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Assessment of the Intake and Knowledge of Folate/Folic Acid Among UNH Students

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Assessment of the Intake and Knowledge of
Folate/Folic Acid Among UNH Students

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Abstract

There are 3,000 U.S. pregnancies affected by spina bifida and anencephaly annually. If women consume adequate amounts of folic acid (400 mcg/day) one month before pregnancy and through the first trimester, then the risk of their infant developing a neural tube defect (NTD) is reduced by 50-70%. However, approximately 50% of pregnancies are unplanned, with some of the highest rates among 18-24 year olds. The purpose of this study was to evaluate the knowledge source, knowledge level, and intake of folic acid among college-aged students. Qualtrics surveys from 96 subjects (87.5% female, aged 18-24) were used for analysis. In the female sample, 16% were taking a multivitamin containing folic acid and 7% a folic acid supplement. Three questions assessed the sample's level of folic acid knowledge. Seventy-six percent knew adequate amounts are needed to prevent NTDs, 71% knew it is most important to start consuming it before pregnancy, and 54% answered at least half of the correct food sources. There were 19 females who took an introductory nutrition course, and 63.2% correctly answered NTDs, before pregnancy, and at least half the food sources. Subjects who got folic acid knowledge from a college course were significantly more likely to answer the three questions correctly compared to those who never received information on the vitamin. Findings suggested that among college students, the best source of information about folic acid is college courses. Future research may study the correlation between folic acid knowledge and knowledge source among a larger, more diverse college population.

Introduction

Folate is a water-soluble B-vitamin that is responsible for several important functions in the body.¹ This vitamin assists in making new cells by creating DNA and other genetic material as well as helping cells divide. Folate is crucial during preconception health, and currently there is no known toxicity level in the general healthy population. There are several natural sources of this vitamin, including dark leafy greens, orange juice, nuts, peas, beans, and beef liver. However, since folate is water-soluble and cannot be stored in the body, consumption of its synthetic form, folic acid, is often necessary.² Folic acid can be found in multivitamins, prenatal vitamins, B-complex dietary supplements, individual folic acid supplements, and fortified foods.³ This synthetic form has shown to be better absorbed than the natural form of folate.³ However, people can obtain enough naturally-occurring folate by consuming a well-rounded diet. Throughout this paper, note that folic acid will be used to describe both folate and folic acid unless folate is being exclusively talked about.

Adequate folic acid intake helps prevent neural tube defects (NTDs), which are a group of birth defects that happen during the first month of pregnancy.⁴ These defects are in the spine, spinal cord, or brain, and the two most common types in the United States (U.S.) are spina bifida and anencephaly. Approximately 3,000 pregnancies are affected by these two conditions annually in this country.⁵ Spina bifida occurs when the fetus's spinal cord does not completely close during development.⁶ This causes the backbone to not form as it should, which can lead to spinal cord and nerve damage. The severity of this condition along with level of

paralysis varies based on the size and location of the spine opening and whether or not the spinal cord and nerves are affected. The three most common types of spina bifida in order from least to most severe are spina bifida occulta, meningocele, and myelomeningocele. Spina bifida is a very costly condition to have. In fact, one study conducted by Radcliff et al found that the median hospital cost per infant with spina bifida was \$21,937 during their first year of life.⁷ Anencephaly, a more severe NTD, results from the upper part of the neural tube not fully closing, preventing the majority of the brain and skull from forming.⁸ Parts of the brain may not even be covered by bone and skin.⁸ Approximately 75% of newborns with anencephaly are stillborn, and the remaining percentage of infants die shortly after birth.

In 1998, the Food and Drug Administration (FDA) mandated that folic acid be added to enriched grain products, including breads, cereals, pastas, and cornmeal, to help prevent NTDs.³ The fortification requirements are that 140 mcg of folic acid are added to every 100 g of enriched cereal grain, resulting in approximately 100-200 mcg of additional folic acid per day in the diets of women of childbearing age.² This has decreased the number of babies born with NTDs by about 1,300 per year, and the birth prevalence has decreased by approximately 35% in this population as well.³

The Center for Disease Control and Prevention (CDC) recommends that all women of childbearing age consume 400 mcg folic acid daily, especially one month before pregnancy.⁴ This recommendation increases to 600 mcg daily once a woman becomes pregnant.¹ Other situations in which higher amounts of folic acid may be recommended are if a mother has had a baby with a NTD in the past, has diabetes, is

classified as being obese, is taking anti-seizure medications, or has a hemoglobin disease such as sickle cell disease.⁹ These Recommended Daily Allowances are based on the prevention of folic acid deficiency. However, it is estimated that 50% pregnancies are unplanned, making it hard to decipher when adequate consumption of this nutrient is essential.¹⁰ An unintended pregnancy is defined as a pregnancy that is unwanted or mistimed, which is primarily the result of the absence of contraception use or using it ineffectively. A study conducted by Finer et al showed that the rates of unintended pregnancies were 76% in 18-19 year olds and 59% in 20-24 year olds.¹¹ Therefore, health care providers are told to always urge women of childbearing age to consume sufficient folic acid.

Certain populations are known to be at an increased risk for folic acid deficiency. Hispanic women have demonstrated a 30-40% higher risk of having babies with NTDs than the general population.¹² The exact reasons as to why are unknown, but research has shown that Hispanic women are less likely to incorporate fortified foods into their diet and are less likely to have heard about the benefits of adequate consumption.¹³ Girls and women between the ages of 14 and 30 years have also shown difficulties with consuming enough folic acid. College-aged women are included in this population, and reasons for their folic acid deficiency may be related to chronic heavy alcohol consumption diminishing its absorption as well as poor dietary intake.¹⁴ College students have demonstrated inadequate consumption of fruits and vegetables and frequent unhealthy snacking habits, which includes items such as chips, cookies, and ice cream.¹⁵ Eating

disorders often begin between the ages of 18 and 21 years as well due to the pressure and stress at school and present-day ideal body trends.¹⁶

Current research on the use of folic acid among the college-aged population is minimal. However, if college students were provided with more education and information regarding the use of folic acid, then NTDs could be better prevented. Therefore, we hypothesized that of students who received their folic acid knowledge information from a health care provider or college course would have a higher level of folate knowledge than those who received their information from other sources. It was also hypothesized that the Internet and health care providers would be the primary sources of folic acid knowledge.

Figure 1-Study Aims

Specific Aims
<ul style="list-style-type: none">• Determine the level of folic acid knowledge among students at the UNH Durham campus.• Determine the number of female UNH students who take a folic acid supplement or multivitamin containing folic acid.• Learn where students are getting their information about folic acid.• Evaluate whether or not the source of folic acid information results in a higher level of folic acid knowledge compared to subjects who never received information on the health benefits of folic acid.

Methods

Questionnaire

The Institutional Review Board (IRB) at the University of New Hampshire (UNH) reviewed the research application and deemed the study as exempt (IRB

#6648). The researchers developed an online questionnaire on Qualtrics software and used it to obtain information on students' knowledge and consumption of folic acid (**Appendix A**). A jury of experts including three professors with doctoral degrees in nutrition reviewed the survey before distribution. The survey contained items in multiple choice, checklist, and ranking formats. Informed consent was obtained prior to each subject completing the questionnaire (**Appendix B**). Students were notified of their right to decline to answer any question or the entire questionnaire without penalty. Survey distribution started on March 27, 2017 and closed in August 2017.

Male participants were only asked to respond to six questions total (age, gender, folic acid knowledge questions, and folic acid knowledge sources), while female subjects were requested to answer all questions. Subject characteristic questions related to living arrangements during the school year, frequency of dining hall visits, and enrollment in an introductory nutrition course during college. Women were also asked about whether or not they took an oral contraceptive, multivitamin with folic acid, or folic acid supplement. One question used a Likert Scale to have women rate their overall health, with one indicating "in poor health" and ten "in excellent health".

There were three folic acid knowledge questions created to evaluate each subject's knowledge of the vitamin. The questions were about why females should take folic acid, when it is most important for them to consume proper amounts, and what foods are good dietary sources of it. Finally, the subjects were asked about where they got their folic acid knowledge. They were allowed to answer more than

one source, and that answer served as the independent variable throughout statistical analysis.

Recruitment

Prospective survey participants were contacted via several routes. The Qualtrics survey link was posted in the Facebook groups for the UNH Classes of 2013, 2014, 2015, and 2016 (**Appendix C**). Students were able to follow a link directly to the survey. Over 200 of UNH's student organization leaders were emailed individually as well (**Appendix D**). They were asked if they would be willing to distribute the survey link to their organization members. If they agreed, the Qualtrics survey link was sent to them, and they either emailed their group members the link or posted it on their group's Facebook page. Finally, the Associate Deans of each college at UNH were emailed and asked if they could distribute the survey link via email to students (**Appendix C**). However, no Dean agreed to this distribution method, for they only wanted to send crucial information to student emails.

Subjects

One hundred and fifteen undergraduate students attending the UNH Durham campus participated in this study. However, 19 participants had to be excluded from statistical analysis for various reasons. Eleven participants were omitted for failure to accept or decline on the consent form at the beginning of the survey. Six people were excluded due to only answering the first two demographic questions, one because they did not answer any questions, and another who was 27 years old. Final data analysis included 96 subjects (84 female, 12 male).

Statistical Analysis

All analyses were conducted using SPSS v.24.0 (SPSS Inc., Chicago, IL). A two-sided p-value of <0.05 was considered the level of statistical significance. A new categorical variable with two levels using two questions was created to measure folic acid knowledge. Subjects were categorized based on whether they obtained folic acid knowledge from the Internet, health care provider, media, college course, relative/friend, or never received folic acid information. We then examined whether the level of folic acid knowledge differed by nutrition information source, where the comparison group included those who never received folic acid information. The two folic acid knowledge questions used were, "Health experts recommend women obtain adequate folate/folic acid daily for what reason?" and "When is it most important for women to start consuming folate/folic acid?" A subject was categorized as to whether they got a question correct (yes/no). A cross tabulation was conducted using chi-square tests and Fisher's exact tests to compare the two-sided variables to each knowledge question. The Pearson chi-square asymptomatic significance (2-sided) was looked at if no cell size was less than five, and the Fisher's exact test exact significance (2-sided) was used if one or more cells had an expected count less than five.

Participants were then given a percent correct sum score based on their answers to the question, "Which of the following foods are good dietary sources of folate/folic acid? Select all that apply". The score was based off of eight correct answers and then multiplied by 100. The lowest score a subject could get was 0, and the highest score was 100. A subject got a point if they answered a correct food

source of folic acid as well as if they did not check off a wrong source of the vitamin. A score of zero was given to subjects who checked off that they were unsure of any sources. Histograms for the continuous variable of scores were then created to determine the normality of the scores. All histograms yielded a non-normal distribution, so Mann-Whitney U tests were performed to determine whether the folic acid aggregate score differed between folic acid knowledge source (Internet, health care provider, media, college course, relative/friend) and those that never received folic acid knowledge.

Results

Demographics of female study participants are shown in **Table 1**. The sample was primarily White (96.43%) and lived in campus residence halls (45.24%), off-campus housing (32.14%), or other university housing (21.43%). No subjects were pregnant or currently had children. Subjects were mostly juniors (45.2%) or seniors (25.0%), but there was a decent representation of freshman and sophomores as well. Approximately 16% of the female sample took a multivitamin with folic acid in it, and 7% took an individual folic acid supplement.

Seventy-six percent of the sample correctly answered that folic acid is taken to prevent NTDs, 71% answered that is most important to consume before pregnancy, and 54% answered at least half of correct food sources. There were 19 females who took an introductory nutrition course, and 63.2% of that sample correctly answered that folic acid is taken to help prevent NTDs, should be consumed before pregnancy, and knew at least 50% correct food sources.

The two most common sources of folic acid knowledge were the Internet (n=44) and a college course (n=35). There were also 26 students who answered that they had never received any information about folate. **Table 2** indicates that students who received their folic acid information from a college course were more likely to answer that healthcare experts recommend women obtain adequate folic acid daily to prevent NTDs than those who never received information about this vitamin in class (88.6% compared to 61.5%; $P=0.029$). This was also the case for students who received information from a relative or friend (100% compared to 61.5%; $P=0.016$) and media (100% compared to 61.5%; $P=0.036$). Similar analysis, as shown in **Table 3**, suggested that students who received knowledge from the Internet versus never receiving information (75% compared to 42.3%; $P=0.006$) and from a college course versus never (91.4% compared to 42.3%; $P<0.001$) were more likely to answer that it is most important for women to start consuming folic acid before pregnancy.

Median sum score percentages for folic acid food sources along with interquartile ranges (IQRs) are presented in **Table 4**. Groups who received their folic acid knowledge through the Internet, a college course, or the media had a significantly higher median score than those who never received information on the vitamin. The Internet group versus no knowledge group median scores were 50.0 and 31.3 ($P=0.019$), the college course group versus no knowledge median scores were 62.5 versus 31.3 ($P=0.001$), and the media group versus no knowledge median scores were 62.5 versus 31.3 ($P=0.020$).

Table 1. Subject Characteristics

Variable	Mean \pm SD or N(%)
Age*	
	20.3 \pm 1.1
Gender*	
Female	84 (87.5%)
Male	12 (12.5%)
Race or ethnicity	
White	81 (96.4%)
Asian or Pacific Islander	1 (1.2%)
Biracial or Multiracial	2 (2.4%)
Year in college	
Freshman	14 (16.7%)
Sophomore	11 (13.1%)
Junior	38 (45.2%)
Senior	21 (25.0%)
Residence during school year	
Campus residence hall	38 (45.2%)
Off-campus housing	27 (32.1%)
Other university housing	18 (21.4%)
Other	1 (1.2%)
Frequency of eating in dining hall	
Every day	35 (41.7%)
4-6 times per week	17 (20.2%)
1-3 times per week	11 (13.1%)
Less than once a week	14 (16.7%)
Never	7 (8.3%)
Completion of college nutrition course	
Yes	19 (22.6%)
No	65 (77.4%)
Overall health score	
	7.4 \pm 1.1
Oral Contraceptive Use	
Yes	50 (59.5%)
No	34 (40.5%)
Multivitamin Use	
Yes, with folic acid	13 (15.5%)
Yes, unsure if contains folic acid	10 (11.9%)
No	61 (72.6%)
Multivitamin frequency of users	
Once daily	20 (23.8%)
Once weekly	1 (1.2%)
Sometimes	2 (2.4%)
Folic acid supplement	
Yes	6 (7.1%)
No	78 (92.9%)

*Indicates both male and female participants answered question.

Table 2. Knowledge Source and % Correct on Folic Acid Use Question

Knowledge source	Source % correct NTDs	No knowledge % correct NTDs	P-value
Internet	75.0% (33)	61.5% (16)	0.235
HCP	85.7% (12)	61.5% (16)	0.157
Media	100.0% (9)	61.5% (16)	0.036*
College Course	88.6% (31)	61.5% (16)	0.029*
Relative/Friend	100% (12)	61.5% (16)	0.016*

* Indicates P<0.05.

Table 3. Knowledge Source and % Correct on When to Take Folic Acid

Knowledge source	Source % correct before pregnancy	No knowledge % correct before pregnancy	P-value
Internet	75.0% (33)	42.3% (11)	0.006*
HCP	64.3% (9)	42.3% (11)	0.185
Media	66.7% (6)	42.3% (11)	0.264
College Course	91.4% (32)	42.3% (11)	<0.001*
Relative/Friend	75.0% (9)	42.3% (11)	0.086

Indicates P<0.05.

Table 4. Median Scores for Folic Acid Sources & Knowledge Source

Exposure Type	Exposed (Median , IQR)	Never Exposed (Median , IQR)	P-Value
Internet	50 (37.5-71.9)	31.3 (0-62.5)	.019*
HCP	50 (25-65.6)	31.3 (0-62.5)	.174
Media	62.5 (43.8-81.3)	31.3 (0-62.5)	.020*
College Course	62.5 (37.5-75)	31.3 (0-62.5)	0.001*
Relative/Friend	25 (0-62.5)	31.3 (0-62.5)	.947

* Indicates P<0.05.

Discussion

A pilot project of the New Hampshire Department of Health and Human Services Folic Acid Education Program was conducted at UNH during the spring semester of 2008.¹⁷ This study involved students completing a pre-survey, receiving a free 90-day supply of multivitamins, and then answering a post-project survey.

There were 177 subjects who completed the pre-survey, and 63% of that sample was between the ages of 18-21 years. The multivitamin consumption among this sample was higher than in our subject pool (41% versus 27%). However, both studies reported that 24% of their sample consumed the multivitamin daily, and approximately 15% knew that it contained folic acid. Survey questions for our study regarding folic acid knowledge were adapted from this study's pre-survey questions. There was a slightly higher level of folic acid knowledge in the pilot study's sample, with 79% of subjects answering that adequate folic acid is recommended to prevent NTDs (versus 76% in our sample), and 76% answering that it is most important for women to start consuming folic acid before pregnancy (versus 71%). The difference in knowledge may be due to the fact that 40% of the pilot project's sample had taken an introductory nutrition course while only 23% of our sample had done so.

Lane et al conducted a descriptive study with secondary analysis involving 1,921 college-aged students in North Carolina.¹⁸ Participants were asked to complete a pre-test survey, which included answering 13 folic acid knowledge and intake questions. Forty-eight percent of subjects indicated that they consumed folic acid, whether it was through food or supplements. Only 23% of our sample answered that they consumed folic acid, however, we only asked about its ingestion via supplement form. Subjects were then given a score between 0-13 based on the number of folic acid knowledge and intake questions they got correct. Researchers found that folic acid knowledge was a significant indicator of folic acid intake (95% CI 1.112, 1.230; $p < 0.001$) along with vitamin usage (15.262, 52.362; $p < 0.001$). This

sample had a mean age of 25.7 years and had male subjects answer all survey questions, which may have accounted for differing results from our study. However, it is important to take away that educating students on folic acid may increase their intake of the vitamin.

Murphy et al conducted a four-week pilot study at a college in Ohio.¹⁹ Pharmacy students and faculty designed a 30-minute oral presentation on preconception health, with approximately half of it focusing on NTDs and proper diet. All female subjects (n=25) answered a pre-test before the presentation, a post-test directly following the session, and then a post-four-week test. They also received a reminder message about folic acid once per week for the three weeks in between the presentation and post-test. Researchers found a significant increase in correct answers on folic acid and NTD knowledge questions between the pre-tests and four-week post-tests. The p-value was less than 0.05 for all six questions. A significant increase was also seen in regular multivitamin intake, defined as consuming one four or more times per week (37.5% versus 68.0%; p=0.023). The team concluded that an oral presentation along with reminder text messages could be an effective method for increasing knowledge about folic acid and NTDs in the college population. This supports our study's results, which showed maintenance of knowledge on these topics by receiving the information through a college course.

Strengths

This research study added to the scientific literature on college-aged students knowledge and intake of folic acid, which is an area where information is

lacking. The survey was easily accessible to students, and they could take it on their phones or laptops since it was accessed via the Internet. A jury of experts, including three registered dietitians with extensive experience in research, reviewed and added suggestions to the survey before its distribution. We complied with the IRB's research protocol standards throughout the whole study. Also, the survey helped expand knowledge about folic acid among a small population of college students.

Limitations

Although this study provides valuable information regarding the knowledge and intake of folic acid among UNH undergraduates, several limitations must be addressed. The results cannot be generalized to the entire population, for the subject pool was small, primarily white, and highly educated. Participants could move forward without consenting or declining on the informed consent form. Eleven participants did this and had to be omitted from data analysis even though they completed the entire survey. This study did not take confounding variables into account, including alcohol, tobacco, and other drug use. Male subjects were not asked about whether or not they took an introductory nutrition course, hence the researcher could not evaluate whether or not this impacted their answers to the folic acid knowledge questions. Also, subjects were not asked if they took a class that contained information on pregnancy and/or child development, which could have contained information about folic acid in the curriculum. Since the survey was available on the Internet, students could have worked together when answering questions, limiting the accuracy of results. Finally, although we asked female

participants about their pregnancy intention, the question did not specify as to how soon. Therefore, the relationship between folic acid intake and pregnancy intention in this sample could not be evaluated.

Conclusion

Increasing the knowledge and consumption of folic acid and neural tube defects among college-aged students should be a primary health priority in America. Educating students on these two topics through college courses might be the most effective way to share the information with this vulnerable population. Education through the Internet has the potential to be a successful route of information as well. Future research should aim to conduct a similar study in a more diverse college-aged population, and colleges should consider providing free folic acid supplements to college students to increase their health status during the important preconception period.

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Appendix A: Qualtrics Survey

Please answer the following questions as they describe you.

- How old are you? _____

Skip to end of survey if answer <18

- What sex were you assigned at birth, such as on an original birth certificate?
 - Female
 - Male
 - I prefer not to answer

Skip to folic acid knowledge questions if answer=male. Skip to end of survey if answer= I prefer not to answer.

- What is your year in school?
 - 1st year undergraduate
 - 2nd year undergraduate
 - 3rd year undergraduate
 - 4th year undergraduate
 - 5th year or more undergraduate
 - Graduate student
 - Currently not a student
- How do you usually describe yourself?
 - Black or African American
 - Hispanic or Latino/a
 - White
 - Asian or Pacific Islander
 - American Indian or Alaskan
 - Biracial or Multi racial
 - Other _____
- Where do you currently live?
 - Campus residence hall
 - Fraternity or sorority house
 - Other university housing
 - Off-campus housing
 - Parent/guardian's house
 - Other _____
- How often do you eat meals in the dining hall?
 - Every day
 - 4-6 times per week
 - 1-3 times per week
 - Less than once a week
 - Never
- Have you completed the course NUTR 400: Nutrition in Health and Well Being or another introductory nutrition course?
 - Yes
 - No

- How would you rate your overall health?
1=poor and 10= excellent
1 2 3 4 5 6 7 8 9 10

Folate/folic acid is a type of water-soluble B vitamin found naturally occurring in foods as well as in supplements (not naturally occurring in supplements). Numerous health benefits have been found through people consuming adequate amounts of this vitamin daily. The purpose of this study is to evaluate the knowledge and use of folate/folic acid among UNH students.

- Are you currently taking an oral contraceptive?
 - Yes
 - No
- Are you currently pregnant?
 - Yes
 - No
- Do you currently have children?
 - Yes
 - No
- Do you plan on becoming pregnant in the future?
 - Yes
 - No
 - Unsure
- Do you currently take a multivitamin?
 - Yes
 - If yes, How often?
 1. Once daily
 2. Once weekly
 3. Once monthly
 4. Sometimes
 - Does your multivitamin have folate/folic acid in it?
 5. Yes
 6. No
 7. Unsure
 - No
- Do you currently take a folate/folic acid supplement?
 - Yes
 - No
- Health experts recommend women obtain adequate folate/folic acid daily for what reason?
 - To make strong bones
 - To prevent high blood pressure
 - To prevent birth defects
 - To prevent cardiovascular disease
 - Some other reason: _____

- When is it most important for women to start consuming folate/folic acid?
 - Before pregnancy
 - During pregnancy
 - After pregnancy
 - Unsure
- Which of the following foods are good dietary sources of folate/folic acid? Select all that apply.
 - Orange Juice
 - Beans
 - Spinach
 - Fortified cereals
 - Milk
 - Broccoli
 - Asparagus
 - Red meat
 - Unsure
- Where do you receive your information about folate/folic acid? Select all that apply.
 - Internet
 - Health care provider
 - College course
 - Magazine/ newspaper
 - Book
 - Relative/ friend
 - Radio/television
 - Other
 - I have never received any information about folate or folic acid

Appendix B: Informed Consent Form

RESEARCHER AND TITLE OF STUDY

My name is Jessica Pelletier, and I am an undergraduate dietetics student at the University of New Hampshire. I am conducting my honors senior thesis titled, "Assessment of the Knowledge and Use of Folate/Folic Acid Among University of New Hampshire Students".

WHAT IS THE PURPOSE OF THIS FORM?

This consent form describes the research study and helps you to decide if you want to participate. It provides important information about what you will be asked to do in the study, about the risks and benefits of participating in the study, and about your rights as a research participant. You should:

Read the information in this document carefully. Ask the research personnel any questions, particularly if you do not understand something. Do not agree to participate until all your questions have been answered, or until you are sure that you want to. Understand that your participation in this study involves you taking a survey that will last approximately ten minutes.

WHAT IS THE PURPOSE OF THIS STUDY?

Folate/folic acid is a type of water-soluble B vitamin found in foods as well as in supplements. Numerous health benefits have been found through people consuming adequate amounts of this vitamin daily. The purpose of this study is to evaluate the knowledge and use of folate/folic acid among UNH students. Approximately 200 participants will be involved in this study. Participants must be at least 18 years old to partake in this study.

WHAT DOES YOUR PARTICIPATION IN THIS STUDY INVOLVE?

Participation in this research involves completing an online survey using the Qualtrics software that should take no longer than ten minutes.

WHAT ARE THE POSSIBLE RISKS OF PARTICIPATING IN THIS STUDY?

Participation in this study is expected to present no risk to you.

WHAT ARE THE POSSIBLE BENEFITS OF PARTICIPATING IN THIS STUDY?

While there are no direct benefits for participation in this study, researchers will be able to gain insight on the knowledge and intake of folate/folic acid among UNH students. These findings will help determine if more education is needed on the benefits of consuming adequate amounts of folate/folic acid.

WILL YOU RECEIVE ANY COMPENSATION FOR PARTICIPATING IN THIS STUDY?

No compensation will be provided for participating in this study.

DO YOU HAVE TO TAKE PART IN THIS STUDY?

Taking part in this study is completely voluntary. You may choose not to take part at all. If you agree to participate, you may refuse to answer any question. If you decide not to participate, you will not be penalized or lose any benefits for which you would otherwise qualify.

CAN YOU WITHDRAW FROM THIS STUDY?

If you agree to participate in this study and you then change your mind, you may stop taking the survey at any time. Any data collected as part of your participation will remain part of the study records. If you decide to stop participating at any time, you will not be penalized.

HOW WILL THE CONFIDENTIALITY OF YOUR RECORDS BE PROTECTED?

I plan to maintain the confidentiality of all data and records associated with your participation in this research. All your information and data will be collected anonymously with no names, email addresses, or phone numbers used. The only individuals who will have access to the data collected are Jessica Pelletier, the undergraduate researcher, and Dr. Ruth Reilly, the faculty advisor of this research project. Data will be reported as group findings with no way to link back to any information pertaining to an individual participant. The results of this study will be used for Jessica Pelletier's senior honors thesis, in a presentation during fall 2017 open to UNH students and staff, and in future publications and research. Further, any communication via the internet poses minimal risk of a breach of confidentiality.

WHOM TO CONTACT IF YOU HAVE QUESTIONS ABOUT THIS STUDY

If you have any questions pertaining to the research you can contact Jessica Pelletier at jlp2006@wildcats.unh.edu or 774-573-9835, or Dr. Ruth Reilly at ruth.reilly@unh.edu or 603-862-2164 to discuss them.

If you have questions about your rights as a research subject you can contact Dr. Julie Simpson in UNH Research Integrity Services, 603/862-2003 or Julie.simpson@unh.edu to discuss them.

Appendix C: Recruitment Materials

Facebook Post

Hi everyone! If you could quickly fill out this survey for my senior honors thesis regarding the knowledge and intake of folate/folic acid among UNH students, I would greatly appreciate it. Thank you!

https://unh.az1.qualtrics.com/jfe/form/SV_6RvsFapbz1vbg6p

First Email Sent to UNH Organization Leaders

Hello! My name is Jessica Pelletier, and I am a senior dietetics student here at UNH. I am starting to work on my senior thesis this semester, which involves assessing the knowledge and intake of folic acid among college students. This research involves having students taking a short five-minute survey online. I am writing to you with hopes that you would be willing to distribute the survey link to your organization members. I am trying to get a diverse sample group, so contacting different student organizations seemed to be a great option! The survey will be ready for distribution within the next few months. I look forward to hearing back from you!

Second Email Sent to UNH Organization Leaders

Hi _____,

I emailed you a few weeks back about distributing the link to my research survey assessing the knowledge and intake of folate/folic acid to the other members of your organization. Below I have put the link to the Qualtrics survey. Thank you so much for helping me out with this, and enjoy the rest of your night!

https://unh.az1.qualtrics.com/jfe/form/SV_6RvsFapbz1vbg6p

Email Sent to Associate Deans

Hello! My name is Jessica Pelletier, and I am a senior dietetics student here at UNH. I am starting to work on my senior thesis this semester, which involves assessing the knowledge and intake of folic acid among college students. This research involves having students taking a short ten-minute survey online. I am writing to you with hopes that you would be willing to pass this email along to the professors in (School name). I am unable to email students directly to ask them to take part in the survey, so instead I am hoping that professors will be willing to post an announcement on their MyCourses page with a link to the survey for anyone who wants to participate. The online survey will be ready for distribution within the next month. I look forward to hearing back from you about whether this is possible or not!

Appendix D: Student Organizations Contacted

- 91.3 FM WUNH
- Accounting Students' Association
- Aegis
- Alabaster Blue
- Alpha Chi Sigma
- AED
- Alpha Kappa Psi
- APO
- Alternative Break Challenge
- American Fisheries Society
- American Institute of Chemical Engineers
- American Red Cross
- American Society for Microbiology
- American Society of Civil Engineers
- American Society of Mechanical Engineers:
- Amnesty International
- Animal Welfare Alliance
- Animation Club
- Anime Club
- Anthropology Club
- Archery Club
- Aspiring Hands
- Association of Exercise Science Students
- Athletes InterVarsity
- Autism Speaks U
- Badminton Club
- Best Buddies
- Black Student Union
- BRING IT
- Buddies Without Borders
- CAB
- Campus Cursive
- Campus Living Association
- Campus Rec
- Catholic Student Organization
- Celebrity Series
- Chemical Engineering Car
- Chess Team
- CSSA
- Chinese Student Music Association
- Circle K
- Climbing Team
- CMAA
- College Democrats
- College Republicans
- Commen-tary
- ContraUNH
- Craft Crazy
- Creating Acceptance Through Students
- Cru UNH
- Dairy Club
- DXP
- Diversity Support Coalition
- Eating Concerns Mentors
- Electronic Dance Music Company
- EWRI
- Eta Sigma Delta
- Eta Sigma Phi
- Et-NavSwarm
- Fencing Club
- Fla Chait Irish Dance
- Freestyle Figure Skating Club
- French club
- Friends of Jaclyn
- Geocaching club
- Girl Up
- Golden Key Honor Society
- Graduate Student Senate-
- Graduate Students of Social Work
- Half Marathon Club
- Healthy UNH
- Hep Cats Swing Dance Club
- Her Campus
- Hi English Learning Partner

- Hillel
- Horsemen's Club
- Improv Anonymous
- ISSA
- ISA
- ISMA
- Inner Yoga Peace Club
- Institute of Electrical and Electronics Engineers
- IGEM
- InterVarsity Christian Fellowship
- IAN
- Karate Club
- Knitting Club
- Lambda Pi Eta
- Linux Club
- LunaCats
- Magic Wheels
- Maiden Harmony
- Main Street Magazine
- Marketing and Advertising Club
- Mask & Dagger
- Math Club
- MUB Governors
- MUSO
- Middle Eastern Cultural Association
- Model UN
- Muslim Student Association
- National Association for Music Education
- National Society of Black Engineers
- NSSLHA
- Native American Cultural Association
- Nepalese Student Association
- Net Impact
- NH Notables
- NH Outing Club
- Nordic Ski Club
- Not Too Sharp
- Off the Clef
- Order of Omega
- Organic Garden Club
- Oxfam America
- Peace and Justice League
- Pedagogy Club
- POW
- Phi Alpha Pi Chi
- Phi Sigma Biological Sciences Honor Society
- Pi Mu Epsilon
- Pi Theta Epsilon
- Planning Student Organization
- Pre-Vet Club
- Precision Racing
- Pre-dental Society
- PASA
- PCMA
- Project Sunshine
- Psychology Club
- Ratio Christ
- Relay for Life
- ROV
- Res Life
- Robotics
- Rotaract Club
- Sailing
- Sales Club
- Sandpaper
- Scriptor
- Seacoast reads
- SHARPP
- Shooting Sports Team
- Sigma Alpha Professional Agricultural Sorority
- Sigma Tau Delta
- SDC
- Sisters in Step
- SKO
- Ski and Board Club
- Slow Food
- SASE
- SPS
- SWE

- Society 19
- Softball
- Spoon U
- STAND
- Stonewall Grads
- Stop the Stigma
- Student Activity Fee Committee
- SAFA
- SATA
- SCOPE
- S.E.A.C.
- Students Honor Council
- Student Nursing Association-
- SOTA
- Student Senate
- Students for St. Jude
- SFAC
- Synchronized Skating Team
- Table Tennis
- Tae Kwan Doe
- Tau Beta Pi
- ToT
- TechX
- Cat Pack
- CRPCC
- The Granite Yearbook
- Meeple and Cardboard
Syndicate
- TNH
- The Recreation Society
- Socratic Society
- TAC
- WildTones
- Turning Point USA
- uLEAD
- Gaming Club
- MOSAICO
- Photography society27
- Pre-Law Society
- Russian Club
- Women's club hockey
- UNHoopers
- United Asian Coalition
- Dance Team
- Juggling Team
- Pre-vet Club
- Vietnamese Student
Association
- VOX
- WildACTS
- Wildcat Wordsmiths
- Wildcat Youth Mentors
- Winter Guard
- Women in Business
- Women in Science
- Women's club lacrosse
- Women's club volleyball
- Women's rowing
- Women's rugby
- Women's ultimate Frisbee
- Woods Cleanup
- Yellow Ribbon Club

Appendix E: IRB Approval Letter

University of New Hampshire

Research Integrity Services, Service Building
51 College Road, Durham, NH 03824-3585
Fax: 603-862-3564

10-Mar-2017

Pelletier, Jessica
Nutrition, Kendall Hall
259 Mast Rd
Durham, NH 03824

IRB #: 6648

Study: Assessment of the Intake and Knowledge of Folate/Folic Acid Among UNH Students

Approval Date: 09-Mar-2017

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b). Approval is granted to conduct your study as described in your protocol.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the document, *Responsibilities of Directors of Research Studies Involving Human Subjects*. This document is available at <http://unh.edu/research/irb-application-resources>. Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,



Julie F. Simpson
Director