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Smoking and Preeclampsia-Eclampsia Risk among Women In San Bernardino County

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ABSTRACT

Objectives: Consistent research findings exploring the relationship between maternal cigarette smoking and preeclampsia risk indicate that women who smoked during pregnancy experience a reduction in preeclampsia risk. The aim of our study was to examine the relationship between maternal cigarette smoking and preeclampsia or eclampsia risk. In addition we examined how the trimester that prenatal care began and enrollment in the Women Infants and Children Program (WIC), interventions commonly used to prevent adverse birth outcomes would affect preeclampsia or eclampsia risk based on smoking status.

Methods: This cross-sectional study utilized 65,288 birth cohort records from San Bernardino County between 2007and 2008. Logistic regression analyses were conducted to estimate preeclampsia or eclampsia risk associated with maternal smoking status.

Results: Significant findings were noted for 2007 age adjusted models. No significant findings were noted for multivariate models. Age adjusted odds ratio for women who never smoked were 0.69 [95% CI: 0.50, 0.94] when considering preeclampsia risk and 0.67 [0.49, 0.92] for preeclampsia or eclampsia risk compared to women who smoked during pregnancy. Similar findings were noted for WIC and prenatal care.

Conclusion: The study results indicated contrary findings regarding maternal cigarette use during pregnancy and preeclampsia risk compared to existing research in this area. Currently a large body of research evidence suggests an inverse relationship between smoking during pregnancy and preeclampsia risk. Reduction in preeclampsia risk was noted when comparing women who never smoked to those who smoked during pregnancy. Further research is needed to explore the relationship between maternal smoking habits and preeclampsia risk.

IN THIS ISSUE

INTRODUCTION

Several adverse reproductive,[1,2] pregnancy and fetal outcomes are associated with maternal cigarette smoking during and after pregnancy.[3,4] These adverse outcomes include spontaneous abortions, premature birth, low infant birth weight, Sudden Infant Death Syndrome (SIDS) and birth defects.[5] Additional concerns include difficulty conceiving, longer hospital stays due to increased infant morbidity and increased infant mortality.[6] Tobacco use remains the most preventable cause of death among both men and women in the United States.[7] Smoking is also the most preventable maternal factor associated with infant mortality and morbidity.[8] Environmental Tobacco Exposure (ETS), commonly referred to as second hand smoke, is also associated with adverse infant outcomes such as increased risk for small head circumference and congenital deformities.[9,10]

Changes in maternal smoking habits have also been noted due to increased awareness of the harmful effects of smoking during pregnancy. Between 1989 and 2004, a 48% decrease was noted among the number of women who reported smoking during pregnancy in the United States.[11] During 2011, 55% of the women who reported smoking before pregnancy stopped by the last three months of their pregnancy, but 40% relapsed within six months of delivery.[6]

Despite the harmful reproductive, pregnancy and fetal outcomes associated with cigarette smoking, research evidence indicates that cigarette smoking may have the opposite effect on preeclampsia (PE) risk.[12] Preeclampsia is a hypertensive disorder occurring after the 20th week of pregnancy characterized by hypertension and proteinuria but multiple maternal organ systems can be affected.[13-15] Risk factors include (1) previous preeclamptic pregnancy, (2) pre-existing chronic disease such as renal disease, hypertension, diabetes mellitus or systemic lupus erythematosus, (3) maternal age >40 years old, (4) nulliparity, obesity and (5) multiple gestations.[15] Pulmonary edema, acute respiratory distress syndrome (ARDS), ischemic stroke, thrombocytopenia and eclampsia are among the adverse maternal outcomes associated with PE.[15] When not treated, preeclampsia can progress to eclampsia which is characterized by seizures.[14] Inducing labor is often a common measure taken to manage severe PE or eclampsia. Consequently, the adverse birth outcomes associated with preterm births are also applicable to infants delivered early due to severe PE or eclampsia. Additional adverse fetal outcomes include intrauterine growth restriction and placental abruption.[15]

The observed protection of cigarette smoking against preeclampsia risk appears to be related to the products of combustion such as carbon monoxide rather than the nicotine which is also found in smokeless tobacco.[16] Among cigarette smokers, heavy smokers (>9 cigarettes per day) experienced a greater reduction in preeclampsia and gestational hypertension risk compared to light smokers (1 to 9 cigarettes per day).[16] The mechanism regarding the reduction in preeclampsia risk and smoking remains unclear. It is speculated that the observed protection is due to changes in the balance of angiogenic factors and the role of carbon monoxide.[17,18] Oxidative stress appears to be an important link between many maternal factors and the risk of PE.[19] Smoking increases oxidative stress and reduces antioxidant levels in the blood yet consensus among researchers is that smoking reduces the risk of PE. [20]

Preconception and prenatal care are valuable health promotion approaches to improving pregnancy and birth outcomes, including the adverse outcomes associated with PE and maternal cigarette smoking. Preconception care was noted to be associated with maternal health promoting behaviors such as prepregnancy multivitamin use, obtaining prenatal care during the first trimester and abstinence from alcohol use prior to becoming pregnant.[21] Preconception and prenatal encounters provide opportunities for health professionals to identify and discuss maternal risk factors such as smoking status with their patients. Women, Infants and Children (WIC) is a national program providing supplemental food and nutrition education to pregnant, breastfeeding, postpartum women and children from birth to age five meeting income requirements.[22,23] Smoking cessation and PE prevention are not part of the primary purpose of the WIC program. However, enrollment in WIC has been shown to positively affect maternal smoking habits.[24,25]

The aims of the study were to explore: (1) the relationship between maternal cigarette smoking and PE risk, (2) possible associations between enrollment in the WIC program and smoking related PE risk, and (3) possible associations between the time prenatal care began and smoking related PE risk. We hypothesized that enrollment in the WIC program and early prenatal care would decrease the risk of PE because of their role in promoting positive maternal health behaviors and preventing adverse pregnancy and birth outcomes.

METHODS

Sample and participants

A total of 65,228 birth cohort records were used in the analysis reflecting all live births occurring in 2007 and 2008 in San Bernardino County, California. Records were included in the analysis if (a) mother's place of residence was in San Bernardino County at the time of delivery; (b) the mother only gave birth to a single baby (e.g., not twins, triplets) and (c) the length of gestation was greater than or equal to 20 weeks. Records with missing information were used but those with missing characteristics of interest were treated as missing, so no imputation was used. The records contained data for all live births occurring in a calendar year, death information for those infants who were born in that year but died within 12 months of birth and all fetal deaths that also occurred during that calendar year as well as detailed demographic information related to the child, mother and father.[26] The files were obtained without personal identifiers.

Variables

There were two outcomes of interest which were PE recorded as "yes" or "no" and eclampsia, "yes" or "no". The exposure variable was maternal smoking status. Respondents were asked to indicate the number of cigarettes or packs of cigarettes they smoked three months before pregnancy, first three months of pregnancy, second three months of pregnancy, and third trimester of pregnancy. They were instructed to enter "0" if they did not smoke cigarettes three

Table 1. Demographic characteristics and smoking status of mothers with preeclampsia versus mothers with no preeclampsia in San Bernardino County in 2007 and 2008.

	2007			2008		
n (column %)	Total	No Preeclampsia	Preeclampsia	Total	No Preeclampsia	Preeclampsia
Occurrence	33193	32488 (97.88)	705 (2.12)	32035	31379 (97.95)	656 (1.01)
Maternal Tobacco Use						
Never Smoked	31050	30410 (93.85)	640 (91.04)	29989	29386 (93.76)	603 (92.63)
Pregnancy Smoker	1430	1388 (4.28)	42 (5.97)	1355	1324 (4.22)	31 (4.76)
Quit at Pregnancy Recognition	626	605 (1.87)	21 (2.99)	38	631 (2.01)	17 (2.61)
Maternal Age						
< 18 Years	1422	1391 (4.28)	31 (4.40)	1317	1293(4.12)	24 (3.66)
18-35 Years	27918	27376 (84.27)	542 (76.88)	26886	26373 (84.05)	513 (78.20)
35 Years or older	3851	3719 (11.45)	132 (18.72)	3832	3713 (11.83)	119 (18.14)
Mother's Race/Ethnicity						
Hispanic	20059	19664 (60.04)	395 (56.03)	19213	18840 (60.04)	373 (56.86)
Non-Hispanic white	8218	8028 (24.71)	190 (26.95)	8013	7837 (24.98)	176 (26.83)
Non-Hispanic black	2800	2712 (8.35)	88 (12.48)	2756	2685 (8.56)	71 (10.82)
Asian/Pacific Islander	1925	1897 (5.84)	28 (3.97)	1824	1796 (5.72)	28 (4.27)
Other/Multi/Unknown	191	187 (0.58)	4 (0.57)	229	221 (0.70)	8 (1.22)
Mother's Years of Education						
0-8 Years	2360	2311 (7.17)	49 (6.98)	2045	2010 (6.46)	35 (5.39)
9-11 Years	7831	7706 (23.91)	125 (17.81)	7504	7357 (23.66)	147 (22.65)
12 Years	11145	10886 (33.77)	259 (36.89)	10399	10173 (32.71)	226 (34.82)
13-15 Years	7445	7254 (22.51)	191 (27.21)	7699	7534 (24.23)	165 (25.42)
16 Years or More	4153	4075 (12.64)	78 (11.11)	4102	4026 (12.95)	76 (11.71)
Mother's Use of WIC						
No	14045	13748 (42.70)	297 (42.25)	12328	12078 (38.70)	250 (38.28)
Yes	18851	18445 (57.30)	406 (57.75)	19535	19132 (61.304)	403 (61.72)
Trimester Prenatal Care Began						
No Prenatal Care	289	282 (0.87)	7 (1.00)	230	229 (0.74)	1 (0.15)
First Trimester	26630	26060 (80.83)	570 (81.08)	25949	25430 (81.67)	519 (80.34)
Second Trimester	5084	4980 (15.45)	104 (14.79)	4780	4671 (15.00)	109 (16.87)
Third Trimester	941	919 (2.85)	22 (3.13)	826	809 (2.60)	17 (2.63)
Principal Source of Payment for Prenatal Care						
Uninsured	1084	1061 (3.27)	23 (3.26)	888	871 (2.78)	17 (2.59)
Private Insurance	13920	13684 (42.12)	236 (33.48)	13295	13078 (41.68)	217 (33.08)
Medi-Cal	16236	15863 (48.83)	373 (52.91)	15844	15486 (49.35)	358 (54.57)
Other	1953	1880 (5.79)	73 (10.35)	2008	1944 (6.20)	64 (9.76)

months before pregnancy, as well as throughout their pregnancy. For the purpose of the study, maternal tobacco use was categorized as never smoked, pregnancy smoker or prenatal smoker. Prenatal smoker (women who smoked during pregnancy) was selected for the reference category. Confounders of interest were maternal age, maternal ethnicity, maternal pre-pregnancy BMI, WIC enrollment, trimester prenatal care started and type of insurance. The BMI variable was calculated by dividing pre-pregnancy weight in pounds divided by the reported height in inches squared multiplied by 703. BMI was stratified according to the Centers for Disease Control BMI classification: (a) underweight (< 18.5kgm/m^2), (b) normal (18.5kg/m^2-24.9kg/m^2), (c) overweight (25.0-29.9kg/m^2), and (d) obese (> 30.0kg/m^2).[27] The standard United States birth certificate does not ask respondents to report the trimester they began prenatal care. However, the date of last normal menses and first date prenatal care began are captured on this document. These measures were used to calculate the trimester respondents began prenatal care. This calculation is often used for this purpose.[28]

Data Analysis

Statistical Analysis Systems (SAS) version 9.3 was used to analyze the data. A total of 22 preeclampsia cases were noted in 2007 and 16 cases in 2008. As a result, we had two outcomes, PE only and PE or eclampsia. Frequencies and percentages were obtained to examine demographic characteristics of respondents, and logistic regression analyses were conducted to estimate smoking related preeclampsia/preeclampsia or eclampsia risk. Four models were used for the logistic regression analyses. Model 1 yielded crude odds ratio (OR) and model 2 analyzed the age adjusted OR. Model 3 was a multivariate model, controlling for maternal age, maternal ethnicity, trimester prenatal care start, WIC enrollment and insurance status. Model 4 included confounders in model 3 and maternal pre-pregnancy BMI. To observe the effects of WIC enrollment and prenatal care on smoking

Table 2. Demographic characteristics and smoking status of mothers with preeclampsia or eclampsia in San Bernardino County in 2007, 2008

	2007			2008		
n (column %)	Total	No Preeclampsia or Eclampsia	Combined Preeclampsia or Eclampsia	Total	No Preeclampsia or Eclampsia	Combined Preeclampsia or Eclampsia
Occurrence	33193	32466 (97.81)	727 (2.19)	32035	31363 (97.90)	672 (2.10)
Maternal Tobacco Use						
Never Smoked	31050	30393 (93.86)	657 (90.62)	29989	29371 (93.76)	618 (92.65)
Pregnancy Smoker	1430	1386 (4.28)	44 (6.07)	1355	1324 (4.23)	31 (4.65)
Quit at Pregnancy Recognition	626	602 (1.86)	24 (3.31)	648	630 (2.01)	18 (2.70)
Maternal Age						
< 18 Years	1422	1390 (4.28)	32 (4.40)	1317	1293 (4.12)	24 (3.57)
18-34 Years	27918	27357 (84.27)	561 (77.17)	26886	26360 (84.05)	526 (78.27)
35 Years or older	3851	3717 (11.45)	134 (18.43)	3832	3710 (11.83)	122 (18.15)
Mother's Race/Ethnicity						
Hispanic	20059	19655 (59.21)	404 (55.57)	19213	18830 (60.04)	383 (56.99)
Non-Hispanic white	8218	8022 (24.71)	196 (26.96)	8013	7836 (24.98)	177 (26.34)
Non-Hispanic black	2800	2706 (8.33)	94 (12.93)	2756	2682 (8.35)	74 (11.01)
Asian/Pacific Islander	1925	1897 (5.84)	28 (3.85)	1824	1794 (5.72)	30 (4.46)
Other/Multi/Unknown	191	186 (0.57)	5 (0.69)	229	221 (.70)	8 (1.19)
Mother's Years of Education						
0-8 Years	2360	2309 (7.17)	51 (7.04)	2045	2009 (6.46)	36 (5.41)
9-11 Years	7831	7699 ((23.90)	132 (18.23)	7504	7352 (23.65)	152 (22.86)
12 Years	11145	10877 (33.77)	268 (37.02)	10399	10169 (32.71)	230 (34.59)
13-15 Years	7445	7251 (22.51)	194 (26.60)	7699	7529 (24.22)	170 (25.56)
16 Years or More	4153	4074 (12.65)	79 (10.91)	4102	4025 (12.95)	77 (11.58)
Mother's Use of WIC						
No	14045	13740 (42.71)	305 (42.07)	12328	12072 (38.70)	256 (38.27)
Yes	18851	18431 (57.29)	420 (57.93)	19535	19122 (61.30)	413 (61.73)
Principal Source of Payment for Prenatal Care						
Uninsured	1084	1060 (3.26)	24 (3.30)	888	871 (2.78)	17 (2.53)
Private Insurance	13920	13676 (42.12)	244 (33.56)	13295	13705 (41.69)	220 (32.74)
Medi-Cal	16236	15851 (48.82)	385 (52.96)	15844	15473 (49.34)	371 (55.21)
Other	1953	1879 (5.79)	74 (10.18)	2008	1944 (6.20)	64 (9.52)

related PE risk, we used age- adjusted models. These analyses were conducted separately for 2007 and 2008.

RESULTS

Demographics

Tables 1 and 2 present demographic characteristics of our study population. In 2007 and 2008 among women diagnosed with preeclampsia, 91% and 93% never smoked, respectively. Preeclampsia or eclampsia cases were identified between the ages of 18 and 35 years old, Hispanic, had 12 years of education and used Medi-Cal as primary source of payment for prenatal care.

Maternal Cigarette Smoking and Preeclampsia Risk

Table 3 and 4 presents crude, age adjusted and multivariate odds ratios for PE risk. Significant results were noted for our crude and age adjusted models. During 2007, women who never smoked had a 31% [95% CI: 0.50, 0.94] age adjusted reduction in PE risk compared to those who smoked during pregnancy. For our PE or eclampsia outcome women who never smoked had an age adjusted odds ratio of 0.67 [95% CI: 0.49, 0.92]. Significant findings were not noted for the multivariate models we constructed.

WIC Enrollment, Prenatal Care and Smoking-Related Preeclampsia Risk

Significant findings were noted for 2007 when accounting for the effects of WIC and early prenatal care. When accounting for the effects, WIC enrollment women who never smoked had age adjusted odds ratio 0.68 [95%CI: 0.49, 0.93] and 0.66 [95%CI: 0.49, 0.90] for PE and PE or eclampsia respectively during 2007 compared to those who smoked during pregnancy. Similar results were noted when accounting for the effects of early prenatal care. During 2007, women who never smoked had age adjusted odds ra-

Table 3. Crude, Age-adjusted, and Multivariable odds ratios with 95% confidence interval limits for preeclampsia outcomes among mother's in San Bernardino County in 2007, 2008

	2007 Crude	Age-Adjusted	Multivariable	2008 Crude	Age-Adjusted	Multivariable
Maternal Tobacco Use						
Never Smoked	**0.70 (0.51, 0.96)**	**0.69 (0.50, 0.94)**	0.83 (0.59, 1.16)	0.88 (0.61, 1.26)	0.87 (0.60, 1.25)	1.06 (0.27, 1.56)
Pregnancy Smoker	1.00 (Reference)			1.00 (Reference)		
Quit at Pregnancy Recognition	1.15 (0.67, 1.95)	1.18 (0.70, 2.02)	1.24 (0.77, 2.12)	1.15 (0.63, 2.10)	1.18 (0.65, 2.14)	1.28 (0.70, 2.34)
Multivariable - Adjusted for age, race/ethnicity, years of education, WIC utilization, insurance status, and month prenatal care began.						CI=Confidence Interval

Table 4. Crude, Age-adjusted, and Multivariable1 odds ratios with 95% confidence interval limits for preeclampsia or eclampsia outcomes among mother's in San Bernardino County in 2007, 2008

	2007 Crude	Age-Adjusted	Multivariable	2008 Crude	Age-Adjusted	Multivariable
Maternal Tobacco Use						
Never Smoked	**0.68 (0.50, 0.93)**	**0.67 (0.49, 0.92)**	0.82 (0.59, 1.14)	0.90 (0.62, 1.29)	0.89 (0.62, 1.29)	1.09 (0.73, 1.60)
Pregnancy Smoker	1.00 (Reference)			1.00 (Reference)		
Quit at Pregnancy Recognition	1.26 (0.76, 2.08)	1.30 (0.78, 2.15)	1.37 (0.82, 2.28)	1.22 (0.68, 2.22)	1.25 (0.69, 2.25)	1.36 (0.75, 2.48)
Multivariable - Adjusted for age, race/ethnicity, years of education, WIC utilization, insurance status, and month prenatal care began.						CI=Confidence Interval

tio of 0.64 [95%CI: 0.50, 0.94] PE risk and 0.68 [95% CI: 0.49, 0.93] for PE or eclampsia risk compared to those who smoked during pregnancy.

DISCUSSION AND CONCLUSION

Researchers examining the relationship between smoking and PE risk have indicated that smoking is protective against the development of PE.[16-18] However, findings for our study indicated that maternal cigarette smoking was not protective against PE risk. In our study we used smoking during pregnancy as the reference category while previous researchers have used non-smoker as the referent category, making it difficult for us to compare our results with these studies. Among our sample population, women who never smoked experienced a reduction in PE risk compared to those who smoked during pregnancy when considering the age adjusted model. Our multivariable models did not yield significant results, indicating the effects of smoking on PE may be confounded by other factors not controlled for in this study. Our study is one of few known studies using women who smoked as a reference category to examine PE risk. We partially confirmed that non-smokers experience a reduction of PE risk compared to women who smoked during pregnancy. Additionally, observed associations between PE risk and women who quit smoking upon recognition of pregnancy were not statistically significant. Therefore, we could not determine the impact of smoking cessation on PE risk.

The associations observed between maternal cigarette smoking and PE risk were similar to the risk of smoking related PE risk when adding WIC enrollment and prenatal care to the multivariable models. Our findings did not elucidate the role of enrollment in the WIC program and the time of prenatal care enrollment on smoking related PE risk. Therefore, we did not prove our hypothesis.

This study is not without limitations. Smoking status was based on maternal self-report, and we could not confirm it. Smoking status may have been underreported since it is less socially acceptable to smoke during pregnancy and reporting varied by demographic characteristics.[29] Our smoking status classification may have introduced error since there was no actual choice for "never smoked" on the birth certificate. Therefore, we classified women who indicated "0" for all smoking questions as "never smoked". We were unable to account for those who smoked but quit longer than three months before pregnancy as well as for those who quit but relapsed later in their pregnancy. Information regarding exposure to second/third hand smoke, illicit drug and alcohol use were not captured on the birth certificate; therefore, we could not add these variables to our multivariate models. Maternal smoking status at middle or late pregnancy rather than early pregnancy appears to be most important in determining PE related smoking risk.[16] We could not examine this relationship since we did not have cessation and relapse history of the respondents.

Future research should explore the mechanisms related to the observed reduction of PE risk among women who smoke during pregnancy since we did not observe this in our study sample. Areas for future research include, exploring PE risk based on smoking habits during various stages of pregnancy, cessation and relapse patterns and exposure to second hand smoke. In addition, further exploration is needed to determine the roles of the WIC program, preconception care and early prenatal care in the prevention of PE risk.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Chair's Message

Lauri Byerley
RDPG Chair

It's that time again for another Digest issue to be published and me to write my Chair column. In the last issue, and my first entry in the Chair's column, I told you about the events planned for this year, 2016-2017. So far, we are on pace. So what do you have to look forward to?

First is FNCE® 2016. The conference is approaching fast. The meeting dates are October 15th through the 18th in Boston. I love Boston, and am hoping to eat delicious seafood and enjoy the beautiful fall colors while I am there. Okay, some of you may laugh at me, but I live in Louisiana and we do not have beautiful fall colors. The leaves turn brown and fall off the trees unless it is a live oak in which case they stay green all winter. So, will the leaves be changing in Boston?

The Research DPG is hosting several events at FNCE®, so join us! We would love to see you there. This year we have two educational sessions along with our networking/socializing breakfast. I wonder who we will see this year. On Monday, there is a special research symposium and several of our members are presenting. Here is the short list of what is on the docket. I have not included the posters our members will be showing. It is wonderful seeing members involved at FNCE® 2016. Don't forget your name tag ribbon to show you are a RDPG member.

- **Research DPG Membership Breakfast Meeting**
  6:30 AM, Sunday, October 16, 2016, Harbor Ballroom III, Westin Boston Waterfront (Headquarters Hotel). Plan to attend. Tate & Lyle is sponsoring this event, and the RDPG thanks them for their very generous support. Come network/socialize, eat breakfast, learn about Tate & Lyle's ingredients, meet the RDPG Executive Council, and congratulate our award winners!
- **The Gut-Brain Highway: Can Traffic Be Regulated By Diet?,** Session #192. 8:00-9:30 AM, Sunday, October 16, 2016, Grand Ballroom West
- **Addressing Unspoken Alcohol Use - Health, Calories, Assessment, and Counseling,** Session 337. 9:45-11:15 AM, Tuesday, October 18, 2016, Room: 258 ABC
- **DPG/MIG Showcase**
  9:00 AM-Noon, Monday, October 17, 2016,
  Boston Convention and Exhibition Center, Hall B-2
- **Dietetics Research: Part of Your Practice - Research Symposium Part 1,** Session #139. 8:00-9:30 AM, Monday, October 17, 2016, Room: 104 ABC
- **Dietetics Research: Cultivating Research Skills: Working with Your IRB and Getting Started with De-Identified Data-Research Symposium 2A, Part 2,** Session #138. 1:30-3:00 PM, Monday, October 17, 2016, Room: 104 ABC
- **Dietetics Research: Planning Your Data Analysis and Preparing for Publication - Research Symposium 2B, Part 3,** Session #168. 3:30-5:00 PM, Monday, October 17, 2016, Room: 104 ABC

Winners of our awards have been picked. I want to thank The Sugar Association for funding a $5000 pilot award this year. The RDPG funded two student poster awards, first author award, and emerging author award.

FNCE® just gets us going this year; more is planned throughout the year. For example, Tate & Lyle will be presenting a webinar the beginning of 2017. You can watch a trailer at our FNCE® breakfast.

We are planning a special webinar for our student members and a third webinar on data management. Of course, any RDPG member is welcome to attend for free. (I like those words.) You will see more on the student webinar in the coming weeks. Most exciting, we will be rolling out our social media. If you are into Twitter, Facebook or LinkedIn, look for the Research DPG. Even better, help! We have a young, talented social media chair (Kevin Klatt) who could use your help.

Talking about help. We have a very talented and dedicated group of volunteers working on your behalf. I am so fortunate to be working with them. We have a strong pool of applicants for next year's leadership positions (Yeah!!), and you will be voting in February. You may also consider volunteering for one of our committee positions. Or how about our Policy and Advocacy Leader (PAL)? For this position, you get to shake the hand of congressional leaders. If you are interested, send us an email at ResearchDPGChair@gmail.com.

I want to thank our VERY GENEROUS sponsors. The Sugar Association sponsored our pilot grant and Tate & Lyle sponsored our Member Breakfast and upcoming webinar. Their contribution is critical for our success, so if you see someone from these two groups, tell them THANKS!

So have a great fall. If you are at FNCE®, come shake my hand and say, "Hi."

Lauri

Notes from the Secretary's Desk

Brook Harmon, PhD, RD, FAND

September 22, 2016, is the first day of fall this year, and fall means it is time for FNCE®. Below is a listing of Research DPG sponsored events which provide great opportunities for you to enhance your knowledge and skills as well as network with other research RDNs.

- Sunday, October 16, 2016, 6:30 AM
  Research DPG Membership Breakfast Meeting
  Harbor Ballroom III, Westin Boston Waterfront (Headquarters Hotel)
- Sunday, October 16, 2016, 8:00 - 9:30 AM
  The Gut-Brain Highway: Can Traffic Be Regulated by Diet?
  Grand Ballroom West, 1.5 CEU
- Tuesday, October 18, 2016, 9:45 - 11:15 AM
  Addressing Unspoken Alcohol Use - Health, Calories, Assessment, and Counseling
  Room: 258 ABC, 1.5 CEU
- Monday, October 17, 2016, 9:00 AM – Noon
  DPG/MIG Showcase
  Boston Convention and Exhibition Center

In addition to FNCE®, the Research DPG is exploring other ways to provide networking and continuing education opportunities to our members. Be on the lookout for opportunities to engage with the DPG via social media. You can currently find us on Facebook (RDPG – Research Dietetic Practice Group), and Kevin Klatt, our Social Media Chair, is hard at work setting up a Twitter account, a blog to highlight the work and accomplishments of research RDNs, and reestablishing our LinkedIn group. We also have a new Webinar Chair, Melissa Prescott, who is working to develop several webinar opportunities for student members as well as the membership at large.

Please continue sending us your feedback on ways we can provide you with opportunities to connect and grow as a research RDN. I can be reached at bharmon1@memphis.edu or at ResearchDPGchair@gmail.com.

Public Policy Update

Mary-Jon Ludy, PhD, RDN, FAND

The June, 2016 Public Policy Workshop was a huge success! Over 325 Academy members visited Capitol Hill to discuss three major nutrition policy issues with their Senators and Representatives. These issues were:

- **Treat and Reduce Obesity Act:** would allow RDNs to independently bill for obesity counseling through Medicare
- **Preventing Diabetes in Medicare Act:** would expand medical nutrition therapy coverage to individuals with pre-diabetes
- **Child Nutrition Programs:** would maintain and strengthen programs that benefit and prevent hunger among children

The RDPG was well represented. Among those pictured below are Mary-Jon Ludy, RDPG Policy & Advocacy Leader, Chris Taylor, RDPG Past-Chair, and Colleen Spees, RDPG member.

Kneeling (L-R): Mary-Jon Ludy, Colleen Spees, Karin Palmer, Kathryn Davis

Standing Front (L-R): Judy Nagy, Heather Butscher, Karen Stanfar, Patricia Becker, Kendra Schmuck

Standing Back (L-R): Jason Roberts, Chris Taylor, Larissa Brophy, Patricia McKnight, Mary Beth Arensberg, Natalie Stephens

RDPG Student Spotlight: Stephanie Kratzer, MS, RD

Name: Stephanie Kratzer

Credentials: MS, RD

Degree pursuing: PhD

University: Iowa State University

Research area(s) of interest: Infant and maternal nutrition, neonatal nutrition

1. Describe the path (education, work experience, etc.) that led you to pursue a degree in nutrition and/or nutrition research.

I had always been interested in health—both nutrition and exercise. Seeing how a registered dietitian was influential when my parents were diagnosed with different chronic conditions made me aware of using nutrition to support the body and treat chronic illnesses. During my undergraduate education, I became involved in research as a research assistant. I enjoyed the opportunity to assist in answering questions to which no one had the answers.

2. On what was or is your graduate work focused? Discuss your area of research or practice, dissertation or thesis topic, etc. Describe 1-2 highlights of your research career thus far.

My dissertation project is a prospective observational clinical study exploring placental transfer of vitamin D. It is a collaborative project between Iowa State University and the University of Nebraska Medical Center. I enjoy the opportunity to learn different skills and techniques as needed for the various projects on which I have the privilege to work.

3. What are your plans for the future (e.g. academia, government, industry, etc.)?

My future goals include gaining additional experience in clinical nutrition. My specific area of interest is neonatal nutrition. Ultimately, I would like to conduct clinical research, ideally in a neonatal setting such as a neonatal intensive care unit.

4. Do you have any advice for students?

Take advantage of the opportunities that present themselves, ask about opportunities to get involved in research, find good mentors, and shadow those already in the field.

Interested in being interviewed for the Student Spotlight? Email rachel.paul@tc.columbia.edu.

Treasurer's Report

Suzanne (Suzi) D. Baxter, PhD, RD, LD, FADA, FAND
RDPG Treasurer 2016-2018

I am excited to serve as Treasurer of the RDPG for 2016–2018. The fiscal year began June 1st, so the Treasurer's Report for this issue of The Digest includes both a summary of last year's budget along with the budget for the current fiscal year.

Our primary source of revenue comes from membership dues, so please share the benefits of being a member of the RDPG with your colleagues and encourage them to join the RDPG! Our key expenses include awards, food service at FNCE, lodging for FNCE and workshops, newsletter production, audio visual services at FNCE, and transportation.

RDPG BUDGET FOR 2015-2016

		Actual as of May 2016 ($)	*Annual Budget ($)*	*Variance ($)*
Revenue	Membership Dues	21,015	22,470	–1,455
	Grants/Contracts	10,620	10,620	0
	Donations/Gifts	983	0	983
	Revenue Total	***32,618***	***33,090***	***–472***
Expenses	Lodging	4,632	1,824	–2,808
	Subsistence	88	381	293
	Transportation	1,272	416	–856
	Professional/Consulting	100	1,900	1,800
	Postage	61	50	–11
	Teleconferences	237	250	13
	Website Hosting	588	1,788	1,200
	Advertising/Promotion	173	250	77
	Depreciation	1,762	0	–1,762
	Other Expense	1	7,200	7,199
	Member Dues & Seminar Fees	1,091	651	–440
	Credit Card Processing Fees	523	504	–19
	Outside Services	2,618	4,000	1,382
	Donations to AND Foundation	200	500	300
	Honorariums & Awards	6,630	7,000	370
	Audio Visual Services	1,158	1,500	342
	Food Service	6,061	6,200	139
	Printing & Copying Services	179	250	71
	Expenses Total	***27,374***	***34,664***	***7,290***
	NET TOTAL	***5,244***	***–1,574***	***6,818***
Reserve	Reserve Percentage (revenue divided by expenses)	119%	95%	

RDPG BUDGET FOR 2016-2017

		Annual Budget ($)
Revenue	Membership Dues	21,260
	Grants/Contracts	14,400
	Revenue Total	35,660
Expenses	Lodging	1,711
	Subsistence	414
	Transportation	538
	Professional/Consulting	1,770
	Postage	100
	Teleconferences	220
	Website Hosting	588
	Advertising/Promotion	350
	Depreciation	3,524
	Other Expense	7,200
	Member Dues & Seminar Fees	667
	Credit Card Processing Fees	479
	Outside Services	2,000
	Donations to AND Foundation	500
	Honorariums & Awards	7,000
	Audio Visual Services	100
	Food Service	5,210
	Printing & Copying Services	275
	Expenses Total	***32,646***
	NET TOTAL	***3,014***
Reserve	Reserve Percentage (revenue divided by expenses)	109%
Investment Reserve	Investment Reserve ($)	65,099
	Reserve Percentage (investment reserve divided by expense budget)	199%

Pioneers in Professional Dietetics – Eighth in a Series: Lydia Maria Francis Child

Submitted by Danielle M Torisky, PhD, RDN
Associate Professor, Dietetics Program, James Madison University, Harrisonburg, VA

Mrs. Lydia Maria Child (1802 – 1880) was well known in the early 19th century, not only for her household economy expertise, but for her life and writings as an advocate for social reform (1,2). Born in Medford, Massachusetts, Lydia Maria Francis was already an accomplished novelist and poet and was publishing a children's magazine when she met David Lee Child, a Boston lawyer who she married in 1828. The couple's strong support of the abolitionist movement caused Lydia's popularity to plummet, and subscriptions to her magazine to be cancelled. While they had no children, the diminished income necessitated great economy in living conditions (1,2). Although Lydia was experiencing limited resources first-hand, she observed others around her either in total poverty or unable to manage money correctly during troubled economic times. Her classic *The American Frugal Housewife* (3) was first published in 1829 and addressed many of the concerns of families in that time period. It is this manual and its companion, *The Family Nurse* ,(4) which are featured in this article. It will be clear from the passages selected below, that she not only had concern for providing recommendations for healthy living that were affordable on a limited income, but also for providing information that was as evidence-based and as reliably-sourced as possible as it could be for the early and mid-1800s.

ON PHILOSOPHY OF ECONOMY, LIMITED RESOURCES

"The true economy of housekeeping is simply the art of gathering up all the fragments, so that nothing lost… Nothing should be thrown away so long as it is possible to make any use of it, however trifling that use may be..." (3, p 3). "It is wise to keep an exact account of all you expend – even a paper of pins" (3, p 4). "True economy is a careful treasurer in the service of benevolence; and where they are united, respectability, prosperity, and peace will follow" (3, p 5).

FOOD SELECTION, PRESERVATION, AND STORAGE

"If you have a greater quantity of cheeses in the house than is likely to be soon used, cover them carefully with paper, fastened on with flour paste, so as to exclude the air. In this way they may be kept free from insects for years. They should be kept in a dry, cool place" (3, p 14). She also featured a meat chart for beef, mutton, lamb and pork (3, p 9) and emphasized less expensive cuts of meat. "The thick part of a thin flank is the most profitable part in the whole ox to buy. It is not so handsome in appearance as other pieces, but it is thick meat, with very little bone, and is usually two cents less in the pound than more fashionable pieces" (3, p 45). Lydia's tomato catsup recipe was on the spicy side; it included "cloves, allspice, pepper, mace, garlic, and whole mustard-seed… a good deal of salt and spice is necessary to keep the catsup well" (3, p 35).

FOOD AS MEDICINE

"Blackberries are extremely useful in cases of dysentery. To eat the berries is very healthy; tea made of the roots and leaves is beneficial; and a syrup made of the berries is still better. Blackberries have sometimes effected a cure when physicians have despaired" (3, p 25). Recipe for beef tea: "Beef tea, for the sick, is made by broiling a tender steak nicely, seasoning it with pepper and salt, cutting it up, and pouring water over it, not quite boiling. Put in a little water at a time, and let it stand to soak the goodness out" (3, p 32). "Dyspepsia bread" appears to have been whole grain. "Three quarts unbolted wheat meal; one quart soft water, warm, but not hot; one gill of fresh yeast; one gill of molasses, or not, as may suit the taste; one teaspoonful of saleratus [baking soda]" (3, p 78). Similar recipes also appear in *The Family Nurse* for dyspepsia bread (4, pp 31-32) and beef tea (4, pp 19-20).

Image: Public Domain

QUALIFIED CARE – EVIDENCE BASED PRACTICE

"If you find yourself really ill, send for a good physician. Have nothing to do

with quacks; and do not tamper with quick medicines. You do not know what they are; and what security have you that they know what they are" (3, p 87). In her preface to The Family Nurse, she acknowledges a Boston physician for reviewing her manual before publishing. "…every part of the work has been submitted to the examination of a member of the Massachusetts Medical Society…" (4, p 3). "My strongest anxiety has been to make the book safe; and whatever its demerits may be, I believe it contains no prescription that can endanger life or health, if a common degree of judgement be exercised (sic)" (4, p 3). She frequently cited well-known doctors in The Family Nurse: "In the diseases of children, I have almost uniformly followed Dr. Dewees, who is very celebrated in that branch of his profession…"(4, p 3).

TO LEARN MORE ABOUT LYDIA MARIA FRANCIS CHILD

Additional biographical details can be found in Weatherford's reprint at the National Museum of Women's History website (2). A bibliography of her written works can be found at the end of Teets-Parynski's biography (1). The same author indicates that collections of Child's papers can be found at Cornell University, Massachusetts Historical Society and at public libraries in Boston and New York. While Mrs. Child's cooking and household manuals have been the focus of this article, she published significant works on social reform issues of the 19th century including slavery abolition, rights of women, and Native Americans.

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Student Article:
The evolution of artificial sweeteners: A review of artificial sweeteners and their controversial impact on human health.

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Reducing added sugar intake is becoming increasingly important in the United States (US) with rising rates of overweight and obesity among adults and children. Many health concerns are associated with overweight and obesity, which necessitate the complete and thorough investigation of a useful alternative to sugar. Artificial sweeteners or non-nutritive sweeteners (NNS) have been suggested as they provide minimal calories and thus have the potential to facilitate the reduction of weight and improvement of disease status. However, controversy surrounds associations of NNS with cancer, weight status, cardiovascular disease, diabetes, and other conditions.

NON-NUTRITIVE SWEETENERS

The American Diabetes Association, the American Heart Association, and the Academy of Nutrition and Dietetics (and the Academy) suggest consumption of non-nutritive sweeteners as a possible method to reduce added sugar intake and, consequently, to decrease energy intake and weight while promoting cardiometabolic health.[1,2] NNS, also known as artificial sweeteners, low-calorie sweeteners, or high-intensity sweeteners, provide a sweet taste while contributing minimally to energy intake.[3] However, because there is a lack of research that adequately explores the roles of NNS in decreasing weight and cardiometabolic risk, replacement of added sugar with NNS remains controversial.[1] In fact, the Scientific Report of the 2015 Dietary Guidelines Advisory Committee acknowledges the role of NNS in short-term weight loss yet suggests using water as the primary replacement method for added sugar in beverages, due to inadequate evidence and uncertainty of the long-term health outcomes for NNS.[4]

REGULATION AND SAFETY STANDARDS OF NON-NUTRITIVE SWEETENERS

The regulations regarding the safety of NNS are enforced by the Food and Drug Administration (FDA) through the US Food Additives Amendment of 1958.[5] This mandate requires any new food additive to be approved prior to entering the market unless it is deemed generally recognized as safe (GRAS).[6] If a substance does not have a GRAS exemption, then premarket approval is required which involves a safety evaluation of the food additive.[6] This evaluation takes into account probable intake, health effects, toxicological data, and safety factors.[7] Toxicological data includes the extent and rate of absorption, distribution, metabolism, and excretion.[8,9] The FDA must also determine the highest no effect level, estimated daily intake (EDI), and acceptable daily intake (ADI).[7] Determination of these levels allows comparison to ensure that the ADI is significantly higher than the normal exposure (EDI) to the food additive.[7] Safety information on food additives is private and determined through tests conducted by the FDA at the request of the additive's sponsor.[10] Table 1 summarizes basic information about the seven currently approved NNS in the US food supply, which include acesulfame-potassium, aspartame, saccharin, stevia, sucralose, luo han guo, and neotame.[3]

COMPOSITION OF SPECIFIC NNS

The seven types of NNS currently available in the US consist of different components and are processed by the body and used in food products in varying ways. Acesulfame-potassium is composed of organic acid and potassium, and because it is excreted mostly unchanged in the urine, it does not provide a significant amount of energy.[11] Acesulfame-potassium is present in many foods, including frozen desserts, candies, beverages, and baked goods and is often combined with other NNS.[12]

Aspartame, a methyl ester of aspartic acid and phenylalanine dipeptide,[13] is one of the most thoroughly reviewed substances in the human diet, with over 100 studies approving it as safe.[12] Although referred to as a NNS, aspartame actually provides the same amount of calories as nutritive sweeteners (4 kcal/g);[13] however, due to the intensity of sweetness, only minimal amounts are needed.[13] Aspartame is often used in chewing gum, cereals, and dry bases for beverages, gelatins, and puddings.[12] In the gastrointestinal lumen, aspartame metabolizes into aspartic acid, methanol, and phenylalanine,[13] so individuals with phenylketonuria must use caution.[3,12] Once metabolized, these components are absorbed into the general circulation.[13]

Discovered in 1878, saccharin is the oldest NNS[14] and is approved for use in beverages, fruit juice drinks, processed foods, bases or mixes, and as a sugar replacement for both cooking and table use.[12] Similar to acesulfame-potassium, saccharin is not metabolized and is excreted unchanged, providing no calories.[14]

Stevia or steviol glycoside comes from the leaves of Stevia rebaudiana Bertoni plant. High-purity (≥95% purity) steviol glycosides, including Rebaudioside A, Stevioside, Rebaudioside D, and steviol

glycoside mixtures are considered GRAS for use as sweeteners under specified conditions. However, stevia leaf and crude stevia extracts, which are sold as dietary supplements, are not considered GRAS.[3,12] Stevia glycosides pass through the stomach and small intestine unchanged but are hydrolyzed by gut bacteria in the colon into steviol.[15] Then, steviol is metabolized by the liver to form steviol glucuronide which is mostly excreted in the urine.[15]

Sucralose which is sucrose with three chlorine molecules instead of three hydroxyl groups is used as a general purpose sweetener in many foods, including baked goods, beverages, chewing gum, gelatins, and frozen desserts.[3,12] Like acesulfame-potassium and saccharin, the majority of sucralose is unabsorbed and excreted unchanged in the feces;[16] any absorbed sucralose is excreted mostly unchanged in the urine.[16]

A lesser known type of NNS, luo han guo or monk fruit extract, is composed of many different cucurbitane glycosides called mogrosides, predominantly mogroside V (>30% of product). Depending on the concentration of mogrosides, sweetness levels can vary for this substance.[3,12] Neotame, another lesser known NNS, is a derivative of the dipeptide phenylalanine and aspartic acid.[14] Neotame is incompletely absorbed in the small intestine and then quickly metabolized to form a negligible amount of methanol along with esterified neotame, which is excreted in the urine and feces.[17]

PRODUCTION AND CONSUMPTION TRENDS OF NNS

Between 1999 and 2004, NNS consumption increased by over 6,000 new NNS-containing products in the US.[18] The most prevalent NNS in products were sucralose (2,500), followed by acesulfame-potassium (1,103), and aspartame (974).[18] Similar to added sugar, NNS are most commonly consumed in the form of carbonated beverages.[19] Mattes and Popkin utilized the USDA Nationwide Food Consumption Surveys and National Nutrition Health and Nutrition Examination Survey (NHANES) data to analyze consumption patterns between 1965 and 2004.[19] The survey data revealed an increase in NNS consumption between 1989 and 2004 in both food and beverage products.[19] In 2007-2008, 19% of US adults were consuming NNS by majority through no-calorie beverages (diet soda and flavored sugar-free water), followed by condiments and other low-calorie foods (light fruit juices, lemonades, and no-sugar-added canned fruit), and desserts such as sugar-free ice cream and pudding.[20] Despite this increase in NNS consumption, a decrease in added sugar products was not reported,[19,20] perhaps indicating that NNS is not being used as a complete added sugar replacement.[19] Thus, NNS may be used in combination with added sugar in reduced-calorie beverages which have been reported to be the driving force behind the recent increase in NNS consumption.[20]

HEALTH CONCERNS OF NON-NUTRITIVE SWEETENERS

Replacing added sugar with NNS in the diet to reduce appetite, body weight, and/or cardiometabolic risk factors is a controversial topic.[1] With 30% of US adults consuming NNS on any given day,[21] it is important to consider all the potential health effects of NNS consumption, such as cancer, weight loss, weight gain, cardiovascular disease, diabetes, and migraines.

Cancer

According to the National Cancer Institute, a clear evidence-based association has not been demonstrated between NNS consumption and cancer.[22] Although earlier studies on rats linked high doses of saccharin to cancer,[23,24] the cancer-producing mechanism was found to be species-specific to rats.[22,25] Aspartame has not been shown to cause cancer in animal studies even at very high doses;[26,27] however, speculations were made on an association between increased cancer cases and entrance of aspartame into the food supply.[28] These conclusions were later refuted due to lack of supporting evidence.[29] Furthermore, examination of 473,984 adults in the National Institutes of Health American Association of Retired Persons Diet and Health Study showed no association between high aspartame intake and risk of cancer.[30] Case-control studies are important to assess this relationship further,[25] and most do not show a significant increase in risk for bladder cancer with NNS consumption.[31-35] One study showed heavy NNS consumption (>1680 mg per day) among 31 bladder cancer patients was associated with an increased relative risk of 1.3 for bladder cancer; however, the exact causal agent was impossible to determine due to the combination of NNS found in current products.[36] Other types of NNS, including acesulfame-potassium, sucralose, and neotame have not been suspected to cause cancer,[25] and the National Cancer Institute emphasizes the results of extensive safety testing con-

ducted by the FDA, which have revealed no evidence linking cancer to NNS consumption[22].

Weight Loss and Weight Gain

Although consuming NNS products have been suggested as a weight loss method, this suggestion remains controversial in both randomized controlled trials and observational studies.[1] In consideration of the effect of NNS consumption on weight, it is important to also look at energy intake. Participants in a six month randomized controlled trial replaced two or more servings of sugar-sweetened beverages per day with NNS beverages and were more likely to lose up to 5% of their body weight[37] as well as significantly decrease total energy intake.[38] These findings support the results of an extensive review by De la Hunty et al. which looked at sixteen randomized controlled trials investigating the effects of aspartame on energy intake and weight loss.[39] Significant reductions in energy intake occurred with aspartame consumption when compared to a variety of controls (except non-sucrose controls like water).[39] Overall, aspartame consumers had a mean reduction of approximately 10% of energy intake which corresponds to 222 kcal per day or 0.2 kg per week.[39] Of the reviewed studies with significant weight loss results, differences were observed between aspartame and nutritive sweetener consumers in the short-term (two, nine, and ten weeks, respectively), with a weight change range of -0.47 to -1.0 kg for aspartame and +0.52 to +1.6 kg for sucrose.[40-42] Another study reviewed by De la Hunty et al. included a large cohort of obese women who were followed throughout a weight loss program and maintenance period. Both groups (aspartame and nutritive sweetener) lost 10±6.3 kg during the active weight loss program; however, after two years the aspartame group maintained a 5.1 kg weight loss while the nutritive sweetener group did not maintain any weight loss.[43] In other words, the weight regained for the aspartame group was significantly less than the nutritive sweetener group (+5.4 kg vs. + 9.4 kg, respectively).[43] These studies provide support for the recommendation that replacing nutritive sweeteners with NNS may be a useful strategy to reduce energy intake and promote weight loss.

Despite results that support the weight loss capabilities of NNS, increases in weight and/or waist circumference with NNS consumption were observed in long-term prospective studies. In the San Antonio Heart Study, a significant relationship existed between NNS beverage consumption, risk for overweight and obesity, and increased body mass index (BMI) (47% higher for NNS consumers).[44] A dose-response relationship was also observed in the San Antonio Longitudinal Study of Aging between NNS consumers and waist circumference with increases in abdominal obesity ranging from 0.80 inches for NNS non-consumers to 3.16 inches for NNS consumers.[45]

This current literature review demonstrates the challenges in reaching conclusions about NNS and weight. There are many short-term randomized controlled trials that observe associations between NNS intake and weight loss while there are many long-term observational studies that observe associations between NNS intake and weight gain.[1] These differences in weight-related outcomes and the limitations of studies investigating the effects of NNS consumption indicate a need for more interventional trials to determine causation, and for more observational studies to understand long-term changes.[1] Additionally, it is crucial to understand the proposed underlying mechanisms for weight gain, specifically pertaining to NNS-driven physiological and intestinal changes.

Cardiovascular Disease

Another potential health outcome of NNS consumption is cardiovascular disease (CVD). As previously mentioned, a dose-response relationship was observed among NNS consumers, with increases in abdominal obesity for daily NNS consumers.[45] This relationship reveals a potential pathway through which daily NNS intake leads to accrual of cardiometabolic risk factors,[45] as abdominal obesity is associated with high glucose concentration, dyslipidemia, high C-reactive protein, loss of physical function with metabolic syndrome, coronary heart disease, and cardiovascular events. Most of these factors are determinants for metabolic syndrome, a condition that multiplies risk for CVD.[46] Metabolic syndrome and NNS have been associated in other observational studies.[47-50] These findings are consistent with longitudinal studies associating the risk for vascular events with NNS consumption.[51,52] Participants consuming ≥1 serving of NNS beverage per day in the Nurses' Health Study had a relative risk of 1.16 for a stroke.[52] It is important to note that in most of these studies, individuals were free of baseline metabolic syndrome and other CVD risk factors, which accounts for some potential confounds. However as with most self-reported observational data, conclusive statements are limited

by the potential for reverse causality, residual confounding, and misreporting. Nonetheless, the clinical implications of these observational studies remain pertinent to those individuals who already have or are at high risk for cardiovascular disease, as consumption of NNS may be considered as a healthy alternative to reduce health risk factors.

Diabetes

NNS consumption has also been shown to have both positive and no-effect associations with diabetes risk. Observational studies reveal positive associations between NNS beverage consumption and incidence of type 2 diabetes (high fasting glucose [>126mg/dL]).[50,53,54] Most of these associations, although weak, remain strong after multivariate adjustments for confounders like demographic and lifestyle factors and baseline BMI and health status.[50,54] However, the associations in the Health Professionals Follow-Up Study did not remain significant after multivariate adjustments for confounders, indicating the association between NNS consumption and diabetes was mostly explained by pre-existing health, weight, and dieting statuses.[53] A study utilizing NHANES data found an association between NNS beverage consumption and poor blood glucose control among adults with diabetes.[55] However, these findings are not supported in the existing literature, and the association may be mediated by the increased likelihood of poor blood glucose control among diabetics consuming NNS beverages.[55] This study, as well as the Health Professionals Follow-Up Study, show how confounding variables, if overlooked during adjustment and analyses of data, can contribute to misunderstood associations between health outcomes and NNS consumption. Furthermore, multiple randomized controlled trials across 1-16 weeks reported no significant effect of NNS consumption on measures of glycemic response (plasma glucose, insulin, hemoglobin A1C), indicating a lack of association between NNS intake and diabetes.[56-59] These findings are in line with conclusions from athe Academy, which state glycemic response is unaffected by NNS in diabetic individuals.[60]

Other Concerns: Migraines and Pregnancy/Lactation

Reports of associations between intake of aspartame and incidence of migraines[61,62] have been a controversial concern as well. Studies suggest that aspartame triggers migraines through its degradation to formaldehyde and formic acid and accumulation of chemical substances.[61] In patients experiencing migraines, counseling to avoid aspartame and other formaldehyde-releasing products was associated with resolved symptoms.[61] An expert work group under the Academy has responded to these concerns, using the evidence analysis process to investigate the relationship among aspartame, methanol, and formaldehyde.[63] Aspartame forms two amino acids, phenylalanine and aspartic acid, as well as an alcohol, methanol. Commonly consumed food items like nonfat milk and tomato juice provide four to thirteen times more phenylalanine, aspartic acid, and/or methanol than an aspartame-containing beverage.[63] After degradation of methanol, formaldehyde is formed and immediately utilized by the body; if the body does not need it, formaldehyde is converted to formic acid which is excreted or degraded into carbon dioxide and water.[63] Consumers should be informed that formaldehyde is produced by the human body daily in amounts thousands of times higher than any aspartame-containing beverage, and this substance is actually needed as a metabolite in many bodily processes.[63]

The Academy also responded to concerns regarding the safety of aspartame consumption in pregnant or lactating women. Studies have overlooked the fact that aspartame does not enter the bloodstream as aspartame, meaning direct contact with the fetus and/or breast milk is not plausible.[63] This suggests investigational studies of aspartame administered intravenously or subcutaneously or in-vivo have no safety implications during pregnancy or lactation based on typical amounts consumed by this population.[63] Therefore, the evidence that aspartame triggers a physiological response leading to migraines or is a safety concern for pregnant or lactating women is weak.

CONCLUSION

NNS intake has been suggested to facilitate reductions in energy intake, weight, and cardiometabolic risk. However, potential health outcomes, including cancer, weight loss, weight gain, cardiovascular disease, diabetes, and migraines have been reported in both observational studies and randomized controlled trials. This uncertainty makes it increasingly important to address the limitations of preexisting NNS literature. The challenges in measuring NNS intake stem from diverse metabolic pathways between animals and humans, small sample sizes and short study durations of randomized controlled trials, multiple

Table 1. Non-nutritive Sweeteners[a]

Sweetener (Chemical Name)	Common Brand Names	Times sweeter than sucrose	Acceptable Daily Intake per kg of body weight	Estimated Daily Intake per kg of body weight	Number of 12 fl oz soda cans=ADI[b]	Number of sweetener packets=ADI[c]
Acesulfame-K (5,6-dimethyl-1,2,3-oxathiazine-4(3H)-1,2,2-dioxide)	Sweet One, Sunett	200	15 mg/kg	0.2 to 1.7 mg/kg	25	20
Aspartame (L-aspartyl)-L-phenylalanine methyl ester)	Equal, NutraSweet, Sugar Twin	160-220	50 mg/kg	0.2 to 4.1 mg/kg	14	68
Saccharin (1,1-dioxo-1,2-benzothiazol-3-one)	Sweet 'N Low, Sweet Twin, Sweet and Low, Necta Sweet	300	5 mg/kg	0.1 to 2 mg/kg	42	8.5
Stevia (Steviol glycosides, rebaudioside A, stevioside)	Truvia, PureVia, Sweet Leaf, Enliten	250	JECFA[d] 4 mg/kg	1.3 to 3.4 mg/kg	16	30
Sucralose (Trichlorogalactosucrose)	Splenda	600	5 mg/kg	0.1 to 2 mg/kg	15	30
Luo han guo extract (Siraitia grosvenorii Swingle fruit extract [SGFE])	Nectresse, Monk Fruit in the Raw, PureLo	150-300	ADI: NS[e]	6.8 mg/kg	NS[e]	None determined
Neotame (N-[N-(3,3-dimethylbutyl)-L-α-aspartyl]-L-phenylalanine 1-methyl ester)	Newtame	7,000-13,000	18 mg/kg	0.05 to 0.17 mg/kg	Not present in sodas	Not present in packet form

[a] Table modified from FDA's Additional Information about High-Intensity Sweeteners Permitted for use in Food in the U.S.[12] and additional information from Gardner et al.[1] and Fitch et al.[3]
[b] Number of 12 fluid ounce soda cans that equal ADI (Acceptable Daily Intake) for a 150 lb (68 kg) person
[c] Number of sweetener packets that equal ADI for a 150 lb (68 kg) person
[d] JEFCA – Joint Expert Committee on Food Additives (determined ADI for Stevia)
[e] NS = not specified because a numerical ADI may not be necessary for reasons such as evidence of ingredient's safety at levels well above the amount needed to achieve the desired effect in food

confounders in observational studies, and subjective dietary methodology. To fully understand the relationship between NNS and various disease states, future research studies need to consider these limitations to understand the impact NNS has on human health.

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Congratulations to the RDPG 2016 Award Winners

Jennifer Hanson, Awards Chair

On behalf of the Research DPG and Awards Committee, we would like to thank everyone who submitted an awards application this year. We had an outstanding pool of applications, and the reviewers were impressed by the overall quality of the work submitted. We are pleased to announce the following winners.

THE $5,000 PILOT GRANT AWARD SPONSORED BY THE SUGAR ASSOCIATION

Justine Karduck, University of Illinois

Mobile Apps for Diabetes Care: Registered Dietitian Nutritionist (RDN) Perceptions in Clinical Care.

STUDENT $500 ABSTRACT AWARD

Tanya Halliday, Virginia Tech (PhD; 5/2016); University of Colorado (Postdoc)

A Comparison of Hunger, Fullness, and Palatability between Low (5%) and High (25%) Added Sugar Diets in Adolescents

STUDENT $500 ABSTRACT AWARD

Renee Pieroth, Rutgers University

The Relationship between Social Support and Diet Quality in Middle-aged and Older Adults in the U.S.

FIRST AUTHOR AWARD

Suzanne D. Baxter, Institute for Families in Society, College of Social Work, University of South Carolina

Suzanne D Baxter, Albert F Smith, David B Hitchcock, Caroline H Guinn, Julie A Royer, Kathleen L Collins, Alyssa L Smith, Megan P Puryear, Kate K Vaadi, Christopher J Finney, and Patricia H Miller. Effectiveness of Prompts on Fourth-Grade Children's Dietary Recall Accuracy Depends on Retention Interval and Varies by Gender.
J Nutr 2015;145:2185–92.

EMERGING INVESTIGATOR FIRST AUTHOR AWARD

Maria Chondronikola, Washington University School of Medicine

Maria Chondronikola, Elena Volpi, Elisabet Børsheim, Craig Porter, Manish K. Saraf, Palam Annamalai, Christina Yfanti, Tony Chao, Daniel Wong, Kosaku Shinoda, Sebastien M. Labbe, Nicholas M. Hurren, Fernardo Cesani, Shingo Kajimura, and Labros S. Sidossis. Brown Adipose Tissue Activation Is Linked to Distinct Systemic Effects on Lipid Metabolism in Humans.
Cell Metabolism. 23, 1-7, 2016.

Second Century Member Survey Update

Courtney Luecking, MPH, MS, RDN
Second Century Visioning Process Liaison

The Academy's upcoming centennial has not only provided an opportune time to reflect on how nutrition and dietetics has changed, but also to envision how we will continue to elevate our profession, expand our reach, and do more to improve health around the world in the next 100 years.

In an online member survey conducted in late August 2016, 1,716 individuals provided feedback on 13 opportunity areas and scope the Academy had identified as potential areas of focus for the future. Participants ranked perceived importance of opportunity areas on a scale of 1 – 5 (1 being least important and 5 being most important). All items were recognized to be important with an average score of at least 3.69. The top ranked areas of importance include:

- **Prevention and Health Care:** Accelerate the shift in the health care system to emphasize preventive care, especially through an increased focus on diet and physical activity.
- **Environment, Behavior, and Choice:** Support healthy choices by scaling programs that create a culture of health at work sites, schools, and throughout the community.
- **Food and Nutrition Security:** Prioritize actions to prevent and divert wasted food at all stages of the food value chain to provide nutrient-dense food for people who need it while benefitting the environment, society and the economy.
- **Food and Nutrition Security:** Engage all points of contact in the health care system to ensure vulnerable populations have access to nutrient-dense foods.

Participants also identified other priority areas such as: need for increased insurance coverage and reimbursement, collaboration with other professions and agencies, increasing the view of RDNs as the nutrition expert, improving the current educational model for RDNs, capitalizing on technology to advance health and wellness, and implementing regular nutrition education in school curriculums.

Thank you to all who responded to this survey! Your opinion will help shape the direction our organization and profession moves. I invite everyone to share opinions and ideas each time there is an opportunity to provide input. Updates and requests for input will be communicated as they are available.

The Academy needs to hear from RDPG members like you! To learn more about the Second Century Visioning Process, visit eatrightfoundation.org/secondcentury.

Member Comment Needed:
DRAFT Future Education Model (FEM) Accreditation Standards for Associate, Bachelor's and Master's Degree Programs

The Accreditation Council for Education in Nutrition and Dietetics (ACEND®) has released the DRAFT Future Education Model (FEM) Accreditation Standards for Associate, Bachelor and Master Degree Programs for public comment. The draft standards, which include the expected competencies and performance indicators for each degree level (Associate, Baccalaureate and Master) and a webinar describing their development, are available on the ACEND website (www.eatright.org/acend; click on 'Standards Committee' under the Proposed Future Education Model heading).

ACEND is requesting stakeholder input and encouraging everyone to provide comments on the draft standards until November 28, 2016 at https://www.surveymonkey.com/r/FEMComments.

The September Standards Update provides additional information about the Future Education Model Accreditation Standards development process and addresses questions received during the past month. The September issue and all previous issues of the Standards Update are posted on the ACEND website (www.eatright.org/acend).

ACEND also hosts monthly virtual town hall meetings that are open to all stakeholders. Beginning October 4, the town hall meeting day and time will change to the first Tuesday of each month at 2:00 p.m. (Central Time). Information for connecting to the virtual town hall is posted on the ACEND standards committee webpage.

It is important for members of the Research Dietetic Practice Group to review and provide comment on the Future Education Models. Regardless of whether or not you are currently involved with a dietetic education program, these models will impact the profession in the future. Member input is critical to ensure that the models are designed to meet the future educational needs of the dietetics profession. If you have questions, please send them to acend@eatright.org, call 312-899-4872 or participate in one of the Town Hall meetings so ACEND can respond to them. Future editions of the monthly update will include these questions and an ACEND response.

Editor's Corner

Cheryl Reifer, PhD, RD, LD

ANNOUNCEMENTS AND UPDATES

We are seeking main author contributors and are still offering a $200 stipend for the submission of peer-reviewed articles once accepted. As always, we welcome student articles too.

Are you interested in being in our Member Spotlight or do you want to recommend a colleague? Please let us know by contacting Erin Gaffney-Stomberg at egaffney@snet.net.

In addition, we would like to hear your ideas and gauge interest for a mentor/mentee column in the newsletter. Please reach out to me to share your interest and ideas at creifer@genesispure.com.

Do you have a career goal in research, but you're not sure where to start? We would like to help you connect with experienced dietitians in the field to share how to get started in research, where to look for research opportunities, and how to develop skills in the field. We will be putting forth information on this topic in a future issue.

We are especially proud of our 50 year members, particularly the members who belong to the RDPG practice group:

- **Betsy (Elizabeth) Nobmann, PhD, MPH, RDN**
- **Linda Brinkley**

Other 50 year members include:

- **Bettie C. Stanislao, PhD, RDN, LN**
- **Madelyn L. Wheeler, MS, FADA, FAND**
- **Barbara L. Blauvelt, PhD, MS, BS**
- **Janet B. McDonald**
- **Phyllis J. Stumbo, PhD**
- **Barbara L. Rice MA, LD**
- **Sachiko St. Jeor, PhD, RDN, FAND**
- **Jean D. Ramsay, MS, RD, LDN**

The Food and Nutrition Conference and Exhibition™ (FNCE®) is just around the corner, and the RDPG is pleased to be hosting and participating in a variety of events. We hope to see you there!

eat right. Academy of Nutrition and Dietetics

FNCE® 2016

Food & Nutrition Conference & Expo™

Boston Convention and Exhibition Center | Boston, MA | October 15–18

We had a great turn out for Research DPG-sponsored events at FNCE® 2015 in Nashville, and we hope to see you October 15-18 in Boston!

Registration is open at this link.

Click here for updates on RDPG events at FNCE®.

RDPG members at FNCE® 2015

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