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Culinary Medicine Experiences for Medical Students and Residents in the U.S. and Canada: A Scoping Review

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Abstract

Phenomenon: Despite the importance of diet in the prevention and management of many common chronic diseases, nutrition training in medicine is largely inadequate in medical school and residency. The emerging field of culinary medicine offers an experiential nutrition learning

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Authors' contributions

CH – conceptualization, data curation, formal analysis, investigation, methodology, project administration, supervision, validation, visualization, writing – original draft, writing – review & editing; MP – investigation, methodology, validation, visualization, writing – original draft, writing – review & editing; AT – investigation, validation, writing – original draft, writing – review & editing; JL – investigation, validation, writing – review & editing; KL – investigation, visualization, writing – original draft; MC – preliminary analysis, investigation; AO – investigation, preliminary analysis, writing – original draft; CD – conceptualization, methodology, visualization, writing – original draft, writing – review & editing; KG – writing – review & editing; TH – writing – review & editing; AA – conceptualization, methodology, supervision, writing – review & editing

Positionality statement

We bring to this work backgrounds in nutrition, medicine, and medical education, and many of us are advocates for increasing nutrition training of physicians. Some of us have experience designing and teaching culinary medicine experiences. While many of us hold advanced degrees and some of us may come from privileged backgrounds, we strive to promote equity in our research.

Disclosure statement

The authors have no disclosures to report.

approach with the potential to address the need for improved nutrition training of physicians. Exploring this innovative nutrition training strategy, this scoping review describes the nature of culinary medicine experiences for medical students and resident physicians, their impact on the medical trainees, and barriers and facilitators to their implementation.

Approach: This scoping review used the Joanna Briggs Institute methodology for scoping reviews and the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) checklist as guides. Eligible publications described the nature, impact, facilitators, and/or barriers of nutrition and food preparation learning experiences for medical students and/or residents. Additional inclusion criteria were location (U.S. or Canada), allopathic or osteopathic, English, human subjects, and publication year (2002 or later). The search strategy included 4 electronic databases. Two reviewers independently screened titles/abstracts and a third reviewer resolved discrepancies. The full-text review consisted of 2 independent reviews with discrepancies resolved by a third reviewer or by consensus if needed, and the research team extracted data from the included articles based on the nature, impact, barriers, and facilitators of culinary medicine experiences for medical trainees.

Findings: The publication search resulted in 100 publications describing 116 experiences from 70 institutions. Thirty-seven publications described pilot experiences. Elective/extracurricular and medical student experiences were more common than required and resident experiences, respectively. Experiences varied in logistics, instruction, and curricula. Common themes of tailored culinary medicine experiences included community engagement/service-based learning, interprofessional education, attention to social determinants of health, trainee well-being, and cultural considerations. Program evaluations commonly reported the outcome of experiences on participant attitudes, knowledge, skills, confidence, and behaviors. Frequent barriers to implementation included time, faculty, cost/funding, kitchen space, and institutional support while common facilitators of experiences included funding/donations, collaboratives and partnerships, teaching kitchen access, faculty and institutional support, and trainee advocacy.

Insights: Culinary medicine is an innovative approach to address the need and increased demand for improved nutrition training in medicine. The findings from this review can guide medical education stakeholders interested in developing or modifying culinary medicine experiences. Despite barriers to implementation, culinary medicine experiences can be offered in a variety of ways during undergraduate and graduate medical education and can be creatively designed to fulfill some accreditation standards.

Keywords

Culinary medicine; hands-on nutrition education; experiential nutrition learning; nutrition training in medicine; residency nutrition training

Introduction

Culinary medicine is an innovative, evidence-based clinical discipline that “blends the art of food and cooking with the science of medicine” through integrating nutrition and culinary instruction.¹ The goal of culinary medicine is to teach individuals, both health care professionals and patients, how to incorporate food and healthy eating into their daily lives in a practical way that reduces the burden of disease. A healthful dietary pattern is linked

to reducing the risk of many chronic diseases (cardiovascular disease, type 2 diabetes, and some cancers) that are prominent mortality causes in the US, and evidence supports the benefits of a healthful dietary pattern for reducing the risk of neurodegenerative disease and all-cause mortality.^{2,3} Sixty percent of U.S. adults are currently managing at least one chronic disease, contributing to reduced quality of life and increased health care costs.⁴

Viewed as credible sources of information regarding diet, physicians are in a unique position to assist patients in making positive dietary behavior changes.^{5–9} The importance of the physician's role in preventive interventions, specifically for individuals with cardiovascular disease risk factors^{10–12} and individuals with prediabetes,¹³ is reflected in practice guidelines from the U.S. Preventive Services Task Force and professional societies.^{10–13} While physicians recognize they have a role in nutrition care, many feel unprepared to address diet with patients, particularly due to a lack of knowledge, skills, and confidence.^{14–17} Inadequate nutrition training spanning undergraduate and graduate medical education is a well-documented problem.^{18–24} Culinary medicine learning experiences implemented during medical school and residency have the potential to address the need for adequately training physicians to address diet with patients.²⁵ Culinary medicine learning experiences may have added benefits: the potential to improve medical trainee and provider self-care through dietary behaviors in a population at risk of burnout,^{26–29} increased frequency of nutrition counseling among providers or trainees with improved personal dietary habits,^{30–32} and more effective learning of nutrition through active learning experiences.^{33–35}

While the idea that food and nutrition are critical to health is not new, culinary medicine presents an opportunity to fill gaps in nutrition training to better prepare physicians to address diet with patients. Given the emerging nature of culinary medicine in medical training, we used a scoping review to explore the breadth of culinary medicine experiences described in the literature to provide a comprehensive overview of the characteristics of culinary medicine experiences for medical students and residents.³⁶ Scoping studies are useful for new and emerging fields where evidence is limited and there are few randomized controlled trials.³⁷ For this study we defined culinary medicine experiences as nutrition learning opportunities that incorporate food preparation.

Compared to prior scoping reviews limited to culinary medicine training for medical students,^{38,39} this review takes a comprehensive approach, focusing on the breadth of published culinary medicine experiences for medical students and resident physicians to capture opportunities for culinary medicine training throughout the medical training spectrum, as deficiencies in nutrition training persist at both these levels. Our comprehensive approach provides a detailed and up-to-date overview of an emerging field with increasingly more publications in recent years. The aim of this scoping review is to describe the nature of published culinary medicine experiences for medical students and resident physicians, their impact on the medical trainees, and barriers and facilitators to their implementation in undergraduate and graduate medical education. Results may provide a useful guide for medical education stakeholders interested in implementing culinary medicine experiences by offering a comprehensive look at the variety of “ingredients” that have been used to design culinary medicine experiences tailored to individual program needs.

Methods

The Joanna Briggs Institute methodology for conducting scoping reviews, which incorporates frameworks from Arksey and O'Malley and Levac, Colquhoun, and O'Brien, and the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) checklist, served as guides for this scoping review.^{37,40–42}

Research question and purpose

The research question that guided this scoping review was: What is the current state of the nature, impact, facilitators, and barriers of culinary medicine experiences for medical students and resident physicians? The purpose of this review is to provide a foundation of knowledge for stakeholders interested in implementing culinary medicine experiences for medical trainees.

Information sources and search strategy

We identified evidence for this scoping study through searching four electronic databases: (1) PubMed, (2) Scopus, (3) CINAHL, and (4) Global Health. University library services assisted with the search strategy. We initially performed a limited search with two databases, PubMed and CINAHL, and included additional terms after review of titles, abstracts, and key words. We completed the initial full literature search on February 1, 2022, and an updated search on August 28, 2023. Boolean operators “OR” and “AND” were used to expand and narrow our search to capture all relevant articles that fit the inclusion criteria (Table 1). We adapted the search strategy for each database to index relevant articles, such as Medical Subject Headings (MeSH).

Eligibility criteria & study selection process

We defined the study selection process and inclusion criteria a priori and published an abstract of our protocol.⁴³ We included publications describing the nature, impact, or barriers/facilitators of culinary medicine experiences, which we defined as nutrition learning experiences that incorporate food preparation/cooking, for medical students or residents. We limited experience location to the U.S. and Canada given shared Liaison Committee on Medical Education (LCME) accreditation standards. We included allopathic and osteopathic programs and publications in English with human subjects. We limited our search time frame to beginning in 2002 as this was the publication year of the first article found documenting a culinary medicine experience.⁴⁴ In the updated search we modified our protocol to exclude literature reviews.

To facilitate the process of screening articles and extracting data, we used the web-based software platform, Covidence.⁴⁵ After the retrieval of publications and removal of duplicates from the search, two reviewers (JL, MP) independently reviewed the remaining titles and available abstracts for relevance. A third reviewer (CH) resolved conflicts. During the full-text review, two reviewers (MC, JL, KL, MP, or AT) conducted independent reviews of the articles. Due to feasibility challenges, we modified our original protocol from resolving conflicts by consensus as a team to resolving conflicts by a third reviewer (CH) or by consensus of three reviewers (CH, JL, MP, or AT) if needed. We identified one publication⁴⁶

with 51 abstracts and a senior reviewer (CH) reviewed each of the 51 abstracts for relevance, and we counted each included abstract as an independent publication for ease of reference. For 10 publications, we emailed authors clarification questions, and we received eight responses. While we did not formally include a review of references in our protocol, during the review of full-text articles, two referenced publications potentially meeting inclusion criteria were discovered, reviewed, and added for data extraction after consensus was reached by three reviewers (CH, MP, and AT). In our updated search, we reviewed the articles included in literature reviews for relevance to our review. If they were not already included in our review, we added those meeting our criteria, including two publications after consensus was reached by three reviewers (CH, JL, and AT). Our study selection flow is shown in Figure 1.

Data extraction process

To extract and synthesize the data, we reviewed the literature based on the following broad categories: (1) nature of culinary medicine experiences, (2) impact of the experiences, and (3) facilitators and barriers to implementation of experiences. The study team charted extracted data using Excel to collate information based on the three categories of interest. We charted data initially by publication and subsequently by institutions and individual culinary medicine experiences. We identified common themes within the categories as they became evident during the data extraction and synthesis process.

Results

Overview

We retrieved 1,706 titles, and, after the removal of duplicates and review of titles/abstracts, we reviewed 186 full-text articles. We excluded 98 publications and added 4 articles from references. In one publication⁴⁶ that contained 51 peer-reviewed abstracts from a research day, we extracted data from nine abstracts that met eligibility criteria and counted each abstract as a distinct publication. A total of 20 abstracts were included in the review.^{47–66} We extracted data from 100 publications. From the included publications we identified 49 program/curriculum/intervention evaluations that reported on some level of impact of the experience,^{34,35,47,48,51,52,55–58,60,63,65,67–102} 10 program descriptions,^{59,61,62,66,103–108} six review articles,^{109–114} six feature/magazine/news articles,^{44,115–119} six reports,^{120–125} four program evaluation protocols,^{49,50,53,64} four commentary/opinion articles,^{1,126–128} one science advisory,²⁵ one research letter,¹²⁹ one interview,¹³⁰ and one book chapter.¹³¹ The remaining 11 publications were other research studies: three multisite surveys,^{54,132,133} one website content analysis,¹³⁴ two comparative effectiveness research studies,^{135,136} and five multisite cohort studies,^{137–141} one of which included a meta-analysis.¹³⁷ Thirty-seven percent of publications described pilot culinary medicine experiences.

The 100 publications covered 116 unique culinary medicine experiences from 70 medical training institutions, eight of which were schools of osteopathic medicine.^{65,73,83,109,111,112,123,132,133} Seven of the identified experiences described plans for an experience not yet implemented.^{49,50,58,69,112,125,126} Three publications described experiences in Canada.^{60,95,97} The majority ($n = 83/100$) of the manuscripts were published

in 2018 or later. The earliest article was published in 2002, describing “Whole Heartedly: Cooking Classes for Healthy Living,” a culinary and nutrition course for medical students at the University of Maryland School of Medicine (SOM) taught by a dual chef and nutrition counselor and supported by participation in the Nutrition Academic Award Program.⁴⁴ In a small portion of experiences ($n = 19/116$), medical trainees provided culinary medicine instruction to patients or community members after or while gaining knowledge and skills in culinary medicine.^{25,34,51,78,88,91,96,99,105,107,108,111–113,116,119,124,129,131,141} Some culinary medicine experiences ($n = 33/116$) integrated interprofessional education (IPE) with medical students and/or residents engaging with trainees from other disciplines.^{25,47,55,60,62,63,65,69,71,72,79,81,84,86,88,94,95,97,101–103,121,124,131,132} Over half ($n = 54/100$) of the publications reported medical trainee outcomes following participation in a culinary medicine experience.

Nature of culinary medicine experiences

The publications demonstrate a variety of ways that medical training institutions are offering culinary medicine experiences, as shown in Table 2 which reports characteristics by institution.

Trainees

Medical students ($n = 96/116$) were primarily the trainees identified, with 28 experiences identified for preclinical students,^{25,34,35,49–52,59,63–65,67,69,76,77,80–82,85,86,88,89,93,95,99,108,111,113,129,133} 24 experiences identified for clinical students,^{1,58,63,69,74,75,90,91,98,100,105,111–113,116,119,121,129,132} nine experiences identified for both preclinical and clinical students,^{48,69,73,78,79,83,92,103,111,131} and the remaining unspecified. Twenty-four experiences reflected opportunities for residents.^{56,57,61,68,70,71,94,96,106,121,122,125,126,130–132} Residency program types included the following: family medicine,^{61,68,94,96,122,130–132} internal medicine,^{121,122,126} pediatrics,^{56,121,132} preventive medicine,^{70,106,131,132} and physical medicine and rehabilitation.¹³² As shown in Table 2, some institutions ($n = 12/70$) offered experiences for medical students and residents.^{34,56,57,68,70,71,74,75,80,82,96,111,113,115,116,122,125,126,128,131,132} Table 3 describes examples of various offerings.

Forms of culinary medicine experience offerings

Nearly 70% ($n = 80/116$) of experiences reflected elective or extracurricular activities, 17% ($n = 20/116$) required experiences, and the remaining unspecified. Of the required experiences, nine were specified for residents,^{50,57,61,68,106,121,130,132} six for preclinical medical students,^{69,80,81,88,108,111} two for clinical medical students,^{111,112} and one for combined preclinical and clinical students.¹¹¹ Extracurricular offerings of culinary medicine included activities hosted by student organizations such as interest groups, which were most commonly lifestyle medicine interest groups.^{107,109,119,120,123–125,132} Six experiences were offered through pathways/tracks, longitudinal experiences for trainees that commonly have a special focus such as lifestyle medicine or community medicine.^{99,103,111,112,131} Two experiences were integrated into a retreat.^{47,68} Table 2 summarizes offerings by institution and Table 3 outlines examples of a variety of culinary medicine offerings.

While most culinary medicine experiences were offered through a trainee's institution, this review also identified opportunities offered outside of a trainee's institution. Residents can attend the Healthy Kitchens, Healthy Lives conference through Harvard University.¹³² CHEF (Culinary Healthcare Education Fundamental) Coaching is an online program that applies health coaching to culinary instruction.¹¹⁷ Free online resources identified include the open-source Culinary Medicine Curriculum¹⁰⁴ or culinary medicine activities included in the Foundations of Lifestyle Medicine for Medical Students curriculum.¹¹³ A pilot elective at the University of North Carolina SOM used free courses offered through online platforms Coursera and NextGenU.⁹⁰

Logistics

The number of trainees in each culinary medicine experience ranged from small groups to entire medical school classes. For example, at Penn State College of Medicine, four clinical medical students participated in an elective culinary medicine experience while the entire class participated in a separate required experience for preclinical medical students.^{74,75,80} The preclinical required experience used existing problem-based learning groups to divide the class of 140 students into 20 small groups of 7 students each for a culinary challenge applying knowledge learned in the basic science curriculum.⁸⁰ After a positively-received pilot elective taken by 12 preclinical and clinical medical students, the University of Maryland SOM engaged the entire first-year medical student class of 125 students in a culinary medicine experience during the Introduction to Clinical Medicine course.⁶⁹ Working with the available teaching kitchen space, they divided the students into five classes, which were further divided into small groups of five students who cooked together.⁶⁹ A virtual clinical medical student elective at the University of Southern California Keck SOM enrolled eight students at a time to allow for individualized attention.⁹⁸ In a four-week elective piloted through the University of Colorado Pediatric Residency Program, seven residents participated,⁵⁶ and the Johns Hopkins Preventive Medicine Residency Program invited 16 residents to participate in a 3-workshop culinary medicine series with workshop attendance ranging from 8–11 residents at a given workshop.⁷⁰

Amount of culinary medicine instruction varied from brief, one-time offerings to longitudinal programs. Medical students at the University of Cincinnati SOM had the opportunity to attend a 6-h interprofessional wellness retreat at a farm that included a farm tour, "Food as Medicine" instruction, and two hours of hands-on cooking.⁴⁷ Twenty-five family medicine residents at East Carolina University Brody SOM and local culinary arts high school students were divided into nine teams practicing culinary skills during a 4-h workshop experience.⁹⁴ At Brown University, a registered dietitian (RD) led a weekly 30-minute class with preclinical medical students for four weeks, meeting either at lunch or after class.^{76,77} The instructor set up a pop-up teaching kitchen in the student lounge using an electric skillet and presented nutrition topics while students tasted the recipes.^{76,77} Keck SOM designed a clinical student elective to meet the 40-h/week requirement with a mix of live virtual sessions and independent study.⁹⁸ Tulane's culinary medicine programming provides a longitudinal elective experience for medical students, beginning with an 8-week preclinical elective meeting weekly for 28 h total and covering the Mediterranean diet

and dietary counseling.¹³⁵ During the third year of medical school, Tulane offers culinary medicine programming that is disease-specific while fourth-year medical students may elect to complete an away rotation at Johnson & Wales University in Rhode Island for four weeks.¹³⁵ A.T. Still University – School of Osteopathic Medicine integrates culinary medicine through its longitudinal lifestyle medicine curriculum.¹¹¹ The University of South Carolina SOM Greenville also integrates a longitudinal lifestyle medicine curriculum while also offering a longitudinal culinary medicine elective that spans the first three years of medical school, totaling over 100 h, and students have the option to take an additional 4-week elective during their fourth year.¹¹¹

Culinary instruction location

The locations of the culinary instruction, listed in Table 4, varied by access to teaching kitchen space, from institutions with a dedicated teaching kitchen at the medical school¹¹⁵ to using an electric skillet in the medical school lounge⁷⁶ to virtually cooking together using personal kitchens.^{90,96,98,102,130,136} A survey of 32 organizations with teaching kitchens found the most common spaces were built-in, borrowed, or mobile/pop-up.⁵⁴ The Tulane medical school-based Goldring Center teaching kitchen is the first teaching kitchen housed at a medical school, and the Goldring Center not only offers space for medical trainees and health professionals to engage in hands-on cooking workshops but also makes their kitchen accessible to the community through community culinary medicine courses.^{115,132,135} Many institutions located kitchen space through partnerships with culinary schools or community organizations while others used cooking spaces housed in nutrition/dietetics departments. An RD-led longitudinal pathway for medical students at Case Western used the food sciences lab housed in the Nutrition Department,¹⁰³ and RDs and dietetic interns in the Department of Dietetics at Marshall University taught medical students in their teaching kitchen.⁶³ Personal kitchens were also commonly used, whether meeting in person or virtually. A medical student-led lifestyle medicine interest group at the University of Utah used a student's home for kitchen space,¹²⁴ and two programs used medical school faculty home kitchens.¹³²

During the COVID-19 pandemic, UNC SOM and Keck SOM virtually offered clinical medical students electives that integrated culinary and nutrition instruction over Zoom, allowing students to learn culinary skills using the equipment accessible to them in their home.^{90,98} The University of Maryland, Northwestern, California Health Sciences University, and the Health meets Food program likewise shifted their culinary medicine experiences to online or virtual opportunities during the pandemic.^{65,69,102,130,136} CHEF Coaching, used by Harvard Physical Medicine and Rehabilitation residents and Yale Preventive Medicine residents, was designed as a remote culinary training experience to supplement nutrition curricula.^{117,132} The Foundations of Lifestyle Medicine for Medical Students' open-source curriculum can be taught in person or virtually,¹¹³ and Keck SOM demonstrated a virtual adaptation of the open-source Culinary Medicine Curriculum.^{98,104} Some experiences integrated culinary instructional videos,^{79,94,102,132} and some trainees were assigned recipes to prepare at home outside of class meetings.^{76,77}

Instructors

Instructors of the culinary medicine experiences varied, from medical students to teams of interprofessional faculty (Table 5). Several experiences included a chef instructor and some featured a dually trained chef-physician or chef-RD. Some experiences engaged community members for cooking instruction, including high school culinary teachers,⁹⁴ community health personnel,¹⁰² and collective kitchen facilitators.⁹⁷ Culinary medicine experiences commonly included dietitians/nutrition faculty and physicians/residency/medical school faculty as facilitators, and multiple experiences used an interprofessional team of a chef, dietitian, and physician/medical faculty member to teach culinary medicine to trainees.^{47,52,62,71,89,91,113,115,132} A certified culinary medicine specialist (CCMS) also led culinary training. Administered as part of Health meets Food programming, the CCMS certification is a 60-h continuing education opportunity with an examination requirement for various health professionals to acquire cooking and nutrition knowledge and skills.¹¹⁷ Some experiences integrated trainees in dietetics/nutrition and culinary arts in the facilitation of the culinary medicine experience. Other specialized instructors included a librarian who instructed on identifying credible nutrition resources,⁸⁴ an Elder who shared about indigenous culture,⁹⁷ a community organization representative speaking on food access/security,⁹⁷ other health professional faculty for an IPE training,^{88,101,102} a health coach covering mindfulness,¹¹³ and a gardener for an experience that integrated growing food.¹³² Some electives invited guest speakers.^{88,97,98,131} The Culinary Medicine Curriculum recommends one of the following options for culinary medicine course facilitators: (1) an instructor trained in culinary arts, nutrition, and the health profession of the trainees, (2) a clinician-educator with nutrition and cooking proficiency, or (3) a team of instructors to meet the culinary, nutrition, and clinical training needs of the course.¹⁰⁴

Curricula

Most of the culinary medicine curricula used to implement the learning experiences were homegrown curricula,^{34,35,47,48,50,51,53,56,57,59–61,65,67,69,70,72,76,77,79–83,85,88,89,91,92,94,96,100,102,103,105,107,108,111,112,115,116,122,124,125,131,132,135} while others licensed existing curricula^{68,71,73–75,84,86,93,112,113,121,131,132,139} or utilized free resources.^{90,98} Some experiences used a combination of existing and homegrown curricula.^{73–75,84,98} Multiple institutions included a culinary medicine experience as part of a broader lifestyle medicine curriculum or interest group,^{105,106,108,111,113,124,125,128,131} and the American College of Lifestyle Medicine collaborated with Stanford University to provide free access to the Culinary Medicine Curriculum, an evidence-based and comprehensive guide to implementing culinary medicine learning experiences based on Stanford University SOM's culinary medicine elective, "The Doctor is In (the Kitchen)."^{79,104} Keck SOM demonstrated adaptation of the Culinary Medicine Curriculum for a clinical medical student virtual elective.⁹⁸ The Foundations of Lifestyle Medicine for Medical Students curriculum, also a free curriculum, includes culinary medicine activities to complement lifestyle medicine content.¹¹³ East Carolina University offers free access to the facilitator guide for a culinary workshop developed for their Family Medicine residency program.⁹⁴ Health meets Food is a culinary medicine courseware that programs can license annually.¹¹⁷ CHEF Coaching is an 18-h evidence-based training available online.¹¹⁷ Examples of curricula are outlined in Table 6.

Nutrition content in culinary medicine experiences was covered in a variety of ways, such as didactics, reading assignments, online modules, problem-based learning, and case-based learning, and was covered separately or concurrently with culinary instruction. In some experiences, trainees completed assignments, such as watching videos or reading articles, prior to a class meeting.^{34,79,91,94,96,98,102,110,113} Curricula commonly focused on the Mediterranean diet and plant-based diets. For instance, the Health meets Food courseware is based on the Mediterranean diet and the Culinary Medicine Curriculum features whole-food, plant-based nutrition.^{104,110} Other common topics included low-sodium/Dietary Approaches to Stop Hypertension (DASH) diets, fad diets, and “Food as Medicine” or dietary management for chronic diseases.

Some experiences were designed to complement the preclinical curriculum. For example, Penn State College of Medicine introduced a hands-on cooking experience as part of problem-based learning of metabolism disorders during the basic science curriculum for first-year medical students.⁸⁰ Students applied basic science knowledge through preparation of food meeting dietary restrictions associated with an assigned disorder, such as Maple Syrup Urine Disease or Phenylketonuria.⁸⁰ This experience required students to consider the challenges faced by patients with dietary restrictions.⁸⁰ The University of Rochester integrated a required experiential culinary laboratory into the first-year curriculum to help medical students connect concepts in biochemistry to practical nutrition.⁸¹ Faculty who teach biochemistry, nutrition, and clinical skills collaborated to write the cases, and dietetic interns from Cornell University facilitated the lab.⁸¹ Preclinical medical students at California Health Sciences University College of Osteopathic Medicine could view “Salt-free Seasonings,” 1 of 6 brief nutrition-focused videos created by dietetic interns, during their Renal System course.⁶⁵

Recognizing a void in nutrition training for clinical medical students, faculty at West Virginia University SOM designed a brief, flexible culinary medicine elective for fourth-year medical students that focused on increasing knowledge and self-efficacy in dietary counseling skill development before they transition to residency.¹⁰⁰ The elective emphasized experiential learning of applied nutrition topics, such as “Nutrition Counseling and Common Patient Questions” and various macronutrients and health, as opposed to focusing on learning biochemical pathways alone.¹⁰⁰ Faculty at the University of Maryland created an IPE-focused culinary medicine curriculum tailored to the participating professions, and medical students received instruction in food access (Social Work), food/medicine interactions (Pharmacy), the relationship between oral health and nutrition (Dentistry), and nutrition policy (Law) while engaging with other professional students.¹⁰²

Learner assessment

Assessment of trainees was infrequently mentioned, with quizzes being the most common form of assessment.^{53,71,88,93,121,135} Another method of assessment was written reflections.^{74,75,88,112} Preclinical students at Virginia Tech were assessed through a quiz, reflective essay, and small group participation and received a pass/fail grade after completing a culinary medicine IPE track.⁸⁸ Students taking a clinical elective offered at Keck SOM also received a pass/fail grade, which was based on attendance, participation, and

assignment completion.⁹⁸ At West Virginia University SOM, students were assessed based on a final project that entailed conducting a literature review, giving a presentation, and making a meal tailored to dietary guidance they would give for a specific condition of their choice.¹⁰⁰ The University of South Carolina SOM Greenville extensively assesses its broader lifestyle medicine curriculum through exams, objective structured clinical examinations (OSCEs), reflections, and cases.¹¹² While a traditional assessment of trainee competencies was infrequently mentioned, multiple programs evaluated the impact of their culinary medicine experience on medical trainees' knowledge and skills through survey questionnaires (see Impact of Culinary Medicine Experiences, below).

Trainee advocacy

The offering of many culinary medicine experiences was influenced by trainee advocacy and interest,^{35,52,59,67,69,83,89,94,97,107,108,120,121,124} commonly to increase nutrition training opportunities in medical training.^{67,89,108,121,124} Some of these efforts were through student organization activities, such as student interest groups^{107,109,119,120,123–125,132} or the medical student-coordinated TEACH kitchen program at the Medical College of Georgia that provides cooking and nutrition classes to patients.¹⁰⁷ Trainee advocacy was instrumental in starting some elective or required culinary medicine experiences,^{35,59,67,69,83,89,97,121} and some trainees were involved in curriculum development.^{35,53,59,85,89,107,108,131} For example, students at Wake Forest SOM engaged a faculty advisor to introduce more lifestyle medicine learning experiences in the curriculum which led to integrating a required food shopping and preparation activity during the first-year medical student wellness-focused orientation.¹⁰⁸ The students and faculty advisor also collaborated to design a year-long pilot lifestyle medicine elective for 16 students that included meal preparation activities.¹⁰⁸

Tailored culinary medicine experiences

Several culinary medicine experiences were tailored to focus on specific learning goals. Common themes of tailored experiences included: community engagement and service-based learning, interprofessional education (IPE), social determinants of health/food insecurity and food affordability, and trainee well-being. Another less common theme in publications was cultural considerations in culinary medicine.

Community engagement and service-based learning. Several programs emphasized community engagement in culinary medicine experiences, often through service-based learning activities. A clinical medical student elective offered at Penn State College of Medicine partnered with a local community senior center and paired students with senior mentors for an intergenerational experience.^{74,75} Johns Hopkins medical students rotating at a primary care medical home joined medical staff and the physician in learning more about the food environment of their patients through a culinary medicine experience that included cooking at the neighboring church and touring the local grocery and corner stores.⁸² Preventive Medicine residents at Johns Hopkins received culinary medicine instruction at a neighborhood church using a curriculum informed by engaging community members,⁷⁰ and Family Medicine residents at East Carolina University engaged with high school culinary students in a 4-h culinary medicine workshop.⁹⁴

Health professional students attending a culinary medicine workshop at the University of Saskatchewan learned about indigenous culture from an Elder invited to speak.⁹⁷

Service-based learning was featured in 19 experiences, frequently in the form of medical trainees teaching in their community.^{25,34,51,78,88,91,96,99,105,107,108,111–113,116,119,124,129,131,141} After training in culinary medicine, medical students taking an elective at Northwestern Feinberg SOM taught the “Small Bites” nutrition and cooking curriculum to elementary students in a Chicago public school, facilitated by a partnership with a nonprofit.^{34,118} Family Medicine residents at Northwestern taught three weekly classes at a middle school with a high proportion of students eligible for the free or reduced-price lunch program.⁹⁶ Medical students who completed the culinary medicine elective for fourth-year medical students at the University of Central Florida led classes at a local YMCA or health facilities,^{113,116} and students at Tulane University may teach community culinary medicine classes at the medical school-based teaching kitchen after receiving culinary medicine training.¹²⁹ While a service component was not a requirement of a Wake Forest University SOM pilot lifestyle medicine experience that integrated culinary medicine, multiple students engaged in culinary-focused service activities in their community following participation.¹⁰⁸ Medical students also engaged in interprofessional service-based culinary medicine experiences, such as members of the Lifestyle Medicine Interest Group at the University of Utah SOM who co-taught culinary medicine classes with a dietetic student at a clinic¹²⁴ and Brown University Warren Alpert Medical School students who worked as a team with nursing students to teach community cooking and nutrition classes.²⁵

Interprofessional education. IPE was integrated into several culinary medicine experiences. An analysis of hands-on cooking programs from medical school website content found IPE to be a priority for programs, as shown by one-third of the web pages including IPE descriptions.¹³⁴ In this review, trainees had IPE opportunities through engaging with instructors and trainees from other disciplines. As shown in Table 5, in several experiences medical trainees received instruction from other disciplines, most frequently culinary arts and dietetics. Some experiences with a specific focus featured specialized instructors such as librarians,⁸⁴ community mentors,^{74,75} an Elder from the community,⁹⁷ a health coach,¹¹³ or a gardener.¹³² Bringing together expertise in clinical, nutrition, and culinary skills, multiple experiences featured a team of facilitators consisting of a physician/medical faculty member, RD, and chef.^{47,52,62,71,89,91,113,115,132} For instance, through a partnership with a local nonprofit teaching kitchen, L.A. Kitchen, medical students at Keck SOM started a culinary medicine elective facilitated by an interprofessional team consisting of a community-based dietitian, physician, and L.A. Kitchen chef.^{52,89}

We identified 33 experiences through which medical students and/or residents interacted with trainees from culinary, dental, dietetics, genetic counseling, health promotion, law, nursing, nutrition, pharmacy, physician assistant, physical therapy, public health, radiologic imaging, social work, and/or other allied health programs,^{25,47,55,60,62,63,65,69,71,72,79,81,84,86,88,94,95,97,101–103,121,124,131,132} and in one experience medical students trained alongside medical staff at a clinic.⁸² Examples of IPE experiences incorporating culinary medicine are outlined in Table 7.

Social determinants of health and affordability. Attention to social determinants of health, particularly considering the cost of food, was commonly integrated into culinary medicine experiences. Williams' study analyzing medical school website content regarding hands-on cooking programs found that 42% of the web pages they coded referenced "food cost and food access for patients."¹³⁴ In this review, multiple experiences mentioned budget, cost, or affordability in relation to food,^{25,52,55,67,69,72,74,76,77,81,82,85,86,89–92,94,97–100,102,103,106,108,116,122,131,132} and several integrated social determinants of health through attention to food insecurity, food access, and/or low-income patient populations.^{25,50,52,56,61,77,78,89,91,97–100,102,103,106,113,116} Some trainees were challenged to prepare budget-friendly meals.^{67,69,72,89,91,94,100,106,108,122} The University of Alabama at Birmingham SOM developed a homegrown culinary medicine curriculum, Cooking Healthily on a Penny, as an elective service-based learning and applied nutrition experience for first-year medical students completing their biochemistry course.⁷⁸ In a 3-h training session, students not only received instruction in nutrition science but also learned about social determinants of health, such as food insecurity, while developing skills in motivational interviewing and cooking.⁷⁸ Students applied their knowledge and skills through conducting cooking demonstrations at a nonprofit-operated farmers market located in a "food desert."⁷⁸ Recipes chosen for the elective were designed to meet the budget of a Supplemental Nutrition Assistance Program (SNAP) recipient.⁷⁸ Medical students at Keck SOM prepared recipes using the SNAP "Just Say Yes to Fruits and Veggies" guide through an elective emphasizing cooking with a limited budget.⁸⁹ Family Medicine residents at East Carolina University prepared recipes based on the Mediterranean diet following the food budget parameters of USDA-determined low, moderate, and liberal cost levels.⁹⁴ In a novel consideration of medical student food insecurity, an elective at Brown University resulted in a reduction in the number of medical students reporting insufficient funds for food after a 4-week course introducing an economical plant-based diet with extra virgin olive oil that was previously developed for a food pantry.⁷⁷

Trainee well-being. Attention to medical trainee well-being was a common characteristic of culinary medicine experiences, with 40% ($n = 46/116$) of experiences addressing self-care, often through targeting personal dietary behaviors of trainees.^{34,47–49,51,56,59,62,67,69,70,76,77,85,86,90,91,93,96,98,102,105,106,108,109,111,113,116,122,129,131,132,135,139}

Clinical students at Keck SOM received individualized coaching on personal diet while learning coaching skills themselves.⁹⁸ Lifestyle medicine curricula and student interest groups at multiple institutions emphasized self-care not only through culinary medicine experiences but also through consideration of other factors, such as stress management, sleep, mindfulness, and exercise.^{98,105,108,111,113,122} Outside of the required longitudinal lifestyle medicine curriculum woven throughout all four years at the medical school, the University of South Carolina SOM Greenville offers a lifestyle medicine elective rotation for clinical medical students that features a plant-based cooking demonstration, observation of a class instructing on grocery store shopping, and counseling practice at a lifestyle medicine clinic.¹⁰⁵ In promotion of student wellness, the elective sets aside 10 h of "student wellness time" each week.¹⁰⁵ Through maintenance of an organic garden, the University of South Carolina SOM Greenville is one of a handful of institutions that offer medical trainees the opportunity to participate in gardening.^{112,122,128,132}

Cultural considerations. A small number of culinary medicine opportunities ($n = 14/116$) mentioned cultural considerations.^{62,67,78,81,82,91,92,94,97–100,106,110} For example, medical students taking an elective at Texas Tech University Health Sciences Center SOM were assigned a different cultural diet (Chinese, Mediterranean, Nigerian, Central American, or US-Southern) during each culinary session,⁶⁷ and Health meets Food culturally adapted its courseware for Hispanic populations.¹¹⁰ In a student-led interprofessional culinary medicine workshop at the University of Saskatchewan, students enjoyed learning about indigenous culture and foods, including sampling new foods.⁹⁷ An elective for clinical medical students at West Virginia University incorporated cultural and religious considerations, particularly tailored to their Appalachian state.¹⁰⁰

Impact of culinary medicine experiences

Over half of the publications ($n = 54/100$) reported evaluation outcomes, including 50 publications reporting on evaluations of 45 individual experiences/interventions (summarized in the Supplemental Appendix). Seven publications reported preliminary results/evidence,^{34,48,51,65,79,81,131} and five publications were multisite studies.^{136–140} Most evaluations were conducted through surveys, and a minority of publications reported findings from trainee written reflections or course evaluations. We identified several ($n = 28/45$) pilot program evaluations.^{34,35,51,52,55,56,58,60,67–77,83,85,89–93,96,98,100,101,108} Most evaluations were of medical student experiences, while seven evaluations included resident experiences.^{56,57,68,70,71,94,96} Evaluations frequently assessed outcomes relevant to food, nutrition, and clinical practice, such as the impact of the experiences on attitudes, nutrition knowledge and skills, culinary knowledge and skills, confidence, personal dietary behaviors, and clinical practice behaviors. Several experiences noted improved attitudes regarding nutrition in clinical practice,^{34,51,72,73,82,85,91,98,101,135} nutrition knowledge,^{34,48,52,55,57,60,63,65,67–69,73,76,81,86,91,92,96–98,100,102} and confidence in dietary counseling skills.^{34,51,52,55,68,69,82,90,91,94,96,98,101,102} Many experiences reported changes in dietary behaviors of trainees,^{34,47,76,85,91,93,131,135} for example improvements in fruit and/or vegetable intake.^{34,76,91,131,135} Other studies included outcomes related to the tailored focus of the elective, such as improving food insecurity scores of medical students⁷⁷ or improving attitudes or knowledge regarding interprofessional team care.^{72,97,102} Multiple evaluations reported trainee feedback about the experience, which was generally positive, with feedback such as helpful content,^{47,83,86,93,94,100,108} trainees indicating they would recommend the experience,^{47,78,83,86,90,93,98,100,101} and an appreciation of the opportunity to engage with their peers through the experience.^{80,92,93,108} Several experiences reported plans to continue the culinary medicine experience, often due to positive feedback from and positive impact on participants.^{52,58,67,69,78,80,85,89,92,93,97,98,100,112}

Our review included publications from the large, multisite Cooking for Health Optimization with Patients (CHOP) study that tracks medical trainee attitudes, dietary behaviors, and counseling practices, and these studies demonstrated improvements in trainee diet scores^{136–138,140} and dietary counseling competencies^{136,138,140} after participating in the Goldring Center for Culinary Medicine, later referred to as Health meets Food, hands-on cooking and nutrition education curriculum when compared to standard medical education, including when offered virtually.^{136–138,140}

Three publications reported outcomes of community or patient classes that medical students led or assisted in leading.^{87,99,141} The first study evaluated a program for patients with type 2 diabetes in which medical students assisted in teaching after receiving culinary medicine training.⁸⁷ The pilot randomized controlled trial resulted in lowered HbA1c, blood pressure, and cholesterol in participants.⁸⁷ The second study evaluated community classes led by medical students who received culinary medicine training through online modules and were required to pass corresponding quizzes before leading the classes.¹⁴¹ These student-led classes resulted in improved dietary behaviors and a decreased belief that “cooking takes excessive time” among the 1,381 community participants.¹⁴¹ In the third experience, preclinical medical students in a primary care track received four hours of training prior to leading virtual, bilingual (English/Spanish) community classes focusing on nutrition/cooking and exercise to predominantly low-income participants.⁹⁹ The majority of participants reported high satisfaction with classes and an intent to make dietary improvements.⁹⁹

Barriers and facilitators

Publications cited barriers and facilitators to implementing a culinary medicine experience, with some overlap (Figure 2). A common barrier described was the costs associated with a culinary medicine experience and the need to secure and maintain funding.^{56,60,69,77,79,89,93,94,98,102,104,108,111,112,114,117,121,132} Some of the costs related to culinary medicine experiences cited included food/cooking expenditures,^{59,69,70,74,75,86,94,98,102,103,121,123} curriculum licensing,^{74,121} staff/instructor time,^{102,103,113,121} and teaching kitchens.^{54,102,121,132} Addressing the cost of food, some programs focused on preparing low-cost recipes or purchasing in bulk.^{69,76–78,100,102} Licensing an existing curriculum such as the Health meets Food courseware, which programs cited as costing \$1,200–\$3,000, can add to cost;^{74,121} however, other publications listed free resources available to facilitate culinary medicine training.^{84,90,98,104,113} Startup expenditures associated with starting teaching kitchens are costly and can range from \$10,000 to more than \$500,000,^{54,132} a barrier overcome by some institutions accessing kitchen space through a culinary institute,¹³² community setting,^{70,74,75,102} a campus facility,¹⁰³ or faculty/trainee homes, including through virtual/online offerings.^{90,102,114,117,132} The Teaching Kitchen Collaborative offers free guidance on establishing teaching kitchens through a seminar.¹¹⁷ Accessing adequate kitchen space, such as the size of the kitchen limiting class capacity, was also a barrier.^{60,67,69,75,79,91,100,136} For several experiences, funding or donations helped facilitate the cooking and nutrition training.^{44,54,59,70,74,75,81,84,86,94,98,102,106–108,111,113,115,121,123–125}

Instructors and institutional support were identified as facilitators and barriers. Some experiences cited faculty as helpful advocates, advisors, and experts for culinary medicine experiences.^{69,72,94,97,98,100,102,105,107,108,111,112,119,125,127} However, securing faculty with the necessary expertise can be a challenge,^{91,105,114} and faculty may need to volunteer their time, a potential barrier given demanding schedules.^{91,119,121} Institutional support was another factor cited as both a barrier and a facilitator, particularly through the availability of

funds and support from the administration, such as providing time for a culinary medicine experience during medical school orientation.^{86,91,93,94,98,103,105,106,108,112,121,132}

Finding time for a culinary medicine experience in an already packed curriculum was another common barrier cited.^{60,70,83,88,94,105,108,111,112,119,121,134,136} Even when culinary medicine is implemented as an elective or extracurricular activity, trainees face barriers of competing demands on their schedule and may not receive academic credit for participation in a culinary medicine experience.^{70,78,102,108,111,121} Scheduling culinary medicine classes amidst packed curricula and competing demands was a barrier¹⁰⁸ that was overcome by one elective offering brief sessions with flexible meeting times based on student schedules⁷⁶ and another elective designed as a brief, 2-week clinical elective for flexibility.¹⁰⁰ Access to online modules and videos was also a facilitator that offered flexibility.^{65,69,83,94,132} Integration of a culinary medicine experience into the existing curriculum was a facilitator for other experiences, such as introducing a culinary medicine-focused track for a required IPE curriculum,⁸⁸ adding a hands-on cooking experience to orientation or a retreat,^{68,108} or introducing an experiential hands-on cooking activity to problem-based learning of basic sciences.⁸⁰ Another barrier to introducing more nutrition in medical training curricula was the lack of emphasis on assessment of practical nutrition competencies on licensing examinations.¹²⁶

Additional facilitating factors cited include collaboratives and partnerships. Some institutions joined or formed collaboratives, such as the Teaching Kitchen Collaborative, Lifestyle Medicine Education Collaborative, and Ohio-based “Health Meets Food Collaborative”, which can facilitate shared learning and resources.^{89,112,121,127} Community partnerships also helped facilitate culinary medicine experiences, at times helping overcome barriers such as locating kitchen space or identifying/funding qualified instructors.^{74,89,102,113,121} Three Ohio-based training programs partnered with a local nonprofit that provided access to a kitchen space and a chef instructor and as a result of their shared community partnership formed the “Health Meets Food Collaborative.”¹²¹ A partnership with a nonprofit helped Northwestern facilitate curriculum development and service-based learning opportunities.^{34,118} Interprofessional collaborations with dietetics and culinary arts were commonly mentioned facilitators that improved access to nutrition and culinary expertise.^{60,65,68,69,74,81,83,86,102,103,107,116,119,126} A final common facilitator of culinary medicine experiences was trainee interest and advocacy. As previously described, multiple programs were trainee-driven, often due to a desire for more nutrition training.

Discussion

This scoping review of culinary medicine experiences for medical students and residents demonstrates that culinary medicine is an emerging experiential nutrition training strategy, as shown by the identification of several pilot experiences and the fact that the majority of the articles were published in 2018 or later. Culinary medicine experiences are offered through a variety of curricula, settings, and instruction and have resulted in positively impacting medical trainees both personally and professionally, despite barriers to implementation such as resources needed and limited curricular space.

Medical educators and trainees recognize there are deficiencies in training physicians in practical nutrition skills, and culinary medicine experiences are being implemented to address this gap.^{50,53,57} Medical trainees are also advocating for more nutrition training, as shown by the number of trainee-driven experiences. The positive impact of culinary medicine experiences on trainee knowledge, skills, and attitudes regarding nutrition suggests that culinary medicine can provide an effective path to achieving nutrition competencies, enabling medical trainees to better counsel patients about diet. Equipping providers with culinary medicine knowledge and skills has the potential to translate to improved patient outcomes, as shown by the improved biometric markers of chronic disease in patients with type 2 diabetes after participating in a culinary medicine course led by a physician, chef, and medical students⁸⁷ and improved dietary behaviors of participants in a medical student-led community class.¹⁴¹ This review also found that medical trainees generally enjoyed the culinary medicine experiences and would recommend them to their peers.

For medical education stakeholders interested in enhancing nutrition training of physicians, the hands-on cooking aspect of culinary medicine offers an innovative approach to nutrition training through active learning experiences, and teaching kitchens, or personal kitchens if a virtual experience, can be conceptualized as “laboratories” for learning nutrition, analogous to medical student laboratory experiences learning anatomy and pathology.^{81,89,142} Active learning interventions that focus on the development of skills rather than knowledge attainment alone have been found to be more successful strategies for nutrition education,^{33,35} supported by the CHOP studies demonstrating a positive impact of nutrition education with hands-on cooking compared to traditional nutrition training in medicine.^{135,138,140} Encouraging trainees to apply knowledge through practice in meaningful ways, active learning fosters understanding and greater learning achievements.³⁴ This review also reveals that experiential nutrition training through hands-on cooking can provide opportunities to teach empathy for patients through living patients’ experiences implementing specific dietary restrictions or adhering to budgetary constraints.^{67,76,78,80,83,89}

Amidst growing concerns regarding the problem of physician and medical trainee burnout, culinary medicine also addresses an unmet need for improved trainee well-being through self-care as trainees can gain practical nutrition knowledge and skills that they can implement in their personal lives. Several studies in this review positively impacted personal dietary behaviors of medical trainees. Culinary medicine activities, especially when implemented in a small group setting, can also provide opportunities for peer engagement outside the rigorous demands of the medical curriculum and can integrate additional self-care activities such as gardening and mindful eating. Improved personal dietary behaviors have the potential to translate to more frequent and effective nutrition care in the clinical setting, as physicians are more likely to effectively counsel about preventive behaviors they practice themselves.^{122,143}

While culinary medicine training offers several benefits, challenges to its implementation can limit adoption. This review shows how medical schools and residency programs are tailoring culinary medicine experiences to meet their needs and demonstrates ways to overcome barriers to implementing culinary medicine during medical training, such as

funding/resources, kitchen access/space, and faculty. Funding and resource needs can be minimized through cost-effective food purchasing and recipe planning¹⁰² and using free curriculum resources.⁹⁸ Virtual culinary medicine experiences can increase accessibility of culinary medicine programming by cutting costs and eliminating the need to find an adequate kitchen space while potentially offering the added benefit of participants gaining more comfort cooking in home kitchens.^{98,102,136} Finally, challenges regarding faculty time can be reduced through medical trainee-led efforts or partnerships with dietetic training programs through which dietetic trainees volunteer their time and expertise while fulfilling their own training requirements.^{69,89,102} If faculty time or turnover is a concern, engaging trainees to take responsibility for program facilitation could address this barrier.

Adding new learning experiences to a packed curriculum is another challenge to introducing culinary medicine. Offering elective or extracurricular opportunities is one strategy to provide these experiences to medical trainees; however, trainees may not feel they can participate given the demands on their schedules, especially if they do not receive academic credit.^{102,121} Some programs demonstrated creative ways to integrate required experiences, such as introducing hands-on cooking and nutrition to an orientation,¹⁰⁸ retreat,⁶⁸ IPE requirement,⁸⁸ or problem-based learning exercise.⁸⁰ Culinary medicine can also supplement case-based learning exercises, a frequent learning activity incorporated into culinary medicine experiences. Based on this review, required experiences may be more feasible when offered as a brief session during preclinical training or during residency whereas elective rotations may be a more feasible route for clinical medical students. Additionally, programs can use culinary medicine experiences to simultaneously fill gaps in nutrition training through experiential nutrition learning activities while also meeting some of the accreditation standards from the Liaison Committee on Medical Education (LCME)¹⁴⁴ and the Accreditation Council for Graduate Medical Education (ACGME),¹⁴⁵ as outlined in Table 8.

Momentum behind Food is Medicine is growing, as shown by the recent White House Conference on Hunger, Nutrition, and Health;¹⁴⁶ Food Is Medicine Summit hosted by the U.S. Department of Health and Human Services;¹⁴⁷ and American Heart Association Food Is Medicine presidential advisory.¹⁴⁸ Additionally, the U.S. House of Representatives passed a resolution, H.Res.1118, that calls for “meaningful physician and health professional education on nutrition and diet” during their training.¹⁴⁹ Food is Medicine, defined in a recent NIH concept clearance for Food is Medicine Networks or Centers of Excellence as “an umbrella term for programs that respond to the critical link between diet and health involving a nexus to the health care system and the provision of different services,” includes culinary medicine as a nutrition training strategy.¹⁵⁰ Medical training organizations and accreditation bodies are taking steps to address these calls to action. For instance, in response to the recent White House National Strategy on Hunger, Nutrition, and Health and calls from the “Food Is Medicine” caucus of Congress for improved nutrition training of physicians, the ACGME collaborated with the Association of American Medical Colleges (AAMC) and the American Association of Colleges of Osteopathic Medicine (AACOM) to hold a Summit on Medical Education in Nutrition during which medical education stakeholders worked together to strategize “integrating nutrition and food insecurity into the medical education curricula while emphasizing health equity and interprofessional

care.”¹⁵¹ As shown in this review, culinary medicine experiences can be a useful strategy for achieving this goal, particularly when culinary medicine experiences integrate social determinants of health and IPE. Medical training organizations and accreditation and licensing bodies in medical education can take further steps to incentivize greater attention to practical nutrition training, such as culinary medicine training, through developing standards regarding nutrition competencies and outlining and/or implementing measures to assess them. Integration of practical nutrition training could be further incentivized through federal and state funding opportunities.

In addition to gaps in nutrition training, physicians face multiple barriers to addressing nutrition in clinical practice, including time constraints and patient barriers.^{17,152} Culinary medicine training may help address some of these barriers. Interprofessional education specifically through dietetics collaboration can expose medical trainees to the dietetics profession, which may in turn improve interprofessional collaboration in practice. RDs offer not only nutrition expertise but also more time to dedicate to dietary counseling. However, given that physicians recognize they have a role in dietary counseling and dietitians are not always accessible to patients, training physicians to confidently advise their patients about diet is essential, and culinary medicine training can equip physicians with practical nutrition skills necessary for clinical practice. Teaching motivational interviewing and ways to address social determinants of health through culinary medicine training can also help better prepare physicians to address patient barriers to dietary change.

Strengths of this scoping review include the study selection process and the use of the Joanna Briggs Institute framework for scoping reviews and PRISMA-ScR as guides. The review provides a comprehensive picture of culinary medicine experiences through the inclusion of 100 publications and identification of 116 culinary medicine experiences from 70 institutions, thus providing a variety of settings and strategies used by medical education stakeholders when designing and implementing culinary medicine training spanning undergraduate and graduate medical education. Additionally, the inclusion of multiple IPE experiences allows for an improved understanding of how culinary medicine may be impacting other professional trainees. The review also provides multiple examples of ways to foster trainee well-being and integrate community engagement, service-based learning, and social determinants of health into medical training.

This review also has limitations. With the goal of comprehensively describing culinary medicine experiences described in the literature, we included publications with brief descriptions of culinary medicine experiences and subsequently some experiences were lacking in detail, leaving an incomplete picture of the experience. We did not assess the quality of the studies evaluating the impact of culinary medicine experiences, and many experiences were elective/extracurricular which may bias the results of program evaluations. Additionally, many programs may not publish evaluation outcomes of their culinary medicine programming, especially due to the small number of participants that can be expected with many culinary medicine offerings, further limiting the ability to fully understand the impact of culinary medicine experiences. The large number of recent publications and pilot programs demonstrates the momentum behind culinary medicine experiences but also highlights the need for more research to understand their long-term

impact, feasibility, and sustainability. This review also demonstrated that culinary medicine experiences are far more prevalent for medical students than residents, and more evidence regarding the feasibility and impact of the experiences during graduate medical education is needed.

Conclusion

Culinary medicine is an innovative learning opportunity in medical training that has the potential to fill gaps in nutrition training with the integration of active learning through hands-on cooking. Several studies, the majority of them pilots, evaluating culinary medicine experiences for medical trainees have demonstrated a positive impact on trainees' nutrition competencies. However, more research is needed to understand the long-term impact on clinical practice and the sustainability of offering culinary medicine during medical training. The interprofessional nature of many experiences supports the potential role of culinary medicine in training other health professionals in nutrition. While several barriers present challenges to culinary medicine in medical training, cooking and nutrition instruction can be implemented through a variety of strategies, depending on the resources and circumstances of individual institutions. Culinary medicine has the potential to transform nutrition training in medicine through offering an innovative, experiential learning experience that can be creatively designed to address trainee well-being and to meet other curricular accreditation standards, such as integration of IPE and exposure to social determinants of health. Ultimately, culinary medicine could enhance patient care through improved nutrition training of physicians. Medical trainees are advocating for more nutrition in medical curricula, and culinary medicine may be the right "recipe" for meeting their needs in an effective and enjoyable way.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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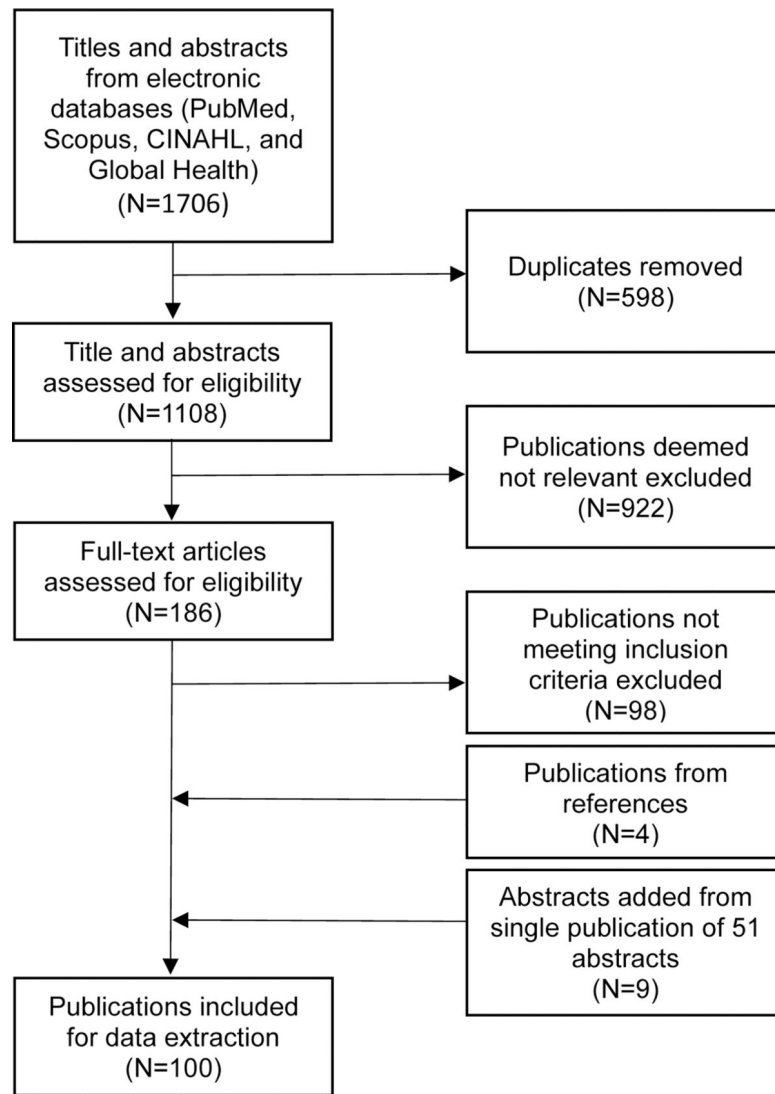


Figure 1.
PRISMA study flow diagram.

Figure 1 depicts the process for the inclusion of publications in this review and the corresponding number of publications for each step of the process.

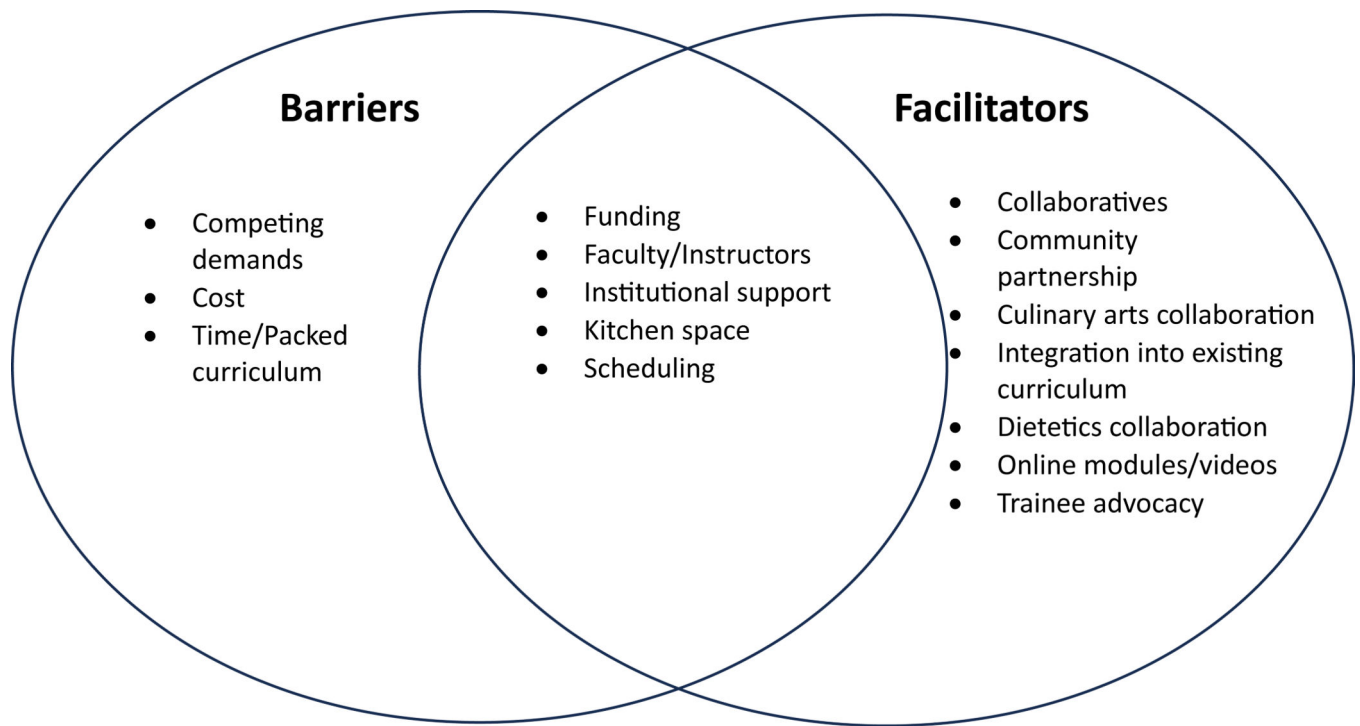


Figure 2.

Barriers and facilitators of implementing culinary medicine experiences for medical trainees. Figure 2 summarizes common barriers and facilitators to culinary medicine implementation during medical training identified in this review and demonstrates the overlap between some barriers and facilitators.

Table 1.
Search Terms with Boolean Operators

First Search Term		Second Search Term
cooking OR teaching kitchens OR culinary OR kitchen OR food as medicine OR food is medicine OR practical nutrition OR experiential nutrition OR nutrition curriculum OR chef OR meals OR meal OR meal preparation OR food preparation OR dinner OR lunch OR lifestyle medicine OR lifestyle counseling OR lifestyle change	AND	medical school OR medical schools OR medical students OR medical education OR medical resident OR medical residents OR medical residency OR medicine resident OR medicine residents OR medicine residency OR medical training OR health professional students OR healthcare professional students OR resident physician OR resident physicians OR physician resident OR physician residents OR residency program OR residency programs OR residency training OR intern OR interns OR pediatric resident OR pediatric residents OR health professional student OR health professional students OR health professional education OR health sciences student OR health sciences students OR medical training OR medical trainee OR medical trainees OR future physician OR future physicians OR future doctor OR future doctors OR physicians-in-training OR doctors-in-training OR interprofessional education OR clerkship OR clinical-rotation OR elective OR residency curriculum OR medical curriculum

Table 1 lists the search terms used for this scoping review and how the Boolean operators “OR” and “AND” were used.

Table 2.
characteristics of culinary medicine offerings by institution.

Institution	Medical students	residents	required	elective	extracurricular/ student organization	Specialized track/ pathway	interprofessional trainees	Service learning
a. T. Still University— School of Osteopathic Medicine, Arizona ¹¹¹	✓ Preclinical, clinical		✓					
Baylor college of Medicine ¹³²		✓ Peds	✓					
Boston University School of Medicine ^{25,53,120,132}	✓			✓	✓ interest group			
Brody School of Medicine at East Carolina University ⁹⁴		✓ FM					✓ Culinary High School Students, Dietetic Interns	
California Health Sciences University College of Osteopathic Medicine ⁶⁵	✓ Preclinical						✓ Dietetic Interns	
Case Western Reserve School of Medicine ¹⁰³	✓ Preclinical, Clinical			✓		✓	✓ Dietetic Interns, Master of Science in Nutrition Students	
Des Moines University School of Osteopathic Medicine ^{1,132}	✓ Clinical			✓			✓ Culinary Students	
Duke University School of Medicine ⁷²	✓			✓			✓ Nursing, Physician Assistant, & Physical Therapy Students	
Geisel School of Medicine at Dartmouth ^{126,132}	✓	✓ IM		✓				
Harvard University – Harvard Medical School and Harvard T.h. Chan School of Public Health ^{1,54,122,132}		✓ PM&R	✓		✓Healthy Kitchens, Healthy Lives Conference			
Hofstra School of Medicine ¹³²	✓	✓		✓				
Joan c. Edwards School of Medicine at Marshall University ⁶³	✓ Preclinical,Clinical			✓			✓ Dietetic Interns	
Johns Hopkins University School of Medicine ^{70,82}	✓ Preclinical	✓ Prev Med		✓				
Keck School of Medicine of the University of Southern California ^{52,89,98,99}	✓ Preclinical, Clinical			✓		✓		✓
Loma Linda University School of Medicine ^{111,113,128,131}	✓ Preclinical, Med Clinical	✓ Prev	✓	✓		✓		✓
Medical college of Georgia ¹⁰⁷	✓				✓			✓

Institution	Medical students	residents	required	elective	extracurricular/ student organization	Specialized track/ pathway	interprofessional trainees	Service learning
Mount Carmel Internal Medicine residency Program ¹²¹		✓ IM	✓				✓ dietetic Students	
Nationwide children's hospital Pediatric residency Program ¹²¹		✓ Peds		✓			✓ dietetic Students	
Nicholls State University/ Louisiana State University School of I Medicine – New Orleans ⁵⁸	✓ Clinica							
Northern Ontario School of Medicine University ^{60,95}	✓ Preclinical						✓ Dietetic Interns	
Northwestern University Feinberg School of Medicine ^{34,51,96,130}	✓ Preclinical	✓ FM	✓ Residents	✓ Preclinical				✓
New York University Grossman School of Medicine ^{62,85}	Preclinical			✓			✓ Graduate Nutrition Students	
Oakland University William Beaumont School of Medicine ¹²⁴	✓				✓ Interest Group			✓
Ohio State University College of Medicine ¹²¹	✓ Clinical			✓			✓ Dietetic Students	
Ohio University Heritage College of Osteopathic Medicine ^{109,112,123}	✓				✓ Interest Group			✓
Oregon Health and Science University – Department of Preclinical Family Medicine ⁴⁹	✓ Preclinical			✓				
Penn State College of Medicine ^{68,74,75,80}	✓ Preclinical, Clinical	✓ FM	✓ Preclinical, Residents	✓ Clinical				
Perelman School of Medicine at the University of Pennsylvania ⁹¹	✓ Clinical			✓				✓
Rutgers New Jersey Medical School ¹⁰⁹	✓				✓ Interest Group			
Santa Barbara Cottage Hospital ¹	✓ Clinical			✓				
Stanford University School of Medicine ^{79,131}	✓ Preclinical, Physician			✓			✓ Physician Assistant Students	
SUNY Downstate Department of Family Medicine Residency M Program ⁶¹		✓ F	✓					
SUNY Upstate School of Medicine ¹	✓			✓				
Texas college of Osteopathic Medicine ¹³³	✓ Preclinical			✓				

Institution	Medical students	residents	required	elective	extracurricular/ student organization	Specialized track/ pathway	interprofessional trainees	Service learning
Texas Tech University Health Sciences Center School of Medicine in Lubbock ⁶⁷	✓ Preclinical			✓				
Touro University Nevada College of Osteopathic Medicine ⁸³	✓ Preclinical, Clinical			✓				
Tulane University School of Medicine ^{25,66,115,129,131,132,135}	✓ Preclinical, Culinary	✓	✓	✓			✓ Culinary Nutrition Interns	✓
University of Alabama ^{71,131}	✓	✓ FM		✓			✓ Nutrition Students	
University of Alabama at Birmingham Heersink School of Medicine ⁷⁸ Clinical	✓ Preclinical, Clinical			✓				✓
University of Arizona College of Medicine – Phoenix ¹¹⁹	✓ Clinical			✓	✓ Interest Group			✓
University of Arkansas for Medical Sciences college of Medicine ¹⁰¹	✓						✓ Genetic Counseling, Pharmacy, Physical Therapy, & Radiologic Imaging Students	
University of California, Irvine ^{113,131}	✓ Preclinical	✓ FM		✓				
University of California, Los Angeles David Geffen School of Medicine ⁵⁵	✓			✓			✓ Nursing & Dental Students	
University of California San Francisco School of Medicine ⁵⁰	✓ Preclinical		✓					
University of Central Florida ^{57,113,116}	✓ Clinical	✓	✓	✓				✓
University of Cincinnati college of Medicine ⁴⁷	✓				✓		✓ Nursing, Allied Health, Pharmacy, & Health Promotion Students	
University of Colorado School of Medicine ^{56,125}	✓	✓ Peds		✓	✓ Interest Group			
University of Maryland School of Medicine ^{44,69,102}	✓ Preclinical,Clinical		✓	✓			✓ Dental, Dietetic/ Nutrition, Law, Pharmacy, & Social Work Students	
University of Minnesota Medical School ^{48,92}	✓ Preclinical,Clinical			✓				
University of Mississippi Medical Center ¹⁰⁶		✓ Prev Med	✓					

Institution	Medical students	residents	required	elective	extracurricular/ student organization	Specialized track/ pathway	interprofessional trainees	Service learning
University of Nevada, Reno School of Medicine ⁶⁴	✓ Preclinical							
University of New Mexico Internal Medicine Residency Program ¹²²		✓ IM						
University of North Carolina School of Medicine ⁹⁰	✓ Clinical			✓				
University of Oklahoma College of Medicine ¹¹¹	✓ Preclinical			✓		✓		✓
University of Rochester School of Medicine & Dentistry ⁸¹	✓ Preclinical		✓				✓ Dietetic Interns	
University of Saskatchewan ⁹⁷	✓						✓ Dentistry, Nutrition, Nursing, & Pharmacy Students	
University of South Alabama Mitchell Cancer Institute ⁸⁴	✓			✓			✓ Nursing & Other Health Sciences Students	
University of South Carolina School of Medicine Greenville ^{93,105,111,112,128}	✓ Preclinical, Clinical			✓				✓
University of Texas Health Sciences Center ¹³⁹	✓							
University of Texas Medical Branch-Family Medicine Residency Program ¹²²	✓	✓ FM						
University of Utah School of Medicine ¹²⁴	✓				✓ Interest Group		✓ Dietetic Students	✓
University of Texas Southwestern Medical School ⁸⁶	✓ Preclinical			✓			✓ Dietetic Student Interns	
Virginia Tech Carilion School of Medicine ^{88,112}	✓ Preclinical, Clinical		✓				✓ Nursing & Physician Assistant Students	✓
Wake Forest University School of Medicine ¹⁰⁸	✓ Preclinical		✓	✓				✓
Warren Alpert Medical School of Brown University ^{25,76,77,113}	✓ Preclinical, Clinical			✓			✓ Culinary & Nursing Students	✓
Wayne State University School of Medicine ^{35,59}	✓ Preclinical			✓				
West Virginia School of Osteopathic Medicine ⁷³	✓ Preclinical, Clinical			✓				
West Virginia University School of Medicine ^{100,132}	✓ Clinical		✓	✓				
Western University of Health Sciences College of	✓			✓		✓		✓

Institution	Medical students	residents	required	elective	extracurricular/ student organization	Specialized track/ pathway	interprofessional trainees	Service learning
Osteopathic Medicine of the Pacific ¹¹²								
Yale School of Medicine Preventive Medicine Residency Program ¹³²		✓ Prev Med	✓					

Table 2 summarizes characteristics of culinary medicine experience offerings by the identified institutions, including available details regarding trainee level, form of offering the experience, and tailored components of interprofessional education and service-based learning.

abbreviations: FM = Family Medicine, IM = internal Medicine, Peds = Pediatrics, PM&R = Physical Medicine and rehabilitation, Prev Med = Preventive Medicine.

Table 3:**Examples of Culinary Medicine Offerings**

<i>Elective Experience for Preclinical Medical Students: Wayne State University SOM^{35,59}</i> • One month after completing a required lecture-based Clinical Nutrition course, 20 preclinical medical students participated in a 4-week elective, “Culinary Nutrition: A Practical Course” • Engaged in hands-on cooking sessions complementary to the required nutrition curriculum themes: micronutrients, obesity, diabetes, and cardiovascular disease • Elective was designed and facilitated by a clinical medical student training in culinary arts with oversight from the Clinical Nutrition course director • Students met for 4 sessions at an undergraduate teaching kitchen facility • During the 2-hour sessions, students received culinary instruction, prepared food in small groups, and engaged in nutrition discussion while sharing the meal
<i>Required Experience for Preclinical Medical Students: University of Maryland SOM⁶⁹</i> • Following an initial pilot of an elective experience for second- and third-year medical students, a 3-hour culinary medicine experience for first-year medical students was integrated into the required Introduction to Clinical Medicine course • Class of 125 students was divided into 5 sessions of 25 students at a time • Students received nutrition instruction, cooked 3 recipes complementary to lecture content in small groups of 5 students, and shared the meal while discussing the relevance of the session to patient care and self-care
<i>Elective Experience for Clinical Medical Students: Perelman SOM at the University of Pennsylvania⁹¹</i> • Elective for fourth-year medical students consisting of eight 2-hour sessions with nutrition instruction, cooking, and sharing a meal while discussing a case • Initiated and coordinated by students • Course covered 7 topics: healthy diet, obesity, diabetes, celiac disease, hypertension, coronary artery disease, and pregnancy/lactation • Students read journal articles in preparation for classes, completed a food insecurity-focused capstone project, and engaged in service through a local high school
<i>Required Experience for Clinical Medical Students: Loma Linda University SOM¹¹</i> • Fourth-year medical students complete a required rotation in lifestyle and preventive medicine that focuses on culinary medicine • The required 4-week clerkship promotes the continued development of personal and clinical lifestyle medicine skills • Part of 4-year longitudinal Lifestyle Medicine curriculum
<i>Elective Experience for Residents: University of Colorado Pediatric Residency⁵⁶</i> • Seven pediatric residents participated in the pilot offering of the “Food as Medicine curriculum” • Over 4 weeks, residents engaged in hands-on cooking, self-directed learning, and discussions with pediatric nutrition experts and policymakers • Residents participated in immersive experiences in the community to learn more about different aspects of the food system, such as visiting farmers markets and touring a food recovery center
<i>Required Experience for Residents: State University of New York (SUNY) Downstate Department of Family Medicine Residency Program⁶¹</i> • Designed to meet the social determinants of health graduate medical education requirement • Residency program partnered with God’s Love We Deliver, a New York City-based provider of medically tailored meals and medical nutrition therapy to meet the needs of individuals facing chronic illness • Residents participated in hands-on cooking in the God’s Love kitchen and received nutrition instruction, with a focus on “food as medicine” for chronic disease management, from a God’s Love RD • Participants gained skills in assessing malnutrition, screening for food insecurity, and making referrals to resources in the community
<i>Specialized Track/Pathway: SOM at Case Western University JJM Wellness and Preventive Care Pathway¹⁰³</i> • 16-month longitudinal elective experience for medical students • Students met monthly for 3 hours in the Nutrition Department’s food sciences lab • Received RD-led nutrition and culinary instruction and engaged in discussion while cooking recipes relevant to the nutrition lecture content
<i>Retreat: Penn State Family and Community Medicine Residency at Mount Nittany Medical Center⁶⁸</i> • Residents received culinary medicine instruction led by RDs during their annual resident retreat day • Prior to the retreat, residents selected obesity management as the topic to be covered and read a relevant journal article • Through a mix of small and large group activities, residents engaged in discussion about an obesity management case, fad diets, and weight loss supplements • Participated in hands-on cooking of recipes from Health meets Food courseware • Class concluded with sharing a meal together and discussing the applicability of the culinary medicine experience to their practice
<i>Student Organization: University of Utah SOM Lifestyle Medicine Interest Group¹²⁴</i> Plant-based Cooking Night: • Hosted at a medical student’s home • Interest group leaders presented research on whole-food, plant-based diets • Students prepared and shared appetizers, entrees, and dessert Culinary Medicine Course: • Interest group co-taught a culinary medicine course with a dietetics student at a student-run clinic

Table 3 summarizes examples of elective and required culinary medicine experience offerings at the various trainee levels and examples of experiences offered as a specialized track/pathway, retreat, and student organization. Abbreviations: RD = registered dietitian, SOM = School of Medicine.

Table 4:

Locations of Culinary Instruction

Church ^{70,82}
Community or technical college ^{84,132}
Community organization ^{52,61,69,102,121}
Culinary or hospitality schools ^{25,66,83,88,93,113,116,132}
Dietetics/Nutrition Department ^{63,103}
Food processing and distribution warehouse ⁹²
High school ⁹⁴
Hospital cafeteria ⁸¹
Hospital teaching kitchen ^{53,121,132}
Medical school faculty home kitchens ¹³²
Medical school-based teaching kitchen ^{115,135}
Medical student's home ¹²⁴
Organic farm with a teaching kitchen ⁴⁷
Research lab ¹⁰⁰
Senior center ^{74,75}
Undergraduate facility ^{35,68,97,131}
Virtual ^{90,96,98,102,130,132,136}
Wellness center ⁸⁹

Table 4 lists the variety of locations where culinary instruction took place.

Table 5:**Instructors of Culinary Medicine Experiences**

Certified Culinary Medicine Specialist (CCMS) ^{94,117}
Chef ^{34,44,47,52,55,62,67,72-74,78,79,83-85,88,89,91-93,96,97,111,113,115,119,121,131,132}
Community member ^{74,75,97,102}
Culinary trainee ^{25,132}
Dentistry faculty ¹⁰²
Dietetics/nutrition trainee ^{60,63,65,69,71,81,86,94,95,102,103,121}
Dietitian/Nutrition faculty ^{25,44,47,52,55,60-63,68,71,76-78,81,82,85,86,89,91,94,95,100,103,106,113,115,119,121,132}
Dietitian-chef ^{71,101,132}
Gardener ¹³²
Health coach ¹¹³
Health psychology faculty ^{88,132}
High school culinary teacher ⁹⁴
Librarian ⁸⁴
Medical student trained in culinary arts ^{35,59}
Medical student ^{25,35,59,86,98,124,131,132}
Nursing faculty ^{88,101}
Pharmacy faculty ¹⁰²
Physician assistant faculty ⁸⁸
Physician/Residency/Medical school faculty ^{47,52,61-63,69,71,73,79,82,85,86,88,89,91-94,96,98,99,102,112,113,115,119,131}
Physician-chef ^{50,70,79,98,131,132}
Public health specialist ⁹²

Table 5 lists the variety of instructors who helped facilitate experiences.

Table 6:

Examples of Curricula

<i>Homegrown Medical Student Curriculum: "Food Matters for Doctors" at the University of Minnesota</i>⁸² <u>Overview:</u> • Designed by medical educators to address gap in practical nutrition training • Applies nutrition didactics content to experiential hands-on cooking activities <u>Logistics:</u> • 6 sessions, each 3 hours long • General format: didactics → cooking → discussion while sharing meal together <u>Curriculum Components:</u> • Example didactics topics: MyPlate, the Standard American Diet, mindful eating, the gut microbiome, the relationship between inflammation and chronic disease • Cooking complementary to nutrition presentations/discussions • Tips for dietary counseling covered during culinary portion • Specific diets covered: vegetarian, vegan, Mediterranean, Paleolithic, gluten-free, low-glycemic index, and anti-inflammatory • Other components: mindful eating, sharing food stories, social and cultural aspects related to food	<i>Homegrown Residency Curriculum: Johns Hopkins Preventive Medicine Residency Program</i>⁷⁰ <u>Overview:</u> • Program administrators used community-engaged approach to develop a workshop series for preventive medicine residents to teach culinary and nutrition skills for personal well-being and clinical care • Based out of a patient-centered medical home with emphasis on meeting the needs of an underserved community <u>Logistics:</u> • Series of three 4-hour workshops • General format: introductions → didactics → cooking instruction and practice → sharing meal together while discussing topics of reflection <u>Curriculum Components:</u> • Program facilitators designed the curriculum based on input from the community and evidence from the literature • Content covered culinary skills, the cost of food and budget-friendly shopping, understanding nutrition labels, and the benefits of cooking and a well-balanced diet on health • Recipes reflected plant-based meals with reduced sodium and saturated fat content • Reflection topics discussed during sharing of meal included challenges related to preparing the meal and acceptability of the meal by community members
<i>Open-access Curriculum: The Culinary Medicine Curriculum (CMC)</i>¹⁰⁴ (Example of implementation: Keck SOM clinical student elective⁸⁸) <u>Overview:</u> • Free curriculum that is an evidence-based and comprehensive guide to implementing culinary medicine learning experiences • Based on Stanford University SOM's culinary medicine elective ["The Doctor is In (the Kitchen)"]⁷⁹ <u>Logistics:</u> • Organized into nine 2-hour culinary skill-themed sessions • General format: prework → session that includes hands-on cooking, discussion, and motivational interviewing practice <u>Curriculum Components:</u> • Provides instruction in preparing healthy and affordable meals that taste good • Motivational interviewing training • Guidance in starting a culinary medicine course, including providing an equipment list for operating a pop-up teaching kitchen space • Includes session-specific materials such as learning objectives, prework, recipes, and discussion topics • Examples of sessions: "Roasting", "Sauté, Stir-fry, Simmer, Braise", "Beans and Whole Grains", and "The Dessert Flip & Healthy Desserts" • Emphasis on "whole-food, plant-based nutrition" with attention to diverse food preferences and traditions and resource limitations	<i>Licensed Curriculum: Health meets Food</i>^{110,115,129,132,135,136} <u>Overview:</u> • Courseware aims to bring together basic sciences, clinical knowledge, and culinary skills¹¹⁵ • Available for undergraduate and graduate medical education culinary medicine experiences^{115,132} <u>Logistics:</u> • General format: independently completing online module/quiz → in-class meeting consisting of discussion of module concepts and a case → cooking → discussion while sharing meal prepared^{115,135} • Adapted for virtual instruction¹³⁶ <u>Curriculum Components:</u> • Courseware consists of online modules with quizzes, readings, recipes for hands-on cooking workshops, and cases with discussion questions^{110,135} • Emphasis on the Mediterranean Diet¹¹⁰ • Many modules are specific to medical conditions and provide tailored culinary instruction for the condition, such as a focus on sodium in food preparation in the module, "Renal Physiology, Hypertension, Sodium and Potassium Homeostasis, Sodium Reduction, and Flavor Building"¹¹⁰ • Offers community courseware that can be used for service-based learning opportunities in conjunction with culinary medicine training¹²⁹
<i>Combination of Homegrown and Licensed Curriculum: The University of South Alabama Mitchell Cancer Institute</i>⁸⁴ <u>Overview:</u> • In line with cancer prevention programming promoted through the Institute, offered culinary medicine program to health professional trainees and community members	

- Faculty aimed to train student participants in nutrition competencies in a way that promoted more effective patient engagement
- Logistics:
- 6 weekly sessions, each 2 hours long
 - General format: faculty-led discussion of module content → cooking → enjoy meal together with chef-led discussion → concluding group discussion
- Curriculum Components:
- Curriculum consisted of 6 modules, such as “Introduction to Healthy Eating: Mediterranean Diet,” “Healthy Lunches,” and “Challenges to Healthy Eating: Carbohydrates and Healthy Snacking”
 - Chef-led discussion regarding nutrition specific to the food prepared
 - Group discussion regarding integrating meals prepared into personal life
 - The institution licensed the Health meets Food courseware for the program
 - Librarians delivered instruction on how to locate credible nutrition sources

Table 6 outlines examples of a variety of curricula used for culinary medicine experiences.

Table 7:
Examples of Interprofessional Education Culinary Medicine Experiences

<i>Virginia Tech Carilion SOM</i>⁶⁸ • Interdisciplinary team of course directors revised required 12-month IPE course to include a culinary medicine track • Interprofessional students: preclinical medical, nursing, and physician assistant students • Students participated in clinical nutrition didactics, cooked diet-specific meals as a team, and engaged in a community service project through local schools
<i>Duke University SOM</i>⁷² • Piloted an interprofessional culinary medicine experience to address limited coverage of nutrition content in the curriculum • Interprofessional students: medical, nursing, physician assistant, and physical therapy programs • Students participated in four sessions that included chef-led culinary training followed by a “dinner table” discussion of clinical and public health nutrition concepts led by experts in these fields
<i>University of Alabama</i>⁷¹ • Developed pilot program to promote interprofessional teamwork • Interprofessional students: medical trainees and nutrition students • Students learned from each other over food preparation and case discussion with the nutrition students providing guidance on food preparation and nutrition and the medical trainees contributing their knowledge of pharmacology and chronic diseases • Interprofessional teams also engaged in discussion about their respective professional roles and the potential for collaboration

Table 7 outlines examples of how some programs integrated interprofessional education (IPE) through culinary medicine experiences.

Table 8:
Ways Culinary Medicine Experiences Can Meet Accreditation Standards

Culinary Medicine Experience Component	Accreditation Standards (LCME¹⁴⁴ and ACGME¹⁴⁵)
Community Engagement and Service-Based Learning	LCME 6.6 Service-Learning/Community Service ACGME II.A.4.a).(2) design and conduct the program in a fashion consistent with the needs of the community
Cultural Considerations	LCME 7.6 Structural Competence, Cultural Competence, and Health Inequities ACGME IV.B.1.a).(1).(c) cultural humility ACGME IV.B.1.e) Interpersonal and Communication Skills
Interprofessional Education	LCME 7.9 Interprofessional Collaborative Skills ACGME VI.E.2. Teamwork
Social Determinants of Health and Health Inequities	LCME 7.6 Structural Competence, Cultural Competence, and Health Inequities ACGME II.A.4.a).(2) design and conduct the program in a fashion consistent with the needs of the community ACGME IV.B.1.f) Systems-based Practice
Trainee Well-Being	LCME 12.3 Personal Counseling/Mental Health/Well-Being Programs ACGME VI.C. Well-Being

Abbreviations: ACGME= Accreditation Council for Graduate Medical Education, LCME= Liaison Committee on Medical Education

Table 8 lists various components of culinary medicine experiences and corresponding accreditation standards for medical school and/or residency curricula that they may fulfill.