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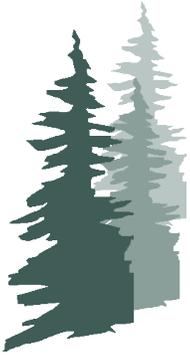
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Implications of Rural Residence and Single Mother Status for Maternal Smoking Behaviors

Jean A. Talbot, PhD, MPH • Donald Szlosek, MPH • Erika C. Ziller, PhD

Background

Although smoking prevalence has decreased throughout the United States since the early 2000s,^{1,2} smoking remains more widespread in rural than in urban populations.^{3,4} Elevated rural smoking rates may contribute to widening rural-urban differences in smoking-related causes of death including chronic obstructive pulmonary disease (COPD), lung cancer, heart disease, and stroke.^{5,6} These differences, in turn, may partially account for the growing rural-urban mortality gap,⁵ which is a major concern for rural health policy.

Nationally representative survey data indicate that as rurality increases, women's smoking rates rise.⁴ However, we do not know if this same pattern holds for rural mothers. Smoking among rural mothers warrants particular attention in view of its potential for harming both mothers themselves and the children in their care. Children of mothers who smoke may be at increased risk for exposure to second-hand smoke.⁷ In addition, they are more likely to begin smoking at early ages⁸ and to become long-term smokers in adulthood.⁹ Thus, rural mothers' smoking behaviors may have implications for smoking rates and smoking-related health outcomes in the next generation of rural residents, and may perpetuate the acceptance of smoking in rural culture.

One important question regarding smoking patterns in rural mothers concerns the role of single motherhood as a risk factor for smoking in the rural context. Mothers parenting alone are significantly more likely to smoke than partnered mothers or other women,¹⁰⁻¹³ perhaps because they experience more psychosocial stress^{11,13,14} and are therefore more likely to use cigarettes as a means of self-soothing. Although the association between single motherhood and smoking risk is well documented, no prior investigations have considered the joint impacts of rural residence and single motherhood on smoking.

Single mothers in rural communities may have sources of stress that their urban or married peers lack. Like all rural parents, rural single mothers may have less access to resources important for effective parenting, such as transportation,¹⁵ health insurance,^{16,17} health care providers,^{18,19} and high-quality professional child care.²⁰ Without the financial and instrumental support that partners sometimes provide, single mothers in rural areas may find it especially challenging to compensate for these deficits. Thus, aspects of the rural environment may heighten single mothers' stress levels and their propensity to use cigarettes as a coping

Key Findings

Rural mothers are significantly more likely than their urban counterparts to be smokers, to smoke frequently, and to smoke heavily, even after adjusting for factors known to increase smoking risk.

Nearly half of rural, single mothers report smoking in the past month, compared with 14.4% of urban, married mothers.

Anti-smoking initiatives prioritizing rural mothers could play an important role in decreasing rural-urban disparities in smoking-related morbidity and mortality.

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mechanism. As a result, rural-urban disparities in smoking may be greater among single mothers than among their married counterparts.

Approach

This study addressed gaps in the research literature on rural smoking by using nationally representative survey data to compare the smoking behaviors of rural and urban mothers, including single and married mothers. The study had three objectives. First, we sought to ascertain whether mothers' smoking behaviors varied as a function of rural residence. In light of previous findings on rural adult populations,^{3,4} we expected that smoking prevalence would be higher among mothers in more rural settings. Second, we examined the association between single motherhood and smoking risk. Given previous findings in the maternal smoking literature,¹⁰⁻¹³ we predicted that single motherhood would be linked to heightened risk for smoking in both rural and urban mothers. Third, we considered the combined impacts of rurality and single mother status on smoking, to determine whether the relationship between rural residence and smoking rates differed among single versus married mothers, and whether the linkage between single mother status and smoking varied as a function of residence. Given the unique stressors faced by rural parents, we expected that the association between rural residence and smoking would be greater among mothers who were single.

Study Population: Adult mothers aged 18 and older with children under 18 living in their homes.

Data Source: This investigation used data from the 2008-2013 public use files of the National Survey on Drug Use and Health (NSDUH), a nationally representative survey of the civilian, non-institutionalized United States population.²¹ The NSDUH collects information on demographics, substance use, mental health status, and access to resources. All data are self-reported.

Variables: The *dependent variable* was smoking behavior. To assess smoking, we used items asking mothers whether they had used cigarettes in the past year; in the past month; or daily in the past month. We also used mothers' reports on the number of cigarettes they had smoked per day in the past month, creating a dichotomous variable to differentiate mothers who smoked 15 or fewer cigarettes per day from those who smoked more than 15.

Primary independent variables were rural residence and single mother status. The rural residence measure in the NSDUH is based on the 2003 Rural Urban Continuum Code (RUCC) system devised by the United States Department of

Agriculture's Economic Research Service.²² The RUCC system classifies metropolitan counties by the population size of their metropolitan areas, and non-metropolitan counties by their degree of urbanization and adjacency to metropolitan areas. Application of these criteria results in a 9-level continuum from large metropolitan (RUCC 1) to completely rural and non-adjacent to metropolitan areas (RUCC 9). The NSDUH variable aggregates RUCCs into three levels. The first level, large metro, corresponds to RUCC 1 and designates metropolitan counties with populations of 1 million or more. The second level, small metro, comprises RUCCs 2 and 3 and refers to metropolitan counties with populations ranging from 20,000 to 1 million. The third level, rural, aggregates RUCCs 4 through 9 and designates them non-metropolitan counties.²³

We defined single mothers as adult women who were unmarried (i.e., single, separated, or divorced) and whose children under age 18 lived with them.

Covariates with established or hypothesized linkages to smoking, rural residence, or single mother status included age, race/ethnicity, education level, employment status, income, insurance status, and psychological distress. To measure distress levels, we used respondents' scores on the Kessler-6 (K6), a validated measure of psychological symptom burden²⁴ administered as part of the NSDUH survey.

Analyses: We conducted chi-square tests to identify bivariate differences by rural residence and single mother status on smoking patterns and covariates, and to assess whether there are rural-urban differences in the role of single parenthood as a risk factor for smoking. We used logistic regression analyses to examine the main effects of rural residence and single mother status on smoking after adjusting for covariates. We also ran models including the interaction between rural residence and single mother status. All reported findings were significant at the $p < .01$ level or lower unless otherwise indicated.

Findings

Sample Characteristics

A total of 38,238 mothers responded to the NSDUH survey. Of these, 42.2% resided in large metro areas, 35.3% lived in small metro areas, and 22.5% were rural residents. Almost half (45.5%) of the mothers in the survey were unmarried, and 34.6% reported smoking cigarettes in the past year.

Rural Mothers Smoke at Higher Rates than Their Urban Counterparts

Compared with their urban counterparts, rural mothers reported the highest rates of past-year

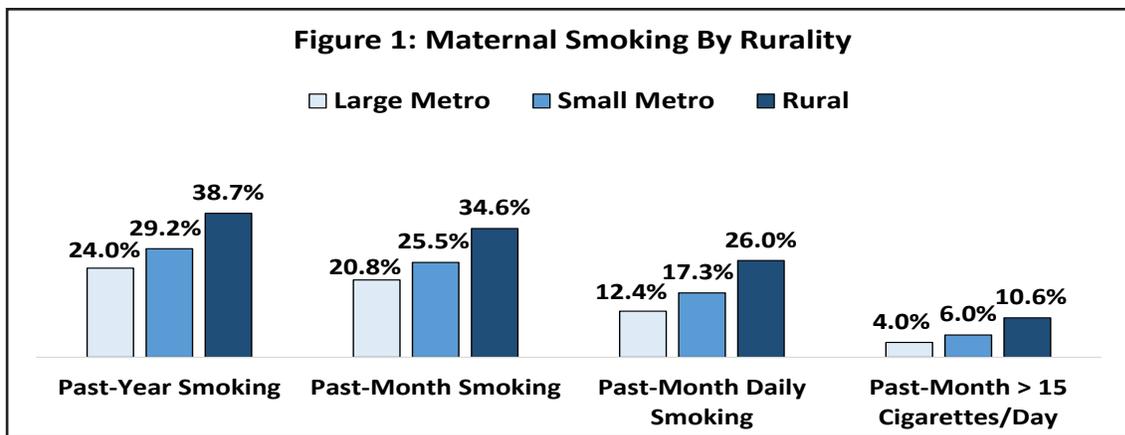
smoking (38.7% versus 24.0% large metro), past-month smoking (34.6% versus 20.8% large metro), and daily smoking in the past month (26.0% versus 12.4% large metro). Rural mothers also smoked the most heavily: 10.6% in the rural group reported smoking more than 15 cigarettes per day in the past month, as compared to 4.1% in the large metro category. (See Figure 1).

The association between rurality and smoking was especially pronounced for mothers with incomes below the federal poverty level. Among mothers living in poverty, smoking rates for rural residents were 54.7% for past-year smoking (versus 32.3% large metro), 50.1% for past-month smoking (versus 29.3% large metro), 37.1% for daily past-month smoking (versus 17.1% large metro), and 13.9% for heavy smoking (versus 5.1% large metro).

As indicated in regression models, single motherhood showed strong associations with smoking measures after adjusting for rural residence and our covariates. Relative to married mothers, single mothers' odds of past-year smoking, past-month smoking, past-month daily smoking, and heavy smoking in the past month were 112%, 114%, 94%, and 58% higher, respectively (see Appendix).

Rural Residence Increases Smoking Risk to a Similar Degree for Both Single and Married Mothers

Chi square tests demonstrated that for both single (Figure 2) and married mothers (Figure 3), rural residents were significantly more likely than their non-rural counterparts to answer 'yes' to each of the four smoking measures.



Data: National Survey of Drug Use and Health, 2008-13

In adjusted logistic regression models of main effects (see Appendix), rural mothers had increased odds of smoking across all four smoking measures, even after controlling for the effects of single motherhood and of other smoking risk factors. Specifically, in comparison to their counterparts in large metro areas, rural mothers had higher odds of smoking in the past year (28%), in the past month (27%), and daily in the past month (45%). Their odds of smoking heavily in the past month were 52% higher.

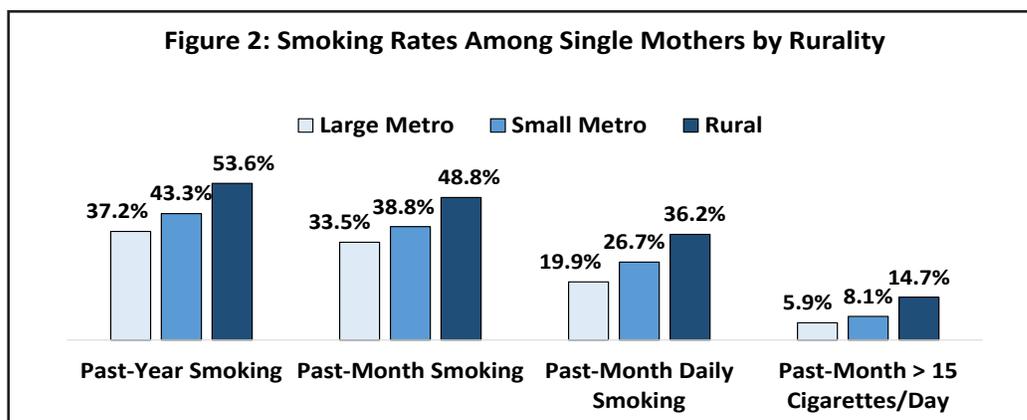
Single Mothers Smoke at Higher Rates than Married Mothers

Chi-square tests showed that single mothers were more likely than their married peers to report past-year smoking (41.6% versus 20.7%), past-month smoking (37.5% versus 17.6%), and daily smoking in the past month (24.5% versus 20.7%). Moreover, 18.3% of single mothers reported using more than 15 cigarettes per day in the past month, whereas only 9.4% of their married counterparts engaged in heavy past-month smoking.

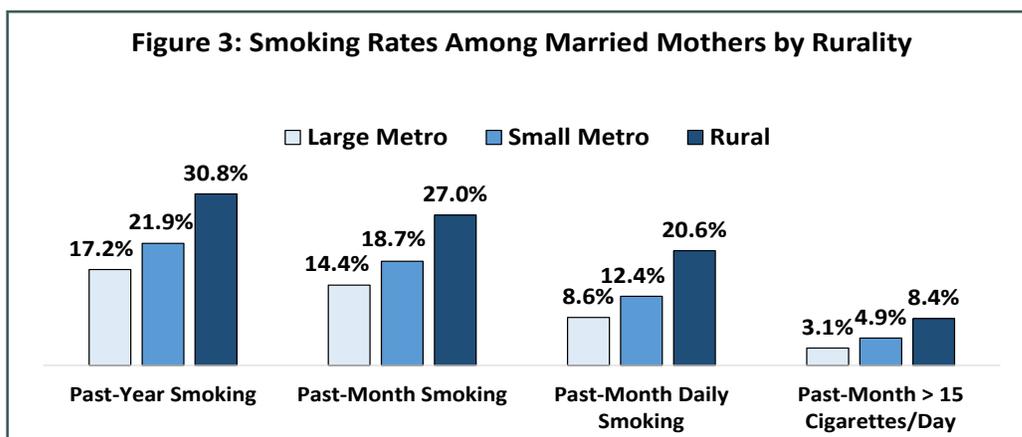
To determine whether the magnitude of the relationship between rural residence and smoking differed among single versus married mothers, we entered the interaction (i.e., the product) of rural residence and marital status into our adjusted logistic regression models for each smoking measure. The interaction of the two independent variables had no effect on smoking in any of the four models (table not shown). Thus, bivariate and multivariate analyses both suggested that rural residence contributed to maternal smoking risk to about the same degree, regardless of single mother status.

Single, Rural Mothers Smoke Significantly More than Married Mothers in Urban or Rural Settings

As a result of the combined impacts of rurality and single mother status on smoking risk, observed frequencies of smoking behaviors were highest for single mothers in rural areas (Figure 2) and lowest for married mothers in large metro areas (Figure 3). Among single, rural mothers, prevalence rates



Data: National Survey of Drug Use and Health, 2008-13



Data: National Survey of Drug Use and Health, 2008-13

were 53.6% for past-year smoking, 48.8% for past-month smoking, 36.2% for daily past-month smoking, and 14.7% for heavy past-month smoking. In contrast, married mothers in large metro areas reported rates of 17.2% for past-year smoking, 14.4% for past-month smoking, 8.6% for daily past-month smoking, and 3.1% for heavy past-month smoking.

Discussion

This investigation used nationally representative survey data to examine how maternal smoking behaviors vary as a function of rural residence and single mother status. Prior research has shown that high rural smoking rates are largely attributable to the fact that many major risk factors for smoking, including low educational attainment,¹ poverty,¹ and unemployment,²⁵ cluster together in rural populations.²⁶⁻²⁸ Our results indicate that even after adjusting for these and other known risk factors, rural mothers are significantly more likely than their urban counterparts to be smokers, to smoke frequently, and to smoke heavily. Thus, it appears that the large rural-urban differences in maternal smoking cannot be completely explained by the high rural prevalence of previously identified risk factors, and that aspects of rural culture, especially attitudes about smoking, substance use, and self-care, are likely to play

an important role in shaping rural mothers' smoking patterns.

Although over a decade has passed since Hartley²⁹ called for a deeper exploration into the ways that rural cultures can reinforce high-risk health behaviors, we still need to know more about how rural smoking-related norms differ, in their prevalence and impact, from those found among disadvantaged non-rural populations. We also need more detailed information about the ways that cultures of smoking vary across rural regions and subgroups. Insights along these lines can help to inform culturally appropriate, effective health education and other interventions for rural residents,^{30,31} including mothers who smoke.

Another key finding of our study is that simultaneous membership in rural and single mother subpopulations places individuals at exceptionally high risk for smoking. Although the quantitative association between rural residence and smoking does not vary between single and married mothers, the smoking experiences of rural, single mothers may nonetheless have distinct qualitative features.

These features must be better understood and taken into consideration when crafting prevention and cessation initiatives for single mothers in rural contexts.

Limitations

This study's cross-sectional design does not allow us to draw conclusions about causal relationships between explanatory and dependent variables. In addition, the three-level measure of rural residence available to us does not reflect gradations of rural residence within non-metropolitan areas. Therefore, our analyses might have underestimated the strength of the association between rural residence and smoking. Our measurement of single motherhood was likewise limited, in that it was based exclusively on marital status; because the data set contained no information regarding cohabitation, unmarried mothers were all classified as single, even though some of these women may have had cohabiting partners. As a result, linkages between single mother status and smoking might have been attenuated. Further, our measurements of smoking were based on self-report, and may have been subject to bias. However, past community-based studies have shown that self-reports of smoking generally correspond closely to smoking status assessments based on biomarkers.^{32,33} Finally, in our adjusted analyses, we were unable to control for certain covariates of rural residence (e.g., state-level smoking policies, area health resources) and of single motherhood (e.g., social support¹¹) that might have affected smoking rates.

Policy Implications

Anti-smoking initiatives prioritizing rural mothers, especially those who are single, could yield high rewards: such efforts could reduce mothers' smoking-related health problems, decrease children's exposures to second-hand smoke, and help mothers promote healthier smoking-related norms in their children. Eventually, these changes could decrease rural-urban disparities in smoking-related causes of death.

Anti-smoking measures for rural mothers are most likely to be successful if they are integrated into a comprehensive state tobacco control plan (TCP), and if they include components such as mass-reach anti-smoking media campaigns; tobacco control laws and regulations; and the provision of smoking cessation interventions.³⁴ In order to design media campaigns that will engage rural mothers in a culturally sensitive manner, state TCPs should incorporate input from these women and from key informants who know them well.³⁴ In the regulatory domain, rural communities can help decrease

smoking rates among mothers by enacting local ordinances to create smoke-free public spaces³⁵⁻³⁷ and by advocating at the state level for increases in the unit price of tobacco products.^{37,38} Rural public health departments can play an important leadership role in building coalitions to support these and other population-based tobacco control measures.

In the realm of clinical interventions, it is important to ensure that rural mothers who smoke can access the full range of evidence-based smoking cessation treatments, including in-person or telephone counseling; nicotine replacement therapies; and the prescription medications bupropion and varenicline.³⁹ Rural primary care providers can play a critical role in facilitating access by targeting mothers for smoking screens and by using best practices for tobacco dependence treatment in their work with mothers who smoke. Specifically, rural providers should routinely advise smoking mothers to quit, offer them appropriate therapies, arrange follow-up, and make referrals as needed.³⁴ Perhaps the most effective way of promoting adherence to these measures is to create an electronic health record (EHR) system that prompts providers to complete each recommended task.³⁴ Therefore, plans to systematize primary care-based cessation interventions for rural mothers should be integrated into broader strategies for expanding EHR use in rural practices.

Rural mothers' use of primary care-based cessation interventions will depend in part on their access to insurance that covers all the associated costs. Research has shown that comprehensive coverage without cost-sharing increases participation in cessation treatment,^{39,40} reduces smoking prevalence,^{39,40} and decreases smoking-related morbidity.⁴¹ In light of this evidence, rural stakeholders and policy makers should consider methods for extending such coverage to rural mothers most in need. Because rural residents,⁴² mothers,⁴³ and smokers⁴⁴ are all overrepresented in the Medicaid population, the provision of comprehensive cessation coverage through Medicaid could be an effective approach toward achieving this end.

In at least two ways, the Affordable Care Act (ACA)⁴⁵ may help to increase access to full smoking cessation benefits among rural mothers in the Medicaid population. To begin with, the ACA permits states to expand Medicaid to all adults with incomes less than 138% of the federal poverty level (Section 2001), and it requires Medicaid expansion plans to offer smoking cessation treatment as a covered service.⁴⁶ Thus, rural mothers who became

Medicaid beneficiaries through the expansion acquired cessation coverage at the same time. Another ACA provision that may boost rates of cessation coverage for rural mothers is the mandate that these benefits be extended to pregnant women in pre-expansion Medicaid plans.⁴⁶

In addition to maximizing rural mothers' access to primary care-based cessation treatment and expanding the cessation coverage available to them, another potentially useful strategy is to enhance the capacity of state quitlines to meet rural mothers' needs. Quitlines exist in every state and provide a range of cessation services, which may include telephone counseling, information, referrals, self-help materials, and vouchers for nicotine replacement therapy.⁴⁷ Because quitlines typically offer services at no cost or low cost to the entire populations of the states they serve,⁴⁷ they are equipped to assist rural mothers who are uninsured or underinsured, as well as those who have insurance coverage. State tobacco control plans should work to ensure that quitline staff are trained specifically to address the cessation concerns of rural mothers, and to provide them with culturally appropriate, accessible resources.

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APPENDIX: ADJUSTED ODDS OF CIGARETTE USE AMONG MOTHERS WITH CHILDREN UNDER 18

	Past-Year Smoking		Past-Month Smoking		Past-Month Daily Smoking		Past-Month Use of >15 Cigarettes per Day	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Characteristic (Referent)								
Rurality (Large Metro)								
Small Metro	1.04	0.96-1.13	1.03	0.95-1.12	1.13*	1.01-1.25	1.09 n.s.	0.91-1.30
Rural	1.28***	1.14-1.43	1.26***	1.13-1.41	1.45****	1.30-1.62	1.52****	1.28-1.80
Single mother status (married)								
	2.12****	1.92-2.35	2.15****	1.93-2.39	1.95****	1.75-2.18	1.58****	1.36-1.85
Psychological distress (very low)								
Low	1.24***	1.12-1.37	1.26***	1.13-1.41	1.15 n.s.	0.99-1.32	1.15 n.s.	0.91-1.45
Moderate	1.79****	1.59-2.01	1.74****	1.55-1.97	1.45****	1.24-1.70	1.58***	1.26-1.99
High	2.15****	1.89-2.44	2.17****	1.92-2.45	1.73****	1.48-2.04	2.08****	1.68-2.58
Very high	3.24****	2.64-3.96	3.29****	2.69-4.01	2.63****	2.13-3.24	3.03****	2.26-4.07
Poverty (Above 2x FPL)†								
Below FPL	1.15 n.s.	1.00-1.33	1.20*	1.04-1.38	1.25**	1.09-1.42	1.17 n.s.	0.98-1.40
FPL- 2x FPL	1.19**	1.08-1.31	1.23***	1.11-1.37	1.32****	1.18-1.48	1.24*	1.03-1.49
Race (White)								
Black	0.36****	0.32-0.40	0.38****	0.34-0.42	0.29****	0.25-0.34	0.15****	0.10-0.22
Hispanic	0.25****	0.22-0.29	0.24****	0.20-0.28	0.15****	0.12-0.18	0.06****	0.04-0.08
Other	0.39****	0.33-0.47	0.42****	0.35-0.50	0.33****	0.27-0.40	0.24****	0.17-0.34
Education (College graduate)								
Less than high school	4.11****	3.58-4.72	4.77****	4.12-5.53	6.78****	5.70-8.06	6.75****	5.11-8.92
High school/some college	2.91****	2.59-3.26	3.28****	2.92-3.67	4.46****	3.88-5.14	4.11****	3.30-5.12
Age (35-49)								
18-25	1.24****	1.13-1.36	1.04 n.s.	0.96-1.14	0.86**	0.78-0.96	0.41****	0.36-0.48
26-34	1.30****	1.19-1.42	1.21***	1.11-1.31	1.13**	1.04-1.22	0.77***	0.67-0.88
50+	0.77 n.s.	0.60-1.00	0.78 n.s.	0.60-1.02	0.77*	0.60-0.99	0.77 n.s.	0.49-1.20
Insurance coverage (any private, military or other non-public)								
Public only	1.50****	1.35-1.67	1.49****	1.33-1.67	1.42****	1.27-1.59	1.41**	1.16-1.71
Uninsured	1.37****	1.22-1.53	1.42****	1.26-1.60	1.41****	1.23-1.62	1.53***	1.27-1.86
Employment status (working)								
Not working	1.03 n.s.	0.95-1.11	1.04 n.s.	0.96-1.13	1.08 n.s.	0.97-1.20	1.21*	1.03-1.43
	N	38,238	N	38,238	N	38,238	N	38,227
	df	20	df	20	df	20	df	20
	-2LogL	39131188	-2LogL	36760531	-2LogL	24189652	-2LogL	11949802

Data Source: National Survey of Drug Use and Health, 2008-2013

†FPL = Federal Poverty Level

*= p < 0.05, ** = p < 0.01, ***= p < 0.001, ****= p < 0.0001

n.s.= non-significant