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Association Between Stressful Life Events and Change of Maternal Smoking During Pregnancy Using PRAMS 2011-2012

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Introduction

Maternal smoking during pregnancy is one of the leading preventable causes of morbidity and mortality among women and infants. Smoking during pregnancy is known to be associated with increased risk of pregnancy complications (i.e., placental previa, placental abruption, and premature rupture of the membrane) and poor pregnancy outcomes (i.e., preterm delivery, restricted fetal growth and sudden infant death syndrome).[1,2] Other identified adverse events associated with smoking in pregnancy include miscarriage, low birth-weight, alteration of heart function and congenital abnormalities.[3.4,5,6] Furthermore, prenatal exposure to maternal cigarette smoking is shown with long-term effects on fetus, including accelerated weight gain occurring in late puberty and a variety of chronic diseases such as type 2 diabetes, obesity, certain childhood cancers and respiratory disorders in adult life.[7,8,9]

The prevalence of smoking during pregnancy is between 13% and 25% in high-income countries.[10] In the US, there has been a decrease in smoking during pregnancy, with 12.3% of women reporting smoking during last trimester of pregnancy in 2010 compared to 13.3% in 2000. However, no states have achieved the HealthyPeople 2020 goal of smoking rate during pregnancy to be less than 1.4%.[11] The proportion of female smokers who quit smoking during pregnancy has increased from 43.2% to 50.7% over a course of 11 years.[11] The percentage of women abstaining from smoking cigarettes during pregnancy in 2007 was 89.6%, about 9% short from HealthyPeople 2020's goal.[12] Cessation of smoking during pregnancy is of vital importance for maternal and fetal health.

Maternal smoking has been associated with a wide array of factors including age, race/ethnicity, education level, and Medicaid coverage.[13] Additionally, psychosocial risk factors are shown to play roles in maternal smoking behavior during pregnancy. Psychosocial factors

encompass a variety of events concerning individual's social, financial, physical, mental and spiritual wellbeing. Host factors, such as prenatal depression, self-esteem, perception of weight control, conscientiousness, neuroticism, extraversion, spirituality and religiosity as well as social factors including but not limited to paternal support, social standing, other support have been studied. [14,15,16,17] Stress from poor neighborhood was shown to correlate with increased maternal smoking behavior.[18] Women's smoking and substance use in pregnancy linked strongly to continued maternal smoking during pregnancy.[19] A prospective cohort study of 1,947 women identified high levels of pregnancy-related anxiety, exposure to physical/sexual violence, and high job strain are significantly associated with continued smoking during pregnancy, after adjusting for socioeconomic factors and smoking intensity.[17] Part-time employment rather than unemployment correlates positively with continued smoking in pregnancy.[20] Gyllstrom M. et al. studied 1495 pregnant smokers from MN PRAMS indicated that women who reported three or more stressful events were half as likely to quit smoking as women who reported no stressful events in the previous year (OR = 0.53, 95% CI:0.34–0.84, P = 0.007). Women with low maternal mood were less likely to quit smoking compared to those with high mood (OR = 0.74, 95% CI: 0.51–1.07, P = 0.11).[21]

One acceptable tool to evaluate level of psychosocial stress is the Modified Life Events Inventory (LEI).[22] The original LEI is validated for use in clinical and survey studies to generate a distress profile for the "whole person."[23] The modified version of LEI is a simplified yet practical way to indicate stress level. Majority of the studies focused on the number of MLEI stressful events on smoking status in pregnancy rather than the impact of specific events on the outcome.[21,24,25] Similar to modified LEI with overlapping stressful events is a four-category stress panel composed of a total of 13 stressors identified by CDC's Pregnancy Risk Assessment

Monitoring System (PRAMS). Stressors are categorized into emotional, financial, partner-related and traumatic groups and often studied in the context of postpartum depression, preterm delivery and low birth-weight infants.[26,27,28] Association of race/ethnicity and poverty on the occurrence of stressful life events are identified by Wisconsin PRAMS study as well as Indu. A et. al.[28,29]

Our study is seeking to understand the impact of the four types of stressors along with the individual stressor identified by PRAMS questionnaire on the smoking status change at last trimester of pregnancy versus 3 months prior to pregnancy. We hope to identify stressful life events that are significantly correlated to maternal smoking continuation during pregnancy. The identified stressors can serve as targets individually and/or collectively on which intervention programs can be developed.

Method and Material

We analyzed data from the Centers for Disease Control and Prevention (CDC) Pregnancy Risk Assessment Monitoring System (PRAMS) during 2011-2012. PRAMS is an ongoing, population-based surveillance system of maternal behaviors and experiences before, during, and after pregnancy. PRAMS is conducted by state and local health departments in collaboration with CDC. All health departments participating in PRAMS use a standardized data collection methodology.[30,31] At each site, 100 to 300 new mothers who are state residents and have recently delivered a live-born infant during the preceding 2–4 months are randomly selected from a file of birth certificate records using stratified systematic sampling on a monthly basis. Women are excluded if they are non-residents, or whose birth certificates lacking mom's last name or delayed in processing (more detail see CDC website). Popular state stratification variables include infant birth weight, maternal race/ethnicity, and geographic location.[30] To minimize recall bias, efforts to contact women end 9 months after the woman has delivered her baby.

Pre-pregnancy smoking status was ascertained from the PRAMS questionnaire. Among women who reported smoking in the last 2 years, the numbers of cigarettes women smoked per day on average during the 3 months before pregnancy were asked. Smoking status at the last trimester suggested by number of cigarettes smoked was collected. CDC provided recoded data on change of smoking status at the last trimester compared to 3 months prior to the pregnancy. Change of smoking during pregnancy included non-smokers, smokers who quitted, continued smokers who reduced amount of cigarettes, continued smokers who maintained or increased amount of cigarettes, and non-smokers who resumed smoking. Our predictor variables are grouped into four categories. Emotional stressors include a very sick family member had to go to hospital, or someone close to the respondent died. Financial stressors cover facts that respondent moved to a new address, her husband/partner lost his job, she lost her job, or she had bills that she couldn't pay. Partner-related stresses are from separation or divorce, respondent argued more than usual with her husband/partner, or her husband/partner said he didn't want her to be pregnant. Traumatic stressors are comprised of respondent being homeless, she was involved in a physical fight, she or her husband/partner went to jail, or someone close to her had a problem with drinking/drugs.

Maternal characteristics included in the analysis were age, race/ethnicity, marital status, education, Medicaid status upon delivery and total income 12 months prior to pregnancy. Age, race/ethnicity, education were ascertained from the linked birth certificate data. Medicaid status, marital status and total income were ascertained from PRAMS questionnaire. Maternal age was divided into 18-24 yrs, 25-34 yrs and ≥35yrs. Maternal race/ethnicity was categorized as non-Hispanic black, non-Hispanic white, Hispanic, Asian and other. Maternal education was

categorized as less or equal to high school, and greater than high school. A woman was classified as enrolled in Medicaid if she reported being on Medicaid at delivery.

The analysis was performed using SPSS 21.0. A total of 33715 women were including from 24 states from 2011-2012. We examined the distribution of characteristics of women by change of smoking status. We used χ^2 tests to examine differences in prevalence estimates by characteristics and the change of smoking status. We calculated p value using χ^2 tests to detect significance of stressor categories with change of smoking. For stressors shown to be significantly associated with smoking change, we conducted multinomial logistic regression to obtain strength of association for each stressor category. Unadjusted and adjusted relative risks and 95% CIs were calculated to rid the confounder's interaction. Impact of individual stressor is considered to be scrutinized by logistic regression if its umbrella category is significantly associated with smoking change.

This study was waived from the Investigational Review Board (IRB) at the University of Kentucky as the data are publically available, de-identified secondary data. The study design was reviewed by the CDC PRAMS working group prior to the obtainment of data.

Results

Around half of women are between 25-34yrs, non-hispanic white, with annual income less than $10,000. The marital status, education and Medicaid coverage are equally presented within women. Maternal age, race/ethnicity, education level, marital status, income/Medicaid coverage all significantly correlate to the smoking change during pregnancy ($p<0.05$). Older women (≥35 yrs), Asian, women received more than high school education, being married, not enrolled in Medicaid, who earn ≥$50,000 have the highest percentage of non-smokers respectively. On the flip side, younger mother (≤24yrs), women whose race/ethnicity is "other,"

who are not married, who earn $10,000-24,999 per year and covered by Medicaid have high rates of quitting smoking, reducing number of cigs or continuing same habit or smoking more in their respective group.

Financial stress is occurred in half of the population (50.6%), followed by emotional stress (30.2%) and partner-related (28.9%). Traumatic is the least to be experienced (18.5%). The compositions of smoking behaviors in women either experienced or not experienced a type of stressor are depicted (Chart 2). Less women who experienced stressor, regardless of types, are non-smokers. More women who experienced emotional stress and financial stress continue to smoke, while rate is similar for those experienced partner-related stress. Less women who experienced partner-related and traumatic stressors quit smoking. Significance differences exist for the four type of stressors with the change of smoking status ($p<0.005$).

Table 2 suggests that no significant correlations of emotional stress exists in women who are nonsmokers (OR 0.959, 0.887-1.306, P= 0.288), who continued smoking ($p=0.73$ for reduced amount of smoking, $p=0.28$ for same/increased amount of smoking) or non-smokers who resumed smoking (OR 2.398, 0.884-6.509, $p=0.086$), compared to smokers who quit, after adjusting for confounders. Women who experienced partner-related stress is about 30% less likely to be non-smokers compared to women who quit smoking (CI 0.619-0.728, $p<0.000$).Women with financial stress during pregnancy have OR of 0.7 to be nonsmokers and 30% more likely to continue smoking with decreased amount of cigarettes. Women who experienced traumatic stress are 47% less likely to be non-smokers than to be smokers who quit smoking. For non-quitters, stronger association exists for women to reduce cigs (OR=1.593) than for women to continue same if not more cigarettes (OR=1.475) compared to quitters ($p<0.05$).

Given the significant associations exist among the financial, traumatic and partner-related stressors with change of smoking during pregnancy, we deal in depth of individual stress incident as following (Table 3). Financially, women who moved, who lost job or couldn't pay bills are strongly associated with less likely of being non-smokers (ORs=0.808, 0.817, 0.717 respectively). Inability to pay bills is a stronger indicator of continued smoking at reduced amount than at same/increased amount in comparison to quitters(OR=1.321 vs 1.079). Husband/partner lost job however, is associated with women more likely to keep same/more amount of smoking compared to quitters (OR=0.023).

Women are less likely to be non-smokers and more likely to continue smoking if experienced homeless, husband/partner in jail or someone closer dealing with drug/alcohols problems. The association for homeless women to increase amount of smoking is stronger than to reduce the amount of smoking (OR=1.429 vs 1.295) whereas women hold a slight tendency to reduce smoking rather than keeping same/more smoking (OR= 1.55 vs 1.5) if husband/partner in jail. Women experienced physical fight are less likely to be nonsmokers (OR=0.802, 0.669-0.961) but no significant association exist between quit or not quit. Being in argument a lot during pregnancy is the only stress event under partner-related stressors that is significantly associated with less likelihood for women to be non-smokers (OR= 0.735, 0.672-0.804).

Table 1. Maternal Characteristics By Smoking Status Change During Pregnancy (Last trimester vs. 3 Months Prior to Pregnancy), For 24 States, PRAMS 2011-2012.

Characteristic	N (%)*	Non-smokers, n (%)	Smokers Who Quit, n (%)	# of Cigs Reduced, n (%)	# of Cigs Same/More, n (%)	Non-Smoker Resumed, n (%)	p
Maternal Age, yrs							**0.000**
≤24	10655 (32.1)	6850 (64.3)	1865 (17.5)	1266 (11.9)	661 (6.2)	13 (0.1)	
25-34	17360 (52.2)	13401 (77.2)	1995 (11.5)	1281 (7.4)	677 (3.9)	6 (negligible)	
≥35	5217 (15.7)	4457 (85.4)	386 (7.4)	229 (4.4)	142 (2.7)	3 (0.1)	
Maternal Race-Ethnicity							**0.000**
Non-Hispanic white	17317 (54.2)	12112 (69.9)	2474 (14.3)	1851 (10.7)	873 (5)	7 (negligible)	
Non-Hispanic black	4998 (15.6)	3875 (77.5)	556 (11.1)	311 (6.2)	249 (5)	7 (0.1)	
Hispanic	4438 (13.9)	3857 (86.9)	382 (8.6)	113 (2.5)	81 (1.8)	5 (0.1)	
Asian	2409 (7.5)	2220 (92.2)	126 (5.2)	26 (1.1)	36 (1.5)	1 (negligible)	
Other**	2810 (8.8)	1752 (62.3)	567 (20.2)	325 (11.6)	165 (5.9)	1 (negligible)	
Maternal Education							**0.000**
≤ to high school	13682 (42.2)	8886 (64.1)	2094 (15.1)	1821 (13.1)	1051 (7.6)	10 (0.1)	
> high school	19012 (57.8)	15542 (81.7)	2111 (11.1)	937 (4.9)	411 (2.2)	11 (0.1)	
Marital Status							**0.000**
Married		16532 (84.2)	1770 (9)	877 (4.5)	448 (2.3)	5 (negligible)	
Other	13575 (40.9)	8159 (60.1)	2472 (18.2)	1898 (14)	1029 (7.6)	17 (0.1)	
Delivery Paid By							**0.000**
Medicaid	16312 (49.2)	10436 (64)	2532 (15.5)	2150 (13.2)	1178 (7.2)	16 (0.1)	
Other	16811 (50.8)	14193 (84.4)	1699 (10.1)	617 (3.7)	296 (1.8)	6 (negligible)	
Total Income 12 months prior to pregnancy, $							**0.000**
less than 10,000	14988 (48.5)	10992 (73.3)	1890 (12.6)	1316 (8.8)	779 (5.2)	11 (0.1)	
10,000 to 24,999	7396 (23.9)	4966 (67.1)	1149 (15.5)	862 (11.7)	413 (5.6)	6 (0.1)	
25000 to 49,999	6092 (19.7)	4707 (77.3)	812 (13.3)	396 (6.5)	174 (2.9)	3 (negligible)	
>=50,000	2443 (7.9)	2235 (91.5)	160 (6.5)	30 (1.2)	17 (0.7)	1 (negligible)	

* by characteristics

** includes American Indian/AK natives, mixed race, Hawaiian, and other non-whites

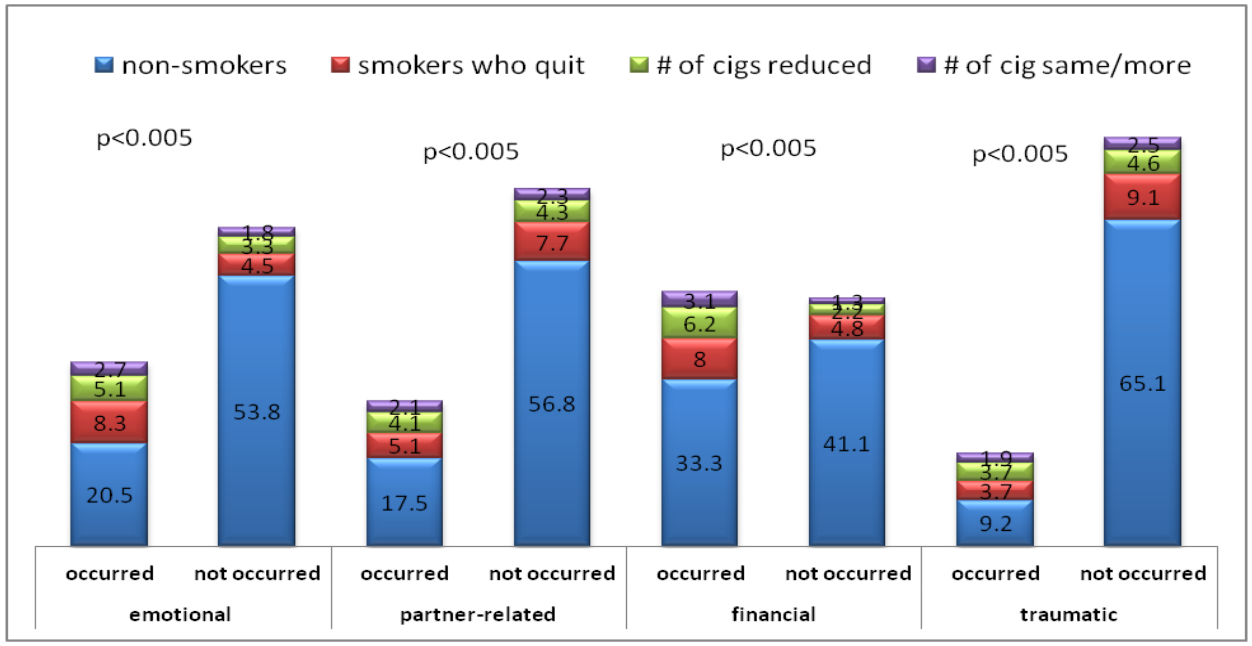

Chart 1. Stressors During Pregnancy (in Categories) By Smoking Status Change Last trimester vs. 3 Months Prior to Pregnancy)

Table 2. Stressors During Pregnancy (in Categories) and Smoking Status Change Multinomial Logistic regression

Predictor \ Outcome Variable		Non-Smoker		# of Cigs Reduced		# of Cigs Same/More		Non-Smoker Resumed	
		OR (Cl 95%)	p	OR (Cl 95%)	p	OR (Cl 95%)	p	OR (Cl 95%)	p
Emotional	Unadjusted	0.869 (0.809-0.935)	0.000	1.031 (0.93-1.142)	0.566	1.079 (0.951-1.225)	0.236	1.554 (0.632-3.818)	0.337
	Adjusted*	0.959 (0.887-1.036)	0.288	1.02 (0.913-1.139)	0.73	1.079 (0.941-1.236)	0.277	2.398 (0.884-6.509)	0.086
Partner-related	Unadjusted	0.659 (0.611-0.71)	**0.000**	1.129 (1.015-1.256)	**0.025**	1.117 (0.979-1.274)	0.1	1.059 (0.409-2.744)	0.906
	Adjusted	0.671 (0.619-0.728)		1.101 (0.982-1.235)	0.099	1.064 (0.924-1.226)	0.391	0.75 (0.266-2.116)	0.586
Financial	Unadjusted	0.624 (0.581-0.671)	**0.000**	1.419 (1.269-1.587)	**0.000**	1.216 (1.061-1.394)	0.005	1.415 (0.488-4.106)	0.523
	Adjusted	0.702 (0.649-0.759)		1.325 (1.174-1.496)		1.149 (0.991-1.334)	0.066	1.449 (0.439-4.779)	0.543
Traumatic	Unadjusted	0.466 (0.428-0.506)	**0.000**	1.747 (1.565-1.951)	**0.000**	1.672 (1.461-1.915)	**0.000**	2.082 (0.798-5.431)	0.134
	Adjusted	0.528 (0.482-0.578)		1.593 (1.413-1.795)		1.475 (1.274-1.709)		2.287 (0.79-6.621)	0.127

* Including maternal age, race/ethnicity, education, marital status, Medicaid upon delivery and income prior to pregnancy

Table 3. Individual Stressors During Pregnancy and Smoking Status Change, Multinomial Logistic Regression, after Adjusting for Confounders

Outcome Variable / Predictors	N (%)	Non-Smoker		# of Cigs Reduced		# of Cigs Same/More	
		OR (Cl 95%)	p	OR (Cl 95%)	p	OR (Cl 95%)	p
Financial							
Move to new address	11249 (33.4)	0.808 (0.747-0.874)	**0.000**	1.001 (0.859-1.121)	0.981	0.971 (0.844-1.117)	0.683
Husband/Partner lost job	4208 (12.5)	0.982 (0.88-1.095)	0.74	1.12 (0.973-1.291)	0.115	1.22 (1.028-1.447)	**0.023**
Mom lost job	3381 (10)	0.817 (0.728-0.918)	**0.001**	1.042 (0.897-1.21)	0.59	0.892 (0.741-1.075)	0.23
Couldn't pay bills	7233 (21.5)	0.717 (0.654-0.785)	**0.000**	1.321 (0.169-1.493)	**0.000**	1.079 (0.941-1.236)	**0.002**
Traumatic							
Mom became homeless	1268 (3.8)	0.774 (0.64-0.937)	**0.008**	1.295 (1.045-1.605)	**0.018**	1.429 (1.115-1.83)	**0.005**
Experienced physical fight	1343 (4)	0.802 (0.669-0.961)	**0.017**	1.211 (0.984-1.491)	0.071	1.212 (0.946-1.553)	0.128
Husband/partner in jail	1480 (4.4)	0.77 (0.648-0.914)	**0.003**	1.549 (1.283-1.87)	**0.000**	1.497 (1.196-1.874)	**0.000**
Someone close to mom has problems with drinking/drugs	4344 (12.9)	0.602 (0.543-0.667)	**0.000**	1.288 (1.132-1.466)	**0.000**	1.119 (0.952-1.316)	0.173
Partner-related							
Women divorced	2695 (8)	0.887 (0.778-1.012)	0.075	1.067 (0.907-1.255)	0.435	1 (0.82-1.22)	0.999
Argued lots	7848 (23.3)	0.735 (0.672-0.804)	**0.000**	1.002 (0.885-1.134)	0.98	1.012 (0.869-1.18)	0.874
Husband/partner didn't want women to be pregnant	2697 (8)	1.126 (0.986-1.286)	0.08	1.015 (0.856-1.203)	0.864	1.068 (0.869-1.313)	0.53

Discussion

Previous studies have rarely considered psychosocial health on maternal smoking behavior. A metal-studies of 64 trials revealed that 3 trials included baseline psychological well-being.[32] Recent study found that psychosocial factors comprised of socioeconomic status, health care, life course and health, and partner and social support were shown to be important in predicting both prenatal and postpartum smoking.[33] Women who smoke during pregnancy experienced a more negative constellation of psychosocial adversities (i.e., perceived stress, self-efficacy, depression, neuroticism, paternal support, perceived racism) than women who do not, after adjusting for demographic characteristics commonly associated with smoking behavior.[16] A better understanding of the psychosocial strengths and weaknesses of smoking women may enable smoking cessation interventions to be more efficacious in both the short- and long-term.[34] The primary aim of the study is to examine the correlations between stressors during pregnancy and the change of smoking at last trimester compared to three months prior to pregnancy.

Our study is by far the first one to study the relationship between PRAMS-identified stress types (i.e., emotional, financial, partner-related, traumatic) and change of smoking during pregnancy, whereas previous studies focus on associations of such categories of stressful life events during pregnancy with preterm delivery or infants with small for gestational age.[26,27,28] The most common stress during pregnancy is financial stress followed by emotional stress whereas traumatic stress is the least to be reported. We don't observe emotional stressors to significantly indicate smoking change during pregnancy. Women's perception of stress and support they received in dealing with those

stress may contribute to how stressful women actually experience. Financial and traumatic stressors are strongly associated with smoking continuation than to quit. Our findings are in line with studies that suggest low socioeconomic status and negative social and paternal support are significantly associated with continued smoking during pregnancy.[13,17] No significant association of women who lost job and continued smoking is found, as suggested in previous studies.[17, 20] We observe no significant correlation between husband/partner didn't want women to be pregnant with change of smoking whereas Page, R. et.al. found in the fragile family cohort of 3522 women that paternal discouragement of pregnancy, indicated by suggestions of abortion from father was significantly associated with constant smoker during pregnancy. This discrepancy can be resulted from different cohorts of women. Page's study focused on unwed couples with 9.8% incidence of suggestion of abortion from father.[33] The cohort in our study includes 59.1% married women with 8% incidence of husband/partner voiced opposition of pregnancy. Our sample size might not be powered to detect any meaningful association. We detect no association of being involved in physical fight with continued smoking, which aligns with the finds from Bullock et al. One study suggests exposure to physical/sexual violence significantly associated with continued smoking during pregnancy.[17] Differences in level of adjustment or in the composition of the reference group could partly account for these inconsistent findings.

There are different mechanisms proposed in attempt to answer the relationship of stress and continued smoking. Smoking as a coping method for women to deal with various stress during pregnancy, or low self-esteem and low perception of interpersonal support for women with psychosocial problems impeding to quit smoking have been

proposed .[16,17] A qualitative systemic review of barriers and facilitators of smoking cessation in pregnant women suggests that smoking is protective of wellbeing in lives of chronic disadvantage and psychosocial stress and offers brief relaxation to smokers. Women's relationships of partners, friends, and healthcare professionals could also serve as barriers or facilitators.[35]

American College of Obstetricians and Gynecologists (ACOG) called for the incorporation of routine psychosocial screening into prenatal care to all pregnant women in 2006.[36] However, significant lower compliance rate of assessing and counseling psychosocial risk factors in comparison to compliance with lab tests and physical examination has been noted.[37] Prenatal care providers regard psychosocial risk prevention "challenging" where practice pattern was inconsistent and success was uncertain.[37] Training might be advised to provide healthcare professionals with the confidence and skills in offering smoking cessation service (i.e., 5As, motivational interviews) during women's routine prenatal check-up. The persistent suggestion of smoking cessation to "hardened smokers" is important as it shows genuine care from the healthcare provider, thus is more likely to motivate women to quit.[35] Additionally, state policies requiring mandatory psychosocial screening and assessment during women's prenatal visits can be considered. One example is West Virginia Prenatal Risk Screening Instrument that's required by WV law to be submitted by every maternity provider of care for women in WV regardless of payment source.[38] Furthermore, specific stress risk factors including husband/partner lost job, inability to pay bills, being homeless, husband/partner in jail, and having someone close to mom who has trouble with drinking/drugs can be integrated into existing psychosocial screening tools as they are

strongly associated with continued smoking. Targeted programs, such as monetary bonuses, provision of shelters, psychosocial therapy that fosters paternal and social support as well as builds up mom's sense of self-efficacy can be potentially beneficial to facilitate smoking cessation. Longitudinal evaluation of the success of programs is needed, and result should be disseminated to healthcare providers. Colorado Prenatal Plus Program set a good example of an intensive and comprehensive approach that manages psychosocial problems during prenatal visits led to reduced risk of smoking, along with corresponding risk factors.[38] A recent RTC of an integrated prenatal invention that targeted on psychosocial and behavioral risk factors on vulnerable African-American pregnant women suggested the success of such intervention to resolve some or all their risk factors (i.e., IPV, smoking, depression).[39] Kentucky's Giving Infants and Family Tobacco Free Starts (GIFTS) which including screening for maternal depression, social support and domestic violence has been funded by Anthem Foundation to be carried out state-wise after a piloting study started since February 2008.[40]

The strength of our study is that it's by far the first to analyze association of the 4 types of stressors on smoking change during pregnancy. It shines light on strength of association of individual stressor on change of amount of smoking among continued smokers. The results of our study should be interpreted in light of several limitations. First, PRAMS stress measure is limited, and women may have experienced other stressful events that affect the relationship such as prenatal depression, women's drug use/alcohol, exposure to second-hand smoking. Additionally, timing of the stressful events, women's perception of stresses, social support in addition to paternal relationship and whether or not women received smoking cessation counseling/treatment could contribute to the

relationship of stressors with smoking. Moreover, both smoking status and incidence of stressors are relied on self-report and potentially result in recall bias, which could potentially explain our findings of traumatic stressors to be significantly associated with continued smoking while emotional stressors are not. Lastly, PRAMS data are limited to its generalization to states that are not part of the PRAMS collection, or women in rural area who lack the prenatal clinic visit. Future studies are recommended to better understand the association of the stressors on maternal smoking behavior under adequate control of possible confounders. Studies can take advantage of stratified sampling of PRAMS to focus on specific women population. For states not participated in PRAMS, it's prudent for researchers to investigate on the association of psychosocial factors specific to its populations to further guide the prenatal screening programs and smoking cessation counseling. With existing programs that have psychosocial screening and counseling as part of the women's prenatal visit, longitudinal evaluation of such programs is recommended.

Acknowledgements

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Biographical Sketch

Shidie Tang earned her Bachelor of Science in Biology from University of Kentucky in 2011. She is currently a PharmD/MPH dual degree candidate at University of Kentucky College of Pharmacy and College of Public Health.

Shidie has received Academic Excellence Scholarship and recognized as Rho Chi Honor Society member since 2013. She is actively involved in professional development at local and national levels. While pursuing her degrees, Shidie participated in research of *Dapsone and Bactrim Use for PCP Prophylaxis in Post-Transplantation Patients*. The results from the study was presented at American Society of Health-System Pharmacists (ASHP) Mid-year 2014.

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