - b. Race (U.S. Census)
 - c. Regional estimate of smoking prevalence (MDCH - BRFSS)
 - d. Practice specialty (practice survey)
 - e. Proportion of patients with Medicaid or uninsured (practice survey)
 - f. Age of patients within practice (exit survey)
3. Significant and independent predictors of the small area smoking prevalence within a multivariate binomial logistic regression model included:
 - a. Regional estimate of smoking prevalence (MDCH - BRFSS)
 - b. Proportion of patients with Medicaid or uninsured (practice survey)
 - c. Age of patients within practice (exit survey)
4. The association between practice specialty and small area smoking prevalence was dependent upon the age of the patient population within family practice, internal medicine, and obstetrics/gynecology practices.

5. The regional estimates of race and income were replaced by a practice-level measurement of insurance distribution as a significant predictor of small area smoking prevalence. The proportion of patients who are uninsured or with Medicaid serves as a small area proxy for socioeconomic status.
6. The final logistic regression model estimate smoking prevalence retains the original distribution approximating lognormal, but with a decreased range and variability.
7. Although the weighted mean smoking prevalence is identical between the model and exit survey smoking estimates, there is only a moderate correlation between the individual practice-level estimates.
8. A very strong correlation exists between provider referral rates utilizing a uniform population mean smoking prevalence and those calculated with the more variable regression model estimate smoking prevalence. Despite this strong correlation, there is some evidence of decreasing correlation as provider referral rates increase.
9. It would be ideal to validate the results of this study through a more comprehensive survey of smoking prevalence within this or other primary care practice cohorts with even more diverse patient populations.

APPENDICES

- Appendix 1 University Committee on Research Involving Human Subjects (UCRIHS) Review
- Appendix 2 Practice Survey
- Appendix 3 Provider Survey
- Appendix 4 Patient Exit Survey

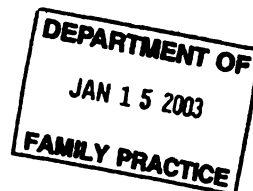
Appendix 1

University Committee on Research Involving Human Subjects (UCRIHS) Review

MICHIGAN STATE UNIVERSITY

January 7, 2003

TO: William WADLAND
B101 Clinical Center
MSU



RE: IRB # 01-789 CATEGORY: FULL REVIEW

RENEWAL APPROVAL DATE: January 6, 2003

EXPIRATION DATE: December 6, 2003

TITLE: EVALUATION OF ORGANIZATIONAL CHANGES TO PROMOTE SMOKING
CESSATION WITHIN MANAGED CARE

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete and I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS APPROVED THIS PROJECT'S RENEWAL.

RENEWALS: UCRIHS approval is valid until the expiration date listed above. Projects continuing beyond this date must be renewed with the renewal form. A maximum of four such expedited renewals are possible. Investigators wishing to continue a project beyond that time need to submit a 5-year renewal application for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please include a revision form with the renewal. To revise an approved protocol at any other time during the year, send your written request with an attached revision cover sheet to the UCRIHS Chair, requesting revised approval and referencing the project's IRB# and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/CHANGES: Should either of the following arise during the course of the work, notify UCRIHS promptly: 1) problems (unexpected side effects, complaints, etc.) involving human subjects or 2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.



OFFICE OF RESEARCH ETHICS AND STANDARDS

University Committee on
Research Involving
Human Subjects
Michigan State University
202 Olds Hall
East Lansing, MI
48824

517/355-2180

FAX: 517/432-4503

Web: www.msu.edu/~ucris

E-Mail: ucris@msu.edu

If we can be of further assistance, please contact us at 517 355-2180 or via email:
UCRIHS@msu.edu.

Sincerely,

Ashir Kumar, M.D.
UCRIHS Chair

AK: bd

cc: Jodi HOLTROP
Health Promotion Program
B-101 Clinical Ctr.

*The Michigan State University
IDEA is Institutional Diversity:
Excellence in Action.*

*MSU is an affirmative action,
equal-opportunity institution.*

Appendix 2
Practice Survey

Health Care Practice Survey

Site ID # _____

Thank you for participating in the Enhancing Smoking Cessation in Michigan Medical Practices Study (ESCMMP)! The purpose of this survey is to collect information about your practice and its smoking cessation services. This study is funded by a grant from the Robert Wood Johnson Foundation to Michigan State University and Blue Cross Blue Shield of Michigan. You indicate your voluntary agreement to participate in this study by completing and returning this survey.

Please complete all 3 pages and return it in the enclosed envelope within 2 weeks.

If you have questions about this project you may contact Dr. Jodi Holtrop at (517) 353-3544 (ext 432) (jodi.holtrop@ht.msu.edu). If you have questions about being a human subject of research you may contact the MSU University Committee on Research Involving Human Subjects (UCRIHS) at (517) 355-2180 or ucrihs@msu.edu. Thank you.

I. Contact Person

Name _____
Title _____

II. Practice Characteristics

1. With what hospital or medical school are you affiliated, if any? _____
2. For 2001, what is the approximate total annual patient visits (total number of visits made by all patients) for all providers (entire practice)? _____
3. For 2001, what is the approximate total number of active patients in the practice (total number of patients who are "signed up" to be a patient at this practice and have had at least one visit in the past three years)? _____
4. What is the practice type? (✓ one only)
____ Solo (one clinician such as physician, nurse practitioner or PA)
____ Two person (two clinicians of same specialty)
____ Group practice (three or more clinicians of same specialty)
____ Multi-specialty group practice (two or more clinicians of different specialization)
5. Who owns the practice? (✓ one only)
____ Physicians
____ Hospital or health system
____ Managed care organization
____ Federal, state or local government
____ Other, please specify: _____
6. Please write in the number in each category for your practice. Place a zero if there are none.
____ Physicians – How many are there in each specialty?
____ Internal medicine ____ Family practice ____ Med/Peds ____ Ob/Gyn ____ Other
____ Physicians assistants ____ Nurse practitioners
____ RN Nursing staff ____ LPN Nursing staff ____ Medical assistants
____ Other health staff (lab, x-ray, psychologists, dietitians, etc.) please specify: _____

7. What is the size of the community in which the practice is located? (✓ one only)

- ☐ <5000
- ☐ 5000 – 10,000
- ☐ 10,000 – 25,000
- ☐ 25,000-100,000
- ☐ >100,000

8. How close is this practice to a major city?

- ☐ not within 25 miles of major city
- ☐ in a major city or within 25 miles of a major city

III. Patient Characteristics

9. What is the approximate percent of patients that fall within the following age categories for this practice? Please write in the percent for each age grouping. This should add up to 100%.

- ☐ <12 years
- ☐ 12-17
- ☐ 18-64
- ☐ 65 and over

100% TOTAL

10. What is the approximate breakdown of race/ethnicity in this practice? This should add up to 100%.

- ☐ White, non-Hispanic
- ☐ Black, non-Hispanic
- ☐ Hispanic
- ☐ Other

100% TOTAL

11. Approximately, what are the payment methods for patients in this practice? Please write in the percent for each insurance type. This should add up to 100%.

- ☐ Private health insurance (prepaid)
- ☐ Private health insurance (fee for service)
- ☐ Medicare
- ☐ Medicaid/other government assistance
- ☐ Other
- ☐ Uninsured

100% TOTAL

12. For 2001, approximately what percent of the patients in this practice are covered by some type of Blue Cross Blue Shield insurance plan ? _____ %

13. Under what Blue Cross Blue Shield plan(s) are the patients covered? (✓ all that apply)

- ☐ Traditional Blue Cross Blue Shield Plan
- ☐ Community Blue PPO
- ☐ Blue Choice
- ☐ Blue Care Network
- ☐ Other: _____

14. Approximately what percent of the patients are smokers? _____ Check here if unknown ☐

IV. Practice Handling of Smoking Patients

15. Which of the following does your practice have in place for encouraging smoking cessation?
Please check one box for each line.

	<u>Yes</u>	<u>No</u>
Clinic is designated as smoke-free	☐	☐
No smoking signs/postings are in the clinic.	☐	☐
Practice has an official policy restricting smoking on site.	☐	☐
Posted signs in the reception area offering help in smoking cessation	☐	☐
Written patient educational materials on smoking cessation are available . . .	☐	☐
<u>If yes</u> , are the materials directly available to patients?	☐	☐
Other types of patient education materials on smoking cessation are available	☐	☐
Please specify: _____		
Staff member designated to maintain smoking cessation materials	☐	☐
System to identify smoking status at every visit	☐	☐
Documentation of smoking status in medical record (such as on problem list)	☐	☐
Presence of follow-up system for patients involved in quitting.	☐	☐
Other: (please specify) _____		

V. Approval for Participation in the Study

14. Has the medical director of the office reviewed the project proposal and agreed to conducting the research at this practice? (✓ one only)
____ Yes ____ No

Signature of Site Medical Director _____ Date _____

***Thank you for completing this questionnaire!
Please return in the self-addressed, stamped envelope provided.***

Appendix 3
Provider Survey

Smoking Cessation Survey for Health Care Providers

Study ID # _____

Please answer questions based on this practice location only.

Return the completed survey within the next two weeks in the envelope provided. Thank you.

1. Please check the appropriate box to describe yourself.
☐ Physician ☐ Nurse Practitioner ☐ Physician Assistant
 2. What is your medical specialty?
☐ Family practice ☐ Internal Medicine ☐ Obstetrics/Gynecology
☐ Other: _____
 3. In your personal outpatient practice, how many patients do you see in an average day?
_____ Total Patients
 4. Of the patients seen in an average day, how many patients are:
_____ Pediatric (<18 years of age)
_____ Obstetric
 5. On an average day of outpatient practice, how many of your patients (age 12 and over) are smokers?
_____ Patients are smokers
 6. On average, how many days do you work in your outpatient practice per month?
_____ Days/month
 7. How often do you ask your patients if they smoke? (Circle one number)

<u>Never</u>				<u>Always</u>
1	2	3	4	5
 8. How often does your staff ask your patients if they smoke? (Circle one number)

<u>Never</u>				<u>Always</u>
1	2	3	4	5
 9. Of all patients you know who are smokers, about what percent do you ask at every visit about willingness to make a quit attempt?
_____ %
 10. Of all patients you know who are smokers, about what percent do you advise at every visit to quit?
_____ %
- Counseling for smoking cessation is defined for this survey as the time spent discussing the possibility of or methods of quitting smoking or staying smoke-free.
11. Of those smoking patients interested in making a quit attempt, about what percent do you provide counseling regarding quitting? _____ %
 12. What is the average number of minutes you spend counseling....
 A new patient on smoking cessation? _____ Minutes Check here if you do not counsel ☐
 The same patient on follow-up visits? _____ Minutes Check here if you do not counsel ☐

13. For patients who wish to quit, how often do you provide... (Circle one number for each)

	<u>Never</u>				<u>Always</u>
Prescription for bupropion or nicotine replacement.	1	2	3	4	5
Brochure, educational material or website information. . .	1	2	3	4	5
Referral to smoking cessation telephone quitline	1	2	3	4	5
Follow-up visit to discuss progress with quitting	1	2	3	4	5
Other, please specify: _____	1	2	3	4	5

14. For patients not willing to make a quit attempt, how often do you... (Circle one number for each)

	<u>Never</u>				<u>Always</u>
Ask patient to let you know when he/she is ready to quit ..	1	2	3	4	5
Ask patient to identify his/her reasons to consider quitting	1	2	3	4	5
Ask patient to identify his/her barriers to quitting	1	2	3	4	5
Discuss health risks of his/her smoking	1	2	3	4	5
Encourage him/her to consider quitting	1	2	3	4	5
Give advice on how to quit	1	2	3	4	5
Give brochure on quitting smoking	1	2	3	4	5
Other: _____	1	2	3	4	5

15. Overall, how would you rate your knowledge about helping people stop smoking?

☐ Poor ☐ Fair ☐ Good ☐ Very Good ☐ Excellent

16. Have you ever received any formal training in smoking cessation intervention strategies?

☐ Yes ☐ No

If YES, please answer - From what source(s)? (✓ all that apply)

- ☐ Continuing education course/program
☐ Organized study club
☐ Professional course or curriculum in medical school or residency
☐ Other, specify: _____

17. How willing are you to receive such training? (✓ one only)

☐ Very willing ☐ Somewhat willing ☐ Somewhat unwilling ☐ Not interested at all

18. How confident are you in your ability to help someone stop smoking? (Circle one number)

Not confident Very confident
1 2 3 4 5

19. How successful have you been in helping patients stop smoking? (Circle one number)

Not successful Very successful
1 2 3 4 5

20. In your opinion, how important is smoking cessation as a component of overall health care provided in medical practices? (Circle one number)

Not important Very important
1 2 3 4 5

Please complete PAGE 3. Thank you.

21. To what extent are the following a barrier to incorporating smoking cessation activities into your practice? (Circle one number for each)

	<u>Never</u>				
<u>Always</u>					
Patient resistance/complaints.	1	2	3	4	5
Amount of time required	1	2	3	4	5
Lack of reimbursement mechanisms.	1	2	3	4	5
Resistance by staff.	1	2	3	4	5
Concerns about effectiveness	1	2	3	4	5
Availability of patient education materials.	1	2	3	4	5
Availability of adequate referral resources.	1	2	3	4	5
Your lack of knowledge.	1	2	3	4	5
Other: _____	1	2	3	4	5

22. Which of the following smoking cessation educational opportunities or practice helps would assist you in enhancing smoking cessation care to your patients? (Circle one number for each)

	<u>Not at all</u>			<u>Very</u>	
	<u>Helpful</u>			<u>Helpful</u>	
Attending a course	1	2	3	4	5
Reviewing audiotapes	1	2	3	4	5
Training for your staff	1	2	3	4	5
Patient access to a quitline program.	1	2	3	4	5
Feedback on your referrals to a quitline.	1	2	3	4	5
Educational materials to give to patients.	1	2	3	4	5
Reimbursement for providing brief advice.	1	2	3	4	5
Other: _____	1	2	3	4	5

23. Approximately what percent of your patients are covered by any type of Blue Cross Blue Shield insurance including Blue Care Network HMO, Blue Preferred PPO . . . _____ %

24. Are you aware of the Blue Cross Blue Shield "Quit the Nic" quitline smoking cessation program?

☐ Yes ☐ No

If YES, have you ever referred patients to this program? ☐ Yes ☐ No

25. What year did you graduate from your residency or clinical training program? _____

26. Your gender: ☐ Male ☐ Female

27. What is your smoking status? ☐ Current smoker ☐ Former smoker ☐ Never smoker

28. You may be receiving feedback on your rates of smoking cessation referral. Would you like to receive this feedback electronically? ☐ Yes ☐ No

If YES, please provide your email address: _____
(this information will be kept confidential)

Thank you for completing this survey. Please return in the self-addressed, stamped envelope provided.

Appendix 4
Patient Exit Survey

Smoking Cessation Counseling by Your Health Care Provider

Study ID # _____

1. What is the name of the health care provider you saw today? Name: _____
2. What was the reason for your visit today? _____
3. During today's visit, did your health care provider ask you if you smoke? ☐ Yes ☐ No
4. During today's visit, did anyone else in the practice ask you if you smoke? ☐ Yes ☐ No
5. Has any provider in this office asked you in the past year if you smoke? ☐ Yes ☐ No
6. Have you smoked at least 100 cigarettes in your entire life? ☐ Yes ☐ No
7. Have you smoked a cigarette, even a puff, in the last 7 days? ☐ Yes ☐ No
If NO - Please SKIP TO QUESTION 12 If YES - Please answer the remaining questions.
8. On the average, how many cigarettes do you now smoke a day? _____ Cigarettes
9. Which of the following BEST describes your plans regarding smoking? Check one box only please.
☐ Seriously considering quitting in the next month
☐ Seriously considering quitting smoking in the next 6 months
☐ Not seriously considering quitting smoking in the next 6 months
10. During today's visit with your health care provider, did anyone do any of the following?
Advise you to stop smoking. ☐ Yes ☐ No
Ask you about your interest in quitting smoking ☐ Yes ☐ No
Ask if you were willing to set a quit date. ☐ Yes ☐ No
Give you a telephone number to call for help quitting. ☐ Yes ☐ No
Give you information about counseling classes or programs to help you quit ☐ Yes ☐ No
Refer you to someone in the office for more information about quitting. ☐ Yes ☐ No
Suggest a follow-up visit or phone call about quitting smoking. ☐ Yes ☐ No
Recommend using a nicotine patch or gum to stop smoking ☐ Yes ☐ No
Recommend using a nicotine inhaler or nasal spray to stop smoking. ☐ Yes ☐ No
Give you a prescription for Zyban (bupropion, Wellbutrin) to stop smoking ☐ Yes ☐ No
Provide you with reading materials on quitting smoking ☐ Yes ☐ No
11. During today's visit, did you agree to make an attempt to quit smoking? ☐ Yes ☐ No
- 12a. How old are you? _____ Years 12b. Are you male or female? ☐ Female ☐ Male
13. Which one or more of the following describes your race and ethnicity?
☐ Black – non-Hispanic ☐ White – non-Hispanic ☐ Other: _____
☐ Asian ☐ Native Hawaiian/Pacific Islander
☐ American Indian/Alaskan Native ☐ Hispanic
14. What is your health insurance? Please make a check in any box that applies to you
☐ No insurance ☐ Medicare ☐ Medicaid
☐ Blue Cross Blue Shield - Please check one if you know what type of plan:
☐ Community Blue ☐ Blue Choice ☐ Blue Care Network ☐ Traditional
☐ Other private insurance not listed above: _____

Thank you! Please write your comments on the back.

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