Med Educ Online [serial online] 1999;4,4. Available from URL http://www.Med-Ed-Online.org

# Nutrition Education in Medical Schools: Trends and Implications for Health Educators

Jessica A. Schulman, MPH, RD, LD/N, Department of Health Science Education
University of Florida, Gainesville

**Abstract:** With 20% of deaths in the U.S. attributed to improper diet and lack of exercise, renewed interest has emerged in nutrition education for medical professionals. Sociopolitical factors are exerting a profound influence on changes in medical curricula, moving medicine away from traditional biomedical curricula and toward more comprehensive programs of study. This paper explores how public demand for nutrition information, inadequate nutrition training among physicians, changes in health care, and medical education reform are influencing the evolution of nutrition in medical schools. This paper also discusses barriers, possible solutions, and specific actions for health educators. To achieve nutrition-literacy among prospective physicians, the following elements must be developed and established: 1) adequate organizational and administrative supports, 2) continuity in credentialing nutrition specialists, 3) innovative nutrition curricula, 4) committed faculty nutrition mentors, 5) clear nutrition education goals, 6) methods for evaluation of program activities/outcomes, 7) substantive research agenda, 8) multidisciplinary medical curricula, and 9) collaboration.

Nutrition interventions can decrease morbidity, mortality, human suffering, and medical costs[1-4], yet only recently have U.S. medical schools begun to integrate nutrition into bedside and case-based teaching.[5] With nearly 20% of deaths in the U.S. attributed to improper diet and lack of exercise[6], renewed interest has emerged in nutrition education, and many medical schools are reconsidering their positions on the role of nutrition education in medical education.[7-10] However, social and political factors have had the most profound influence on recent changes in medical school curricula.[11-12]

As we enter a new millennium, sociopolitical variables, and not public health programs, are moving medicine away from the traditional medical school curricula.[13-14] Substantive research in social and behavioral sciences can help us to identify unique factors that mediate, or forestall, nutrition education in medical curricula.[15] This paper explores how sociopolitical factors are influencing the evolution of nutrition education in medical schools in the U.S. Specific factors include: 1) public demand for nutrition information coupled with a negative perception of physicians' nutrition expertise, 2) inadequacies in nutrition education among medical students, and 3) changes in health care and medical education reform. This portion of the paper is followed by a discussion of how health educators are uniquely positioned to develop rationale nutrition education programs.

## Sociopolitical Developments: Nutrition in Medical Schools

**Social Awareness: Demand for Nutrition Information & Public Sentiment -** The public is becoming more nutrition conscious and demanding reliable sources of nutrition information.[7] This change results from an increased emphasis on nutrition by the medical profession, and a growing public awareness that physicians are not nutrition experts. Historically, physicians were not prepared to assess and treat nutrition problems in their patients.[4,7,16-19] In addition, the press has fostered among the public a negative image of the nutrition expertise among physicians.[20] Suspicious attitudes toward physicians encourage people to seek nutrition information from potentially unreliable sources[7,21,22] Nutrition fraud and food faddism will continue to be rife as long as physicians remain ignorant about nutrition and the public continues to seek dietary advice.

Consensus exists among physicians that nutrition constitutes an essential aspect of health care.[23] In a nationwide survey, Levine et al [24] found that 60% of physicians held positive attitude statements toward nutrition (e.g. diet has an important role in the prevention of heart disease), and they disagreed with negative-attitude statements (e.g. physicians are well prepared to provide nutrition counseling). The survey demonstrated that, in general, physicians *do* value nutrition education. However, physicians who valued nutrition did not possess an appropriate knowledge base to counsel patients. This study, as well as oth-

ers, demonstrated need for nutrition education among all primary-care physicians.[24-26]

**Inadequacies in Nutrition Education -** "Many undesirable practices concerning the nutritional care of hospitalized patients have their roots in long-standing neglect of nutrition in medical education and in health care delivery systems."[26] The professional literature documents opposition to integrating nutrition education in medical curricula. In 1987, the American Dietetic Association (ADA) issued a report that suggested educational opportunities in medical school went unrecognized or underused.[27] Subsequently, in 1994 the National Academy of Sciences (NAS) established that nutrition education in medical schools was still inadequate.[7] Though nutrition courses had been recommended for the past 30 years, NAS found a downward trend in the number of required courses offered.

The Clinical Administrative Data Service of the Association of American Medical Colleges (AAMC) provided data that indicate the current level of nutrition course offerings for 128 U.S. accredited medical schools. In the 1995-1996 and 1997-1998 academic years, 27 and 33 schools, respectively, (21.1% and 25.8%) reported a *required nutrition* course (Figure 1).[28] In 1995-1996 and 1997-1998, 56 and 61 schools respectively, (43.8% and 47.7%) reported an *elective nutrition* course.[28] An estimated 25% of medical schools provide no nutrition instruction, or they cannot quantify the amount of nutrition education offered.[28] Currently, no systematic method exits to measure quality and quantity of nutrition education provided within medical courses. Future projects

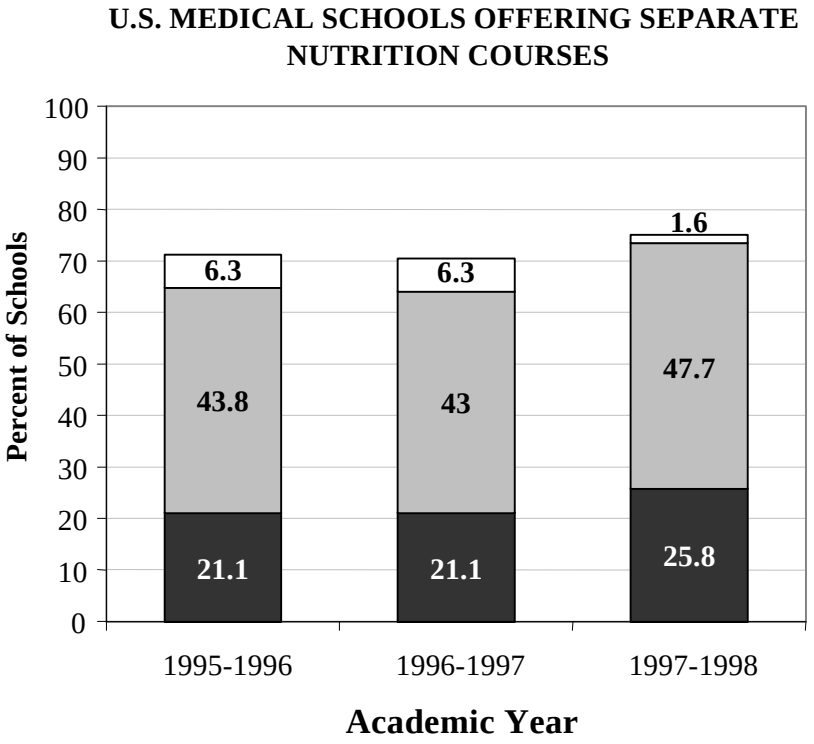


**Figure 1**. Percentage of 128 accredited U.S. medical schools offering a separate required nutrition course (solid bars), percentage of schools offering an elective course (shaded bars), and percentage of schools with missing data (open bars) for academic years 1995-96, 1996-97, and 1997-98. Annual figures are provided by the Association of American Medical Colleges, Clinical Administrative Data Service, Washington, D.C.[28]

may enable researchers to monitor adequacy of nutrition education.

**American Medical Students Association's Nutrition Project -** Noting the widely held belief that U.S. physicians are poorly trained in human nutrition, the American Medical Student Association (AMSA) established the Nutrition Curriculum Project to create a framework for integrating nutrition topics into medical education (1996). In turn, an advisory board of dietitians, nutrition educators, physicians, and researchers identified 92 topics deemed essential for developing physicians' competency in nutrition.[29] This project shows promise for improving physicians' knowledge of nutrition because topics include not only nutritional biochemistry and pathophysiology but they emphasize 1) screening and assessment, 2) disease prevention, and 3) medical nutrition therapy, which may require referring patients, addressing cultural issues, etc. This approach supports the idea that, "Nutritional literacy means more than knowing technical aspects...teaching of nutrition should include examination of the world which generates nutrition problems".[30]

**Changes in Health Care & Medical Education** - Congress expressed concern about escalating health care expenditures and has recognized the need for interventions that improve public health and lower medical costs.[7,31] Accordingly, the Pew Health Professions Commission recommended that: 1) U.S. medical schools should reduce the number of matriculating students, and 2) graduate medical training programs should increase the number of residents entering primary care to at least 50% by the year 2000. The Commission outlined the need for medical training to become more population versus client-centered, interdisciplinary, and prevention-oriented.[32-34]

Several contemporary projects[35-37] identified physician roles and organizational attributes necessary to meet societal needs. For example, the University of Texas Medical Branch and Eastern Virginia Medical School created community-based generalist clinical experiences, early in the first two years of medical school, as part of The Robert Wood Johnson Foundation's Generalist Physician Initiative (GPI). Studies from the University of Virginia, East Carolina University, and the State University of New York at Buffalo provide evidence of achievements related to curricular reform supported by GPI.[38] Likewise, the University of Florida's College of Medicine implemented a service-learning program called "Keeping Families Healthy" that recruits families to participate in the medical education process.

Some critics still believe that reform initiatives have not successfully modified physicians' behaviors and attitudes[39], but, some progress clearly has been made.[36] At the latest AAMC Forum on the Future of Academic Medicine, Michael Whitcomb, MD dispelled the belief that medical schools cannot change their curricula.[40] Twenty-four medical schools are working with the AAMC's Medical Schools Objectives Project (MSOP) on curricular reform, despite expanding conceptualizations of health that place new pressures on already stressed academic medical centers, their missions, and their curricula.[40]

Modern definitions of primary care stress the importance of health promotion, disease prevention, and integrated services. Therefore, primary care physicians (PCP) must be prepared to treat a variety of lifestyle related problems, such as diabetes and obesity, with nutrition advice.[3] A modest trend has developed toward increasing PCPs[41] and giving more attention to how social factors influence health.[5] These trends have been accompanied by reduced lecture hours in which the fourth year of medical training may emphasize behavioral, social, and epidemiological sciences. These changes are making it possible for nutrition education to be adopted into medical schools.

## Implications for Health Educators: Addressing Barriers and Creating Solutions

Despite changes in the sociopolitical climate, formidable barriers continue to forestall inclusion of nutrition education into medical curricula. Specific challenges to implementing nutrition into medical school curricula included institutional and organized medicine resistance, education failures, insufficient human resources, and fear that nutrition departments would become a financial liability. These concerns continue to hinder program development.[5] Other proposed solutions assure both prospective and practicing physicians' of access to nutrition training. The Report to Congress on the Appropriate Federal Role in Assuring Access by Medical Students, Residents, and Practicing Physicians to Adequate Training in Nutrition (November, 1993), suggested that significant changes in 1) the reimbursement system, 2) credentialing process, and 3) nutrition curricula must occur to support national goals pertaining to health promotion and disease prevention.[42]

Research has demonstrated that improved or expanded nutrition services actually can help reduce hospital expenditures or increase revenues.[43] Nevertheless, reimbursement for nutrition services remains inadequate.[44] This problem, coupled with inadequate

funding of nutrition training programs, creates insurmountable obstacles for planning, implementing, and evaluating nutrition curricula. Recently, however, a federal grant initiative was launched to encourage development and enhancement of medical school curricula.[45] In 2000, monies will be appropriated to each of seven medical schools to support opportunities for students, faculty, practicing physicians, and house staff. The initiative seeks to develop nutrition competencies for preventing various chronic diseases, and to provide training modules for dissemination to other medical schools. With continued support and collaboration between societies, nutrition-literacy (e.g. improved knowledge and problem-solving skills, attitudes, practices in applied nutrition) among prospective physicians may be in our future. However, before this goal can become reality, additional organizational and administrative supports, such as faculty recruitment and retention, must be in place.

**Credentialing** - Active, interested faculty are essential to the success of nutrition education programs. Yet, intensive faculty development has been neglected.[10] Only a limited number of faculty mentors are available who can design and implement appropriate nutrition courses and experiential learning activities.[46] In addition, no consensus exists on minimum responsibilities to guide the training of physician nutrition specialists. Some training programs focus on nutrition as a categorical subspecialty, while others combine nutrition with other subspecialties — such as gasteroenterology — giving it various levels of emphasis. Therefore, substantial inconsistencies remain in basic nutrition training between medical schools.[47] Some incorporate basic nutrition science as a component of other classes (e.g. physiology or biochemistry), while others require a separate nutrition course[9] or complementary curriculum.[10,48,49] Only when minimum standards are established can consistent, and sustainable, efforts be made to train nutrition-literate students, faculty, and practicing physicians.[50]

**Development of Nutrition Curricula** - The primary goal of educating prospective physicians, both in existing medical curricula and in undergraduate medical programs, seeks to increase students' awareness about the relevance of nutrition in prevention and treatment of disease.[46] Only then can the secondary goal — imparting important information about nutrition — be achieved.[46] A coalition of physicians and health educators have started this process.[29] They developed a framework for integrating 92 nutrition topics in medical education — through the Nutrition Curriculum Project (NCP) — as the basis for a satisfactory nutrition curriculum. Instructional methods such problem-based learning, on-line tutorials, innovative teaching modules, evidence based medical-nutrition-therapy, and other types of nutrition education techniques may be useful. However, educators still must come to a consensus on principles that define the goals, scope, and sequence of medical nutrition education programs. This consensus is necessary to reduce variability in approaches to teaching nutrition to medical students, and in physician nutrition specialist (PNS) training programs. A medically based nutrition education program also must: 1) be taught in coordination with other aspects of medical education, 2) provide continuous in-service programs, 3) offer appropriate teaching/learning resources, and 4) receive institutional support, such as committed faculty, to administer the program.

**Role Models and Faculty Mentors** - Weinsier et al established that the most salient feature of successful nutrition education programs was the presence of an active and visible physician nutrition specialist (PNS).[51] However, an inadequate number of nutrition-oriented role models is a major constraint in teaching nutrition to future physicians.[50] To address this problem, nutrition societies should exert a vigorous and continuous effort to form a national nutrition coordinating center, regional networks, consortia, and professional organizations.[5,52,53] The societies should reflect an interdisciplinary composition including various professionals such as physicians, health educators, and dietitians. In 1997, the Intersociety Professional Nutrition Education Consortium was chartered to: 1) establish educational standards for training PNSs, 2) implement a mechanism for long-term support, 3) develop standards for assessment certification, 4) disseminate information about training and certification, and 5) increase the pool of PNSs. Several societies agreed to participate in the consortium, and they are in the initial stages of addressing relevant strategies to accomplish their objectives. The consortium represents a crucial step for creating high quality, sustainable, nutrition-training programs that meet the needs of prospective physicians and enhance the nutritional health of the public.

**Suggested Goals of Nutrition Education** - To achieve nutrition-literacy, health educators and faculty mentors must develop methods to teach medical students: 1) why nutrition is important in health promotion, disease prevention, and lifestyle maintenance, 2) how to identify and prioritize nutrition problems through screening and assessment, 3) where to obtain accurate information for clinical problem-solving or patient referral, 4) to whom they should be

providing MNT, 5) how to use recent nutrition-related research to improve patient care and cost-effective therapies, 6) when to advocate for an individual and a community's quality of life, and 7) how to become a positive role model and/or faculty mentor.

Educators would be mistaken to focus exclusively on teaching only current nutrition content, because applied nutrition is a relatively new field with a constantly expanding body of information.[46] This approach would allow health educators to become more efficient and not feel that they need additional time to expand their program as more nutrition facts and research findings are generated. Still, adequate time should be allocated to nutrition education, though the optimal amount of time remains to be determined. [7,31,46,54]

Positive outcomes or cost-effectiveness of practice-based studies[1,23,55,56] may persuade medical school faculty, administration, and primary care physicians to spend more time learning about applied nutrition. However, the success of nutrition training programs does not depend on the number of hours of instruction, but on demonstrated quality or effectiveness of a program. Evaluations of medical or educational programs should not rely solely on observable behavior or cognitive tests. This method ignores other important constructs, such as self-efficacy, that predict current and future practices.[57,58] As state-of-the-art nutrition curricula are developed and applied, valid instruments must be created to assess the dynamic educational needs of prospective physicians, their practices, and patient outcomes.[59-62]

**Evaluation Methods and Research**

Shils[60] clearly expressed the need for research and evaluation of both general medical and nutrition education: “The criteria commonly used by the AAMC in its annual curriculum and graduation questionnaires are, in my opinion, relatively useless because they give no information about how well clinical nutrition has entered into the knowledge base of the graduating student” (p. 631). Schools often integrate nutrition concepts into basic science courses, but studies indicate that when nutrition is taught as a component of another course, students often do not recognize the concepts as nutrition and the role of diet in disease prevention.[50] Now that a consensus exists on a nutrition curriculum,[9,29] and schools will be developing curricula and training modules to be adapted and used by other academic training units and institutions,[45] it is an opportune time to integrate evaluations into existing programs and to implement new methods. Health educators should conduct program evaluations to provide valuable information on the effectiveness of the new curricula. In addition, they should be prepared to conduct: 1) accountability studies[63] to determine if the program was implemented correctly, if it reached the appropriate targets, and if funds were expended properly, and 2) formative evaluations to guide the implementation process. Planned evaluations are necessary to provide useful criteria for determining whether or not program objectives were met, and they inform program activities and health policy.[58] Moreover, researchers should monitor the extent to which nutrition education has been implemented; whether medical students, physicians, and patients are being reached; and how nutrition education affects the health of the public.[64]

Researchers also should revisit application of behavioral theories that predict physician practice behavior, and the psychosocial theories of social power as they apply to an individual's adherence to health protocols. In 1986, Raven & Litman-Adizes found no studies that examined the patient’s perception of the legitimacy and expertise of the physician to enhance compliance.[65] Ten years later, researchers still know little about adherence to complex medical regimens.[66] This deficiency is unfortunate because physicians can exert influence over their patients’ attitudes and behaviors, and encourage dietary modification. Furthermore, power educative and empowerment approaches, as they pertain to nutrition education, also may bring about widespread changes.[67,68] For example, in a power educative approach, primary targets of nutrition education include prospective physicians (our medical authorities), because they are not well-trained in nutrition therapy,[4] but the secondary target and ultimate beneficiary is the public.

**Development of Multidisciplinary Curricula**

In view of the environmental factors previously described, curriculum developers should revitalize joint degree programs and create new programs. For example, a joint M.D.-Ph.D. or master's degree program in community health sciences or in applied nutrition would enable students to obtain outstanding medical, nutrition, health education, and research experience they could transfer to clinical and community settings. Scholars have emphasized the need for medical faculty interested in preventive medicine and public health.[69] Dual degrees provide a seamless method for re-integrating preventive medicine and public health into traditional medical programs. Health educators in academe possess the resources to

facilitate inter- and multi-disciplinary endeavors by working, teaching, and problem solving with students and faculty from a variety of professions. In this arena, future health educators can collaborate with medical professionals and develop common goals.

**Collaboration**

Deen, Karp, and Lowell suggest that medical school nutrition education programs can gather strength beyond that available at any single institution by forming regional networks.[70] This approach involves multidisciplinary collaboration as a means to improve nutrition education in medical schools. This approach has worked in Norway, Germany, and Canada's applied nutrition programs.[71-73] Before collaboration can occur, however, social and political issues within and between organizations must be understood. Health educators must facilitate collaboration between organizations, respecting one another's contributions, not trying to displace each other.

Health educators must understand the diversity of the educational process among medical schools so they can align themselves with medicine instead of being viewed as intruders. For example, currently there are topics being proposed for the medical curriculum, such as medical informatics, domestic violence, child abuse, and alcoholism — to name a few. Tension between trying to enhance the medical curriculum and manage a program already replete with coursework presents a challenge. It may prove difficult to determine why one specific discipline, or topic, outside the traditional medical curricula is more important, or deserves more time, than another. We do know, however, that coronary artery disease, obesity, and diabetes are devastating medical conditions from which people suffer and die every day. Modifying nutrition risk through lifestyle change represents one of the most sensible approaches to preventing complications from the leading causes of morbidity and mortality.[74] If the medical community seeks to address the health needs of the public, it must be skilled at examining and treating the underlying determinants of disease, such as psychosocial and biological elements, and not merely patients that present with symptoms. While many of the potential new topics may be valuable, inclusion of new topics should be based, at least to some extent, on need and impact on patients' health and quality of life.

**Conclusion**

In 1976, Esther Nelson, MD-nutritionist conveyed the importance of and the state of nutrition in medical schools: “The field of nutrition is wide open, and more good can accrue to the human race from this fundamental knowledge than from any other avenue. Eventually it will come. Let it hasten”.[17] In the 21st Century, medical professionals hold the potential to make nutrition education in medical programs a reality. Health professionals must minimize barriers and create opportunities to advance medical nutrition education. Though no easy solutions exist to the problem of inadequate nutrition education in medical curricula, the following approaches offer a good beginning: 1) provide adequate organizational and administrative supports, 2) devise strategies for continuity in credentialing nutrition specialists, 3) develop innovative nutrition curricula, 4) create opportunities for qualified and available nutrition role models or faculty mentors, 5) identify clear nutrition education goals, 6) evaluate program activities and outcomes, 7) conduct substantive research, 8) continue the development of multidisciplinary medical curricula, and 9) encourage collaboration.

To achieve the goal of nutrition literacy among physicians, nine basic approaches should be implemented. However, to make long-term progress with this issue, we should conduct a careful study of past and present sociopolitical forces.[15,58] The topic of nutrition education in medical schools cannot be considered in isolation; improvements in nutrition education only can be addressed in the broader context of how it is perceived and accepted by academic medicine, the medical profession, and the public.[4] In turn, both physicians and health educators will become more prepared to make meaningful contributions to the field of medical education and improve personal health behaviors.

**References**

1. Gibbs J, Cull W, Khuri S, Daley J, Henderson W. Serum albumin level as a predictor of surgical mortality and morbidity: results from the National VA Surgical Risk Study [abstract]. AHSR FHSR Annu Meet Abstr Book 1996;13:163.

2. Montgomery D, Splett P. Economic benefit of breast-feeding infants enrolled in WIC. J Am Diet Assoc 1997;87(4):379-385.

3. van Weel C. Morbidity in family medicine: the potential for individual nutritional counseling, an analysis from the Nijmegen Continuous Morbidity Registration. Am J Clin Nutr 1997;65(6 Suppl):1928s-1932s.

4. Halsted C. Clinical nutrition education: relevance and role models. Am J Clin Nutr 1998;67:192-196.

5. Shils ME. National Dairy Council Award for Excellence in Medical and Dental Nutrition Education Lecture, 1994: nutrition education in medical schools--the prospect before us. Am J Clin Nutr 1994;60(4):631-8.

6. McGinnis J, Foege W. Actual causes of death in the United States. JAMA 1993;270:2207-12.

7. American Dietetic Association [ADA]. Position of The American Dietetic Association: Nutrition--an essential component of medical education. J Am Diet Assoc 1994;94(5):555-557.

8. Go VL, Wilkerson L, Heber D. Implementation of a longitudinal nutrition curriculum at UCLA. Acad Med 1995;70(5):432-3.

9. Hark L. One program's experience in nutrition education of medical students. Topics in Clinical Nutrition 1997;12(3):42-48.

10. Wilkes MS, Usatine R, Slavin S, Hoffman JR. Doctoring: University of California, Los Angeles. Acad Med 1998;73(1):32-40.

11. Rodning CB. Sociopolitical influence upon medical education: the Medical College of Alabama (1859 to 1861) as a model. South Med J 1986;79(6):744-5.

12. Martin SC, Howell JD. One hundred years of clinical preventive medicine in America. Prim Care 1989;16(1):3-8.

13. Meyer GS, Potter A, Gary N. A national survey to define a new core curriculum to prepare physicians for managed care practice. Acad Med 1997;72(8):669-76.

14. Rabkin MT. A paradigm shift in academic medicine? Acad Med 1998;73:127-131.

15. Mechanic D. Social research in health and the American sociopolitical context: the changing fortunes of medical sociology. Soc Sci Med 1993;36(2):95-102.

16. Butterworth C. The skeleton in the hospital closet. Nutrition Today 1974:4-8.

17. Nelson E. Nutrition instruction in medical schools. JAMA 1976;236:2534.

18. National Research Council. Committee on Nutrition in Medical Education, Food and Nutrition Board: nutrition education in US medical schools. Washington, DC: National Academy Press, 1985.

19. Council on Scientific Affairs. Education for health: a role for physicians and the efficacy of health education efforts. JAMA 1990;263(13):1816-1819.

20. Schollar A. Why med students miss their minimum daily requirement of nutrition education. New Physician 1989;38:16-21.

21. Eisenberg D, Kessler R. Unconventional medicine in the United States: prevalence, costs and use of. N Engl J Med 1993;328:246-252.

22. McLaren DS. Nutrition in medical schools: a case of mistaken identity. Am J Clin Nutr 1994;59(5):960-3.

23. Lazarus K. Nutrition practices of family physicians after education by a physician nutrition specialist. Am J Clin Nutr 1997;65(6 Suppl):2007s-2009s.

24. Levine BS, Wigren MM, Chapman DS, Kerner JF, Bergman RL, Rivlin RS. A national survey of attitudes and practices of primary-care physicians relating to nutrition: strategies for enhancing the use of clinical nutrition in medical practice. Am J Clin Nutr 1993;57(2):115-9.

25. Kirby RK, Chauncey KB, Jones BG. The effectiveness of a nutrition education program for family practice residents conducted by a family practice resident-dietitian. Fam Med 1995;27(9):576-80.

26. Young EA, Weser E, McBride HM, Page CP, Littlefield JH. Development of core competencies in clinical nutrition. Am J Clin Nutr 1983;38(5):800-10.

27. ADA. Position of The American Dietetic Association: nutrition--essential component of medical education. J Am Diet Assoc 1987;87:642-647.

28. Association of American Medical College's Clinical Administrative Data Service. [Topic: Nutrition, 1995-1996, 1996-1997, 1997-1998]. Raw data. Washington D.C.: 1997.

29. American Medical Student Association [AMSA]. Essentials of nutrition education in medical schools: a national consensus. American Medical Student Association's Nutrition Curriculum Project. Acad Med. 1996;71:969-71.

30. Kent G. Nutrition education as an instrument of empowerment. J Nutr Educ 1988;20:193-195.

31. Davis CH. The report to Congress on the appropriate federal role in assuring access by medical students, residents, and practicing physicians to adequate training in nutrition. Public Health Rep 1994;109(6):824-6.

32. Finocchio LJ. Looking into the future of allied health: recommendations of the Pew Health Professions Commission. J Allied Health 1994;23(1):29-33.

33. Finocchio LJ, Bailiff PJ, Grant RW, EH ON. Professional competencies in the changing health care system: physicians' views on the importance and adequacy of formal training in medical school. Acad Med 1995;70(11):1023-8.

34. O'Neil E. Education as part of the health care solution: strategies from the Pew Health Professions Commission. JAMA 1992;268(9):1146-1148.

35. Maudsley RF. Content in context: medical education and society's needs. Acad Med 1999;74(2):143-5.

36. Matson CC, Ullian JA, Boisaubin EV. Integrating early clinical experience curricula at two medical schools: lessons learned from the Robert Wood Johnson Foundation's Generalist Physician Initiative. Acad Med 1999;74(1 Suppl):S53-8.

37. Mennin SP, Krackov SK. Reflections on relevance, resistance, and reform in medical education. Acad Med 1998;73(9 Suppl):S60-4.

38. Rollins LK, Lynch DC, Owen JA, Shipengrover JA, Peel ME, Chakravarthi S. Moving from policy to practice in curriculum change at the University of Virginia School of Medicine, East Carolina University School of Medicine, and SUNY-Buffalo School of Medicine. Acad Med 1999;74(1 Suppl):S104-11.

39. Hafferty FW. Beyond curriculum reform: confronting medicine's hidden curriculum. Acad Med 1998;73(4):403-7.

40. Iglehart J. Forum on the future of academic medicine: session V--implications of basic and applied research for AMCs. Acad Med 1998;73(12):1241-8.

41. Ginzberg E. The future supply of physicians. Acad Med 1996;71(11):1147-1153.

42. U.S. Department of Health and Human Services. Report to Congress on the appropriate Federal role in assuring access by medical students, residents and practicing physicians to adequate training in nutrition. Washington, D.C.: 1993.

43. Tucker HN, Miguel SG. Cost containment through nutrition intervention. Nutr Rev 1996;54(4 Pt 1):111-21.

44. Kushner RF. Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners. Prev Med 1995;24(6):546-52.

45. National Heart Lung and Blood Institute, National Institute of Diabetes and Digestive and Kidney Diseases. Nutrition academic award. Washington, D.C.: National Institutes of Health, 1999.

46. Weinsier RL. National Dairy Council Award for Excellence in Medical/Dental Nutrition Education Lecture, 1995: medical-nutrition education--factors important for developing a successful program. Am J Clin Nutr 1995;62(4):837-40.

47. Maillet JO, Young EA. Position of the American Dietetic Association: nutrition education for health care professionals. J Am Diet Assoc 1998;98(3):343-6.

48. Slavin SJ, Wilkes MS, Usatine R. Doctoring III: innovations in education in the clinical years. Acad Med 1995;70(12):1091-5.

49. Tillman HH, Woods M, Gorbach SL. Enhancing the level of nutrition education at Tufts University's Medical and Dental Schools. J Cancer Educ 1992;7(3):215-9.

50. Intersociety Professional Nutrition Education Consortium. Bringing physician nutrition specialists into the mainstream: rationale for the Intersociety Professional Nutrition Education Constortium. Am J Clin Nutr 1998;68:894-8.

51. Weinsier RL, Boker JR, Brooks CM, et al. Nutrition training in graduate medical (residency) education: a survey of selected training programs. Am J Clin Nutr 1991;54(6):957-62.

52. Deen DD, Jr., Karp RJ, Lowell BC. Contribution of regional networks to the nutrition education of physicians. J Am Coll Nutr 1996;15(4):413-7.

53. Feldman EB. Networks for medical nutrition education--a review of the US experience and future prospects. Am J Clin Nutr 1995;62(3):512-7.

54. Winick M. Nutrition education in medical schools. Am J Clin Nutr 1993;58(6):825-7.

55. Franz MJ, Splett PL, Monk A, et al. Cost-effectiveness of medical nutrition therapy provided by dietitians for persons with non-insulin-dependent diabetes mellitus. J Am Diet Assoc 1995;95(9):1018-24.

56. Johannesson M, Agewall S, Hartford M, Hedner T, Fagerberg B. The cost-effectiveness of a cardiovascular multiple-risk-factor intervention programme in treated hypertensive men. J Intern Med 1995;237(1):19-26.

57. Patton M. How to use qualitative methods in evaluation. Newbury Park: SAGE, 1987.

58. McKinlay JB. Health promotion through healthy public policy: the contribution of complementary research methods. Can J Public Health 1992;83 Suppl 1:S11-9.

59. Schulman JA, Wolfe EW. The nutrition self-efficacy scale for prospective physicians: evaluating reliability and validity through Rasch modeling. Manuscript in preparation.

60. Shils ME, Karp R, Stevenson N, Kuperman A, Gebhardt C. Evaluation of the quality and quantity of nutrition teaching in the curriculum. Bull N Y Acad Med 1984;60(6):591-601.

61. Wheat JR, Killian CD, Melnick DE. Reevaluation of medical education: a behavioral model to assess health promotion/disease prevention instruction. Evaluation and the Health Professions 1991;14(3):304-318.

62. Wright BD, Masters GN. Rating scale analysis: Rasch measurement. Chicago: Mesa Press, 1982.

63. Rossi PH, Freeman HE. Evaluation: a systematic approach. (5 ed.) Newbury Park: SAGE, 1993.

64. Karp R. A methodology for nutrition curriculum evaluation. Bull N Y Acad Med 1984;60(6):585-90.

65. Raven B, Litman-Adizes T. Social power and compliance in health care. In: Maes S, Spielberger CD, Defares PB, Sarason IG, eds. Topics in health psychology. New York: Wiley, 1988:229-244.

66. Steckler A, Allegrante J, Altman D, et al. Health education interventions strategies: recommendations for future research. Health Educ Q 1995;22(2):307-121.

67. Green L, Kreuter M. Health promotion planning: an educational and environmental approach. (2 ed.) Mountain View: Mayfield, 1991.

68. Israel B, Checkoway B, Schulz A, Zimmerman M. Health education and community empowerment: conceptualizing and measuring perceptions of individual, organizational, and community control. Health Educ Q 1994;21(2):149-70.

69. Melville S, Coghlin J, Chen D, Sampson N. Population-based medical education: linkages between schools of medicine and public health agencies. Acad Med 1996;71(12):1350-1352.

70. Deen D, Jr., Karp R, Lowell B. A new approach to nutrition education for primary care

physicians in the United States. J Gen Intern Med 1994;9(7):407-8.

71. Bratland SZ. Handling nutritional advice in general practice in Norway. Am J Clin Nutr 1997;65(6 Suppl):1953s-1956s.

72. Schauder P. [Graduate education in nutritional medicine in Germany--2 years after organization of the "Nutritional Medicine" teaching curriculum]. Z Arztl Fortbild Jena 1995;89(4):386-91.

73. Wasylenki DA, Cohen CA, McRobb BR. Creating community agency placements for undergraduate medical education: a program description. Can Med Assoc J 1997;156(3):379-83.

74. Bidlack WR. Interrelationships of food, nutrition, diet and health: the National Association of State Universities and Land Grant Colleges White Paper. J Am Coll Nutr 1996;15(5):422-33.

**Acknowledgements**

In appreciation of the faculty in the Department of Health Science Education, University of Florida for reviewing this article and Albert Salas, M.A., Staff Associate in the AAMC's Division of Medical Education for providing the administrative data set. I am especially grateful to Dr. Steve Dorman and Dr. R. Morgan Pigg, Jr., professors in the Department of Health Science Education, University of Florida, for making significant contributions to this article.

**Correspondence can be set to**:

Jessica A. Schulman, MPH, RD, LD/N
Department of Health Science Education
University of Florida, Gainesville,
FLG-5, P.O. Box 118210
Gainesville, FL 32611-8210

TEL/V-MAIL: 352-392-0583
E-MAIL: mnt@ufl.edu