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Nathalie Bergeron

*Touro University California*, [nathalie.bergeron@tu.edu](mailto:nathalie.bergeron@tu.edu)

Sebastian Al-Saiegh

Eric J. Ip

*Touro University California*, [eric.ip@tu.edu](mailto:eric.ip@tu.edu)

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## RESEARCH

# An Analysis of California Pharmacy and Medical Students' Dietary and Lifestyle Practices

Nathalie Bergeron, PhD, Sebastian Al-Saiegh, PharmD, Eric J. Ip, PharmD

Touro University College of Pharmacy, Vallejo, California

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**Objective.** To assess dietary and lifestyle practices of pharmacy and medical students in California and investigate whether they adhered to behaviors consistent with current dietary and exercise guidelines.

**Methods.** The Block Brief 2000 Food Frequency Questionnaire and a supplemental survey assessing demographics, exercise, and dietary behaviors were administered to students across 10 California pharmacy and medical schools.

**Results.** While the majority of students consumed sodium <2300 mg/day (73%) and dietary cholesterol <300 mg/day (84%), only 50% had a saturated fat intake  $\leq$ 10% total kcal, 13% met fiber intake goals, 10% consumed  $\geq$ 8 servings/day of fruit and vegetables, and 41% exercised  $\geq$ 150 minutes/week. The largest barrier to consuming a healthful diet was lack of time.

**Conclusion.** A high proportion of pharmacy and medical students in California did not meet many of the dietary and physical activity recommendations. Health care programs may benefit from implementing nutrition and lifestyle education in their curriculum.

**Keywords:** diet, nutrition, counseling, lifestyle, nutrition education

## INTRODUCTION

Poor lifestyle choices have repeatedly been associated with an increased risk of developing chronic disease in the general population,<sup>1,2</sup> but there is limited data regarding lifestyle practices of health care professional students. Current evidence indicates that better health practices among health care professionals are correlated with increased confidence and frequency of patient counseling regarding lifestyle and diet. In a cross-sectional study of 500 male and female primary care physicians randomly recruited from a national opt-in panel of 145,000 United States (US) physicians, those with a normal body mass index (BMI) (representing 47% of the study population) were more confident and more likely to provide exercise and diet counseling to patients than physicians who were obese or overweight (53% of the study population).<sup>3</sup> A cross-sectional study of female physicians showed that training and self-confidence in nutrition counseling and practicing a vegetarian diet were positive predictors of weight and nutrition counseling.<sup>4</sup> In addition, the lifestyle practices of health care professionals, as evidenced by their body weight, have been

shown to affect their credibility. A survey revealed that adult patients are more likely to mistrust their physician, change physicians, or not follow medical advice if they perceive their physician to be overweight or obese.<sup>5</sup>

The majority of studies in health care professional students have focused on exercise. In a study conducted on medical students, those who met the Centers for Disease Control and Prevention (CDC) recommendations of 150 minutes/week of moderate activity or 75 minutes/week of vigorous-intensity activity attributed higher relevance to counseling patients on physical activity in their future practice.<sup>6</sup> Frequency of counseling was also found to be positively correlated with student physical activity level.<sup>6</sup> In the "Healthy-Doc Healthy Patient" study, medical students exposed to a 4-year curricular and extracurricular intervention on diet, exercise, alcohol, and tobacco use were more likely to provide counseling about these lifestyle behaviors during standardized patient encounters compared to a control group of students from the same medical school who were not enrolled in the intervention.<sup>7</sup>

Although recent studies have begun investigating personal health practices of medical students, there is limited data on dietary habits of health care students. As future providers working in diverse settings, pharmacy and medical students appropriately trained in nutrition are in a prime position to provide clear and empowering messages about healthier food choices to their patients.<sup>8</sup>

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**Corresponding Author:** Nathalie Bergeron, Touro University California College of Pharmacy, 1310 Club Drive, Mare Island, Vallejo, CA 94592. Tel: 707-638-5921. E-mail: Nathalie.bergeron@tu.edu

Through interventions that promote healthy dietary and lifestyle habits, behavioral counseling can improve intermediate risk factors for cardiovascular disease and diabetes<sup>9,10</sup> and thereby contribute to preventing and decreasing the burden of these chronic diseases in high-risk individuals.<sup>11</sup> Yet, few health care professional programs adequately train students on nutrition-related issues so that, in turn, they feel empowered to counsel their patients about lifestyle.<sup>12,13</sup> The purpose of this study was to survey students enrolled in pharmacy and medical programs across California regarding their own dietary and lifestyle practices. We also investigated whether students adhered to behaviors consistent with current dietary and exercise guidelines<sup>14,15</sup> and explored potential barriers to adopting a healthy lifestyle. Given the limited exposure of health care professional students to required nutrition curriculum,<sup>13,16</sup> we hypothesized that the dietary practices of pharmacy and medical students in this study would not meet current dietary and lifestyle guidelines, and that lack of time and nutritional knowledge would be the main impediments to healthful habits in these individuals.

## METHODS

Male and female students attending a pharmacy or medical school in California, and having received an email or verbal invitation to participate in our study were eligible for enrollment. Assistant/associate deans of student services from the 10 California campuses that have pharmacy and medical programs were contacted and asked to distribute an email invitation to students enrolled in their programs (~5000 students), but we were unable to determine how many of these students received the actual email. Interested students who provided their email addresses received a link to our study surveys. We excluded those individuals who viewed the questionnaire but indicated that they did not wish to participate, those who completed the questionnaires but did not submit their answers, and those who failed to complete both the food frequency questionnaire and the supplemental survey questions about demographics, exercise, and dietary behaviors. All participants provided informed consent to take part in the study, approved by the Touro University Institutional Review Board.

Dietary intake of study participants was assessed using an abbreviated Block Brief 2000 Food Frequency Questionnaire (FFQ) (NutritionQuest/Block Dietary Data Systems, Berkeley, CA), a questionnaire based on 70 food items and that captures information about dietary intake during the six preceding months.<sup>17</sup> The Block Brief 2000 FFQ is an updated version of the validated 1990 “reduced” 60-item Block FFQ used to estimate usual and

customary dietary intake.<sup>17</sup> It is methodologically improved over the earlier version in that it more accurately estimates portion sizes, is based on an updated version of the USDA nutrient database for research, and the food items that the Block Brief 2000 FFQ queries are weighted for an ethnically diverse population.<sup>17</sup> The FFQs were self-administered online, with visual prompts embedded to facilitate estimation of portion sizes. Raw data captured in the FFQs were analyzed by NutritionQuest (Berkeley, CA) and translated into quantitative intake of macronutrients and micronutrients, based on frequency and number of servings of foods consumed.

Individuals who reported unrealistically low daily caloric intake (<750 kcal/d) were excluded from data analysis. No one was excluded on the basis of unrealistically high daily caloric intake (>4200 kcal/d).<sup>18</sup> Validated gender and age-specific adjustment factors developed to correct for underreporting that occurs with abbreviated FFQs were applied to daily calories, total fat, saturated fat, sodium, protein, carbohydrate, cholesterol and fiber.<sup>19</sup>

In addition to completing the Block Brief 2000 FFQ, participants were also asked to respond to a second supplemental survey which queried demographics, exercise patterns, dietary behaviors, and included the Starting the Conversation (STC) food frequency instrument. The STC is an eight-item food frequency screener designed to aid non-dietitians in assessing and counseling dietary habits.<sup>20</sup> This instrument queries the frequency of consumption of food items deemed protective (fruit, vegetables, beans/fish/chicken) and detrimental to overall health (fast food, sodas/sugar sweetened beverages, chips/crackers, desserts/sweets, butter/meat fat). Responses are scored (0, 1 or 2) and compiled (range 0-16), with lower scores implying more healthful dietary practices. In total, the time to complete the Block Brief 2000 FFQ and the second supplemental survey was estimated to be between 15 to 25 minutes.

Statistical analyses were conducted using version 11.0 of JMP (SAS Institute, Cary, NC). Continuous data are reported as mean (SD) and categorical data are reported as numbers and percentages of respondents. Students’ two-tailed *t*-test was used to analyze continuous data while Chi-Square test (two-tailed) was used to analyze categorical data. P values <.05 were considered statistically significant.

## RESULTS

Data collection occurred between April 9, 2013 and November 30, 2013. A total of 270 students across 10 California pharmacy and medical schools responded to our surveys. For pharmacy students, 171 of the 200 students

who responded to our email invitation completed both the FFQ and demographic surveys (RR=86%). Sixty-four of the 70 medical students who responded to our email invitation completed both the FFQ and demographic surveys (RR=91%), for a combined response rate of 87%. Of the 270 students who responded to the survey, 235 students completed both the Block Brief 2000 FFQ and the second supplemental survey. Thirty-five students were excluded from data analysis due to unrealistically low caloric intake (<750 kcal/day) resulting in a final analytical cohort of 200 students (n=68 males; n=132 females), 26 (4) years of age. The student population consisted of 72% pharmacy students and 28% medical students, the majority in the first (37%) and second year (29%) of their academic program, with 16% and 18% of students in the third and fourth year, respectively. They were in good health, with only 4% of students reporting either pre-diabetes, hypertension, or elevated cholesterol levels. The majority of students were Asian (49%) or Caucasian (40%). On average, they had a normal BMI 23.3 (3.5 kg/m<sup>2</sup>), with 66% of males and 83% of females having a BMI ≤25 kg/m<sup>2</sup>. In the group as a whole, 18% of students were overweight (BMI, 25-29.9 kg/m<sup>2</sup>) and 5% were obese (BMI ≥30 kg/m<sup>2</sup>) (Table 1).

Dietary intake estimated from the Block Brief 2000 FFQ is summarized in Table 2. As expected, the FFQ-estimated energy intake of males was significantly higher than that of females (*p*<.0001). While the percentage of energy (%E) derived from total fat and saturated fat was comparable across genders, men consumed a significantly higher %E from protein (*p*<.0001) and lower %E from carbohydrate than women (*p*=.02). Gender differences

were also noted for intake of cholesterol and fiber, with men having a significantly higher intake of cholesterol (*p*=.02) and lower intake of fiber (*p*=.005) per 1000 kcal, compared to women. Added sugar intake in the form of sugar sweetened beverages such as regular sodas, energy drinks, and fruit drinks was low (2%E) and comparable in men and women.

When assessing adequacy of dietary intake (Table 3), we found that 50% of students had a saturated fat intake ≤10% total kcal, and that the majority consumed <2,300 mg/day sodium (73% of students) and had a cholesterol intake <300 mg/day (84% of students). Only 10% of students consumed the recommended ≥8 servings of fruit and vegetables/day (equivalent to 4-5 cups/day), consistent with the finding that only 14% of females and 10% of males met or exceeded their recommended daily fiber intake. While comparisons of estimated intake with dietary recommendations were generally consistent across gender groups, a lower percentage of males were within recommendations for dietary cholesterol and sodium. Using the Institute of Medicine equation to estimate daily energy needs for weight maintenance,<sup>21</sup> we found that the FFQ underestimated caloric intake by 26% in males and 29% in females (data not shown), consistent with earlier reports.<sup>19</sup>

A majority of students (60%) reported consuming fast foods regularly, ranging from a few times per month to at least once/week (Table 4), for an estimated 0.8 (0.8) fast food meals/week in females and 1.0 (1.2) fast food meals/week in males. In keeping with this observation, 59% of students reported that lack of time was their largest barrier to a healthful diet. Under 10% of students reported cost, lack of access to healthy foods or lack of knowledge as their greatest barrier to eating a healthful diet. On average, students reported 141 (120) minutes/week of moderate-intensity exercise, with 36% of females and 52% of males exercising ≥150 minutes/week.

Just over half of students reported being exposed to nutrition classes in their professional curriculum. Correspondingly, roughly half of the students in our cohort felt sufficiently trained in nutrition to provide optimal recommendations to patients. The majority of students (74%) also reported their intention to emphasize diet and exercise over medication “to a great extent” when treating their patients (Table 4).

The mean score of participants who completed the STC instrument was 6.6 (2.9), and the majority of participants (59%) scored between 6-10 out of a total of 16 possible points, whereas only 31% scored ≤5, with lower scores implying healthier dietary choices (Table 5). There were no significant gender difference in STC scores: 6.2 (3.1) males vs 6.8 (2.8) females; *p*=.21, and average

Table 1. Participant Demographics and Anthropometrics

Gender	Percent
Female	66
Male	34
<b>Ethnicity</b>	
Asian	49
Caucasian	40
Hispanic	4
African American	3
Mixed race	4
<b>BMI (kg/m<sup>2</sup>)</b>	<b>Mean (SD) 23.3 (3.5)</b>
< 18.5	5
18.5 to 24.9	72
25 to 29.9	18
30 to 34.9	4
35 to 39.9	1
> 40	0

Table 2. Daily Dietary Intake Estimated by a 70-item Food Frequency Questionnaire

	Total Group (n=200) Mean (SD)	Males (n=68) Mean (SD)	Females (n=132) Mean (SD)	p value (males vs females)
Calories	1,606 (730)	1,972 (973)	1,418 (468)	<.0001
Protein				
g	69 (42)	96 (53)	54 (25)	<.0001
% kcal	16.6 (4.6)	19.5 (5.3)	15.1 (3.4)	<.0001
Carbohydrate				
g	193 (89)	227 (116)	176 (65)	.001
% kcal	48.7 (9.3)	46.5 (9.7)	49.8 (8.2)	.02
Total fat				
g	62 (33)	76 (45)	55 (22)	.0007
% kcal	34.7 (8.0)	34.0 (8.0)	35.1 (8.0)	.37
Saturated fat				
g	18 (11)	22 (15)	16 (7)	.001
% kcal	10.0 (2.8)	10.0 (2.7)	10.1 (2.8)	.81
Cholesterol				
mg/day	198 (153)	273 (204)	159 (99)	<.0001
mg/1000 kcal	120 (68)	138 (89)	111 (53)	.02
Fiber				
g/day	18 (10)	21 (12)	17 (8)	.03
g/1000 kcal	12 (5)	10 (4)	12 (5)	.005
Sodium				
mg/day	2,033 (949)	2,492 (1,202)	1,798 (680)	<.0001
mg/1000 kcal	1,269 (248)	1,267 (232)	1,270 (257)	.93
Sugar sweetened beverages				
Servings/day <sup>a</sup>	0.33 (0.66)	0.41 (0.98)	0.39 (0.43)	.35

<sup>a</sup>One serving defined as 8 fluid oz

Abbreviations: g=gram; mg=milligram; kcal=kilocalorie

scores did not differ across the number of academic years in the program ( $p=.38$ ), or across BMI categories ( $p=.18$ ). When STC scores were stratified by lifestyle behaviors, a significantly greater percentage of individuals with STC scores  $\leq 5$  exercised  $\geq 150$  min/week and read food labels frequently to very frequently, compared to individuals with higher STC scores (Table 6).

## DISCUSSION

It is estimated that 4 out of the 10 leading causes of death in the United States, including heart disease, certain cancers, stroke and diabetes, are in some way linked to poor diet and physical inactivity.<sup>22</sup> Improved nutrition and increased physical activity achieved through

intensive lifestyle counseling have been associated with health benefits including reduced plasma lipids, blood pressure, and plasma glucose<sup>9</sup> as well as reduced risk for all-cause<sup>11,23</sup> and CVD mortality, and diabetes.<sup>11</sup> Notably, recent studies have shown that physicians and medical students who adopt healthy lifestyle behaviors are more confident about their skills and more likely to counsel their patients about lifestyle modifications.<sup>3,4,24,25</sup> In turn, patients are more likely to follow medical advice from physicians who practice healthy lifestyles, as evidenced by physician body weight.<sup>5</sup> To date, studies of health care professionals' lifestyle habits have focused primarily on physical activity,<sup>6</sup> but little is known about their dietary behaviors.



Table 3. Comparison of Estimated Intake With Dietary Recommendations

	% of All Individuals Reaching Goals	% Males Reaching Goals	% Females Reaching Goals
Saturated fat intake $\leq 10\%$ kcal	50	53	49
Cholesterol intake $< 300$ mg/day	84	68	92
Fiber intake	13		
$\geq 25$ g/day (female)			14
$\geq 38$ g/day (male)		10	
Sodium intake $< 2,300$ mg/day	73	53	83
Fruit & vegetable intake $\geq 8$ svg/day	10	8	12
Fruit & vegetable intake 5-7 svg/day	59	60	58
Fruit & vegetable intake $\leq 4$ svg/day	31	32	31

N=195 (65 males, 130 females)

Abbreviations: kcal=kilocalorie; mg=milligram; g=gram; svg=serving

Intended for the general population, the 2015 Dietary Guidelines for Americans emphasize healthy eating patterns and recommend limitation of sodium intake to  $< 2,300$  mg/day, saturated fat  $< 10\%$  of total daily kcal, whereas specific recommendations for dietary cholesterol have been abandoned due to lack of evidence relating dietary cholesterol to serum cholesterol levels.<sup>15</sup> The macronutrient composition of the diet of our student population was generally comparable with that of U.S. adults and consistent with earlier guidelines that emphasized adoption of a lower fat, higher carbohydrate diet.<sup>26,27</sup> The majority of students also met recommendations for sodium and cholesterol.<sup>21,28</sup> However, 50% of the cohort failed to meet recommendations to limit saturated fat to  $\leq 10\%$  of total calories, consuming on average 12% kcal from saturated fat, and  $> 85\%$  students failed to meet recommendations for dietary fiber.<sup>15,21,29</sup> Despite consuming more fiber on average than the general US population aged 19-30 years old,<sup>30</sup> our study cohort fell short of dietary recommendations for  $\geq 25$  g/day (females) and  $\geq 38$  g/day (males).<sup>21</sup> Limited studies are available assessing the diets of health care students. In a study of 157 first-year medical students,<sup>31</sup> females and males were found to have low intake of dietary fiber (12 g/day and 16g/day, respectively; equivalent to 8g/1000 kcal and 7g/1000 kcal), consumed  $\sim 11\%$  kcal from saturated fat, and exceeded daily recommendations for sodium (2,445 mg/day and 3,616 mg/day for females and males, respectively), consistent with our findings. Another study of young adults attending Ohio State University reported comparable intakes of protein (17% kcal), total fat (34%) and carbohydrate (49%) to that of our student population, but higher average intakes of saturated fat (12% kcal), sodium (3,873 mg/day) and cholesterol (299 mg/day), and lower intake of dietary fiber (9g/1000 kcal),<sup>32</sup> possibly reflecting regional differences in dietary intake between California and Ohio. Taken together the above findings

suggest that, as is reported in the general population<sup>15,33</sup> and in diverse student populations,<sup>31,32</sup> our pharmacy and medical students have followed recommendations promoted over several decades to adopt a lower fat diet.<sup>27</sup> However their low fiber intake, together with the finding that 47% of male students in our cohort exceeded sodium recommendations [daily intake, 3474 (1023) mg in this subgroup] suggests that, as is seen in the general population,<sup>15</sup> selection of minimally processed, nutrient-dense foods is not optimal in these health care professional students.

Given the increasing emphasis placed on food-based dietary patterns for achievement of optimal health,<sup>15</sup> we also assessed intake of specific food groups and found that only 10% of students met recommendations for daily fruit and vegetable intake. The failure of our survey population to meet these recommendations is remarkably consistent with what has been observed in 19-30 year old adults in the general population, where  $\sim 88\%$  of males and  $\sim 82\%$  of females fail to meet recommendations for daily fruit intake, and  $\sim 95\%$  of males and females in this age group do not meet recommendations for vegetable intake.<sup>30</sup> In keeping with this observation and the notion that fast food establishments are the primary source of empty calories for Americans,<sup>30</sup> 60% of our students reported consuming fast food a few times/month to at least weekly, and the majority reported lack of time as the main barrier to adopting a healthy diet. In a 2013 Gallup poll among 2,027 US adults, 57% of 18-29 year olds reported consuming fast food at least weekly and 33% consumed fast food 1-2 times/month,<sup>34</sup> a behavior generally associated with higher risk of weight gain, BMI and obesity,<sup>30</sup> and a diet that is energy-dense, low in fiber and poor in micronutrients.<sup>35</sup> The suboptimal dietary behaviors of our health care student population were also reflected in the STC survey, with 69% of students having scores  $\geq 6.0$ , implying less healthful dietary practices. Consistent with recent

Table 4. Percent Distribution of Students According to Lifestyle Habits, Nutrition Knowledge and Lifestyle Counseling Intentions

<b>% of students who consume fast food:</b>	
≤ 1/month	40
A few times/month	30
≥ once/week	30
<b>% of students who use of food labels:</b>	
Very frequently/frequently	69
Occasionally	20
Rarely/very rarely/never	11
<b>% of students who exercise:</b>	
≥150 min/week	41
<150 min/week	59
<b>% of students whose largest barrier to healthful diet is:</b>	
Lack of time	59
Difficulty changing established dietary habits	17
Cost (ie, too expensive)	8
Lack of access to healthy foods	2
Lack of Knowledge	1
No barriers	13
% of students exposed to nutrition classes in professional curriculum	59
% of students feeling sufficiently trained in nutrition to provide nutritional counseling to patients	53
<b>When treating patients, % of students who would emphasize diet and exercise over medications:</b>	
To a great extent	74
Somewhat	24
Very little	2
Not at all	0

N=196-198

observations that the frequency of food label use correlates with measures of diet quality,<sup>36</sup> we found that those students with higher STC scores rarely used food labels to guide their dietary selections. Students with less healthful diets (higher STC scores) also failed to meet recommendations for exercising ≥150 minutes/week, a finding in agreement with results from a systematic review where unhealthy dietary behaviors such as higher intake of energy-dense snacks and fast food, reduced consumption of fruits and vegetables, and low intake of dietary fiber were found to cluster with a sedentary lifestyle.<sup>36</sup> While we did not specifically query what constitutes the main source of students' meals during the week (eg, home-prepared, school cafeteria, vending machines, etc.) it is reasonable to infer, based on existing literature,<sup>37</sup> that strategies

Table 5. Distribution of Starting the Conversation (STC) Scores

STC Score (0-16), Mean (SD)	6.6 (2.9)
STC Score 0-5, % of students	31
STC Score 6-10, % of students	59
STC Score 11-16, % of students	10

N=200

targeted at improving the nutritional environment in institutions of higher learning are important to consider for improving this population's dietary intake.

Nutrition education in health care professional programs has been a topic of intense discussion in recent years.<sup>8,12,13,38</sup> In a 2010 national survey of 105 accredited US medical schools, an average 19.6 hours of required nutrition instruction was delivered over the course of four years of training, with most of this instruction delivered in the first two years. While programs differed in how nutrition education was provided, only 20% was delivered within a dedicated nutrition course, with the remainder integrated in the curriculum (36%), clinical practice (15%), basic science courses (24%) or other (6%).<sup>16</sup> In a survey of 50 out of 89 US pharmacy schools present in 2005, 6% of schools had a required course and 4% had an elective course in nutrition,<sup>39</sup> with instruction still heavily focused on nutrition support therapy rather than acquisition of core competencies in nutrition as it relates to health promotion and disease prevention.<sup>8</sup>

In our study, 59% of pharmacy and medical students reported being exposed to nutrition courses in their graduate curriculum, and 53% of the student cohort felt sufficiently trained in nutrition to provide optimal nutritional recommendations for their patients, suggesting that those who took nutrition classes were more confident about their abilities to counsel about diet. As such the majority of students (74%) reported their intention to emphasize lifestyle in their patient encounters. Also noteworthy, only 1% of our students reported lack of nutrition knowledge as their main barrier to healthy eating. These findings differ from those in resident physicians where only 14% of respondents believed that they were adequately trained to provide nutrition counseling to their patients.<sup>40</sup> This suggests that in the first four years of their professional education, students may be overconfident about their readiness to provide lifestyle counseling. Consistent with this observation, in a study that compared "actual" vs "perceived" nutrition knowledge among health professionals, medical students and nursing students, the majority of respondents also overestimated their knowledge about lifestyle modification for chronic diseases management.<sup>41</sup> As such, these health professionals did not

Table 6. Starting the Conversation (STC) Scores Stratified by Lifestyle Behaviors

STC Category	Physical Activity Level <sup>a</sup>		Reading Food Labels <sup>b</sup>		
	<150 min/week	≥150 min/week	Never to rarely	Occasionally	Frequently to very frequently
	% of individuals		% of individuals		
1	36	64	5	5	90
2	66	34	9	25	66
3	93	7	35	35	30

STC categories: 1 = STC scores 0-5; 2 = STC scores 6-10; 3 = STC scores 11-16 (lower STC scores reflect healthier dietary choices)

<sup>a</sup>Overall Chi-square,  $p < .01$  for physical activity level, stratified by STC score

<sup>b</sup>Overall Chi-square,  $p < .0001$  for reading food label behavior, stratified by STC score

perceive lack of knowledge as a barrier to counseling about lifestyle.<sup>41</sup> This misalignment of “perceived” vs “actual” nutrition knowledge raises questions about the true benefit of counseling provided by health care professionals whose applied lifestyle modification knowledge is suboptimal. Future studies should assess nutrition knowledge among health care professional students and determine whether students with greater nutrition knowledge actually engage in more high quality lifestyle counseling during clinical rotations.

A limitation of our study is inherent to the tool used to estimate dietary intake. While Block Brief Food Frequency Questionnaires capture habitual dietary intake over the preceding 6-12 months and produce estimates of a wide range of nutrients, they underestimate total energy (~ 20%) and absolute levels of macronutrients, cholesterol, fiber and sodium (7% to 18%), while overestimating micronutrient intake in comparison to food records.<sup>19,42-44</sup> To increase the accuracy of our data, we applied adjustment factors to calories and select nutrients so that estimates from the 70-item FFQ more closely reflect what is captured from comprehensive 100-item FFQs.<sup>19</sup> Using this dietary assessment tool, we found that the diet of our health care professional students was consistent with what has been reported in the general population.<sup>30</sup> Another limitation of our study is the relatively small sample size, originating solely from pharmacy and medical schools in the state of California. Our results should not be taken as indicative of the lifestyle practices of pharmacy and medical students across the nation.

To our knowledge our study is the first to provide quantitative measures of dietary intake, together with an overall measure of dietary quality, in a diverse sample of health care students across multiple years of academic and experiential training. It is novel in that it compares students’ diet and exercise behaviors to current recommendations. It also contrasts their lifestyle behaviors with the perceived adequacy of their nutrition training and their intention to counsel patients about lifestyle. Intuitively,

one would predict students enrolled in health care professional programs to be more knowledgeable and thus more likely to adopt a healthy lifestyle for the management of their own health.

However, our findings highlight that a high proportion of pharmacy and medical students do not meet recommendations for physical activity and select nutrients and food groups. Because increased nutrition knowledge improves dietary habits and since health care professionals who adopt healthy lifestyles are more likely to counsel patients about the benefits of these practices<sup>3,4,6,7,45</sup> and are viewed as entrusted role models for adoption of a healthy lifestyle,<sup>5</sup> our findings support recommendations for increased nutrition education in the training of health care professionals<sup>8,12</sup> for promotion of wellness, and prevention and management of chronic diseases. Finally, while the majority of students reported that they intended to place strong emphasis on diet and exercise over medication when treating their patients, whether this intention to counsel about lifestyle actually occurs in real life practice remains to be established. Future studies should determine whether greater emphasis on nutrition in the curriculum affects student dietary intake and, ultimately, whether this translates into improved patient counseling about healthy lifestyle practices for the prevention and management of chronic diseases.

## CONCLUSION

A high proportion of pharmacy and medical students in California did not meet many of the dietary and physical activity recommendations. Health care programs may benefit from implementing nutrition and lifestyle education in their curriculum.

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