

Change Drivers and Trends Driving the Profession: A Prelude to the Visioning Report

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Table of Contents

| | |
|--|----|
| Introduction..... | 3 |
| The Approaching Gray Tsunami..... | 7 |
| Embracing America’s Diversity..... | 12 |
| Eating to Make the World a Better Place..... | 17 |
| Tailored Health Care to Fit My “Genes” | 22 |
| The Buck Stops Here | 26 |
| Making the Healthy Choice the Easy Choice | 31 |
| Creating Collaborative-Ready Health Professionals..... | 36 |
| Food as Medicine | 41 |
| Technological Obsolescence is Accelerating..... | 45 |
| Simulations Stimulate Strong Skills | 51 |
| GLOSSARY | 56 |
| Reference List | 63 |

Introduction

The Council on Future Practice (CFP) was created as a permanent organized body within the Academy responsible for formalizing an ongoing visioning process to define future nutrition and dietetic practice at all levels and to identify educational and credentialing needs required for future practitioners and their development.

The CFP is an Academy committee that collaborates with the Accreditation Council for Education in Nutrition and Dietetics (ACEND), the Commission on Dietetic Registration (CDR), and the Nutrition and Dietetics Educators and Preceptors (NDEP) to project future practice needs for the profession of nutrition and dietetics. Future practice, accreditation, credentialing and education represent the four critical organizational units and segments necessary to produce new practitioners and assist experienced practitioners in advancing their careers.

One of the functions of the CFP is to ensure the viability and relevance of the profession of nutrition and dietetics by engaging in a visioning process to identify the preferred future of the profession. The Council developed a standardized process and guidelines for visioning and futures thinking in 2014, based on a workshop conducted for members of the CFP by futurist Marsha Rhea from Signature i, LLC.¹ The current visioning process focuses on a 3-year program of work (2014-2017) and began with the use of a scanning framework comprised of 16 categories reflective of society's and the profession's future needs and changes. In July of 2014, the CFP utilized the scanning framework to identify and prioritize the following five categories for the 2014-2017 visioning cycle:

- Translating Evidence-Based Research into Practice and Policy
- Food and Nutrition Systems and Sustainability
- Workforce Projections

- Education/Professional Development
- Economic and Market Forces

A Visioning Process Workgroup of the CFP was appointed in 2014. The Workgroup identified a preliminary list of change drivers and trends, related to the five prioritized scanning framework categories, based on CDR's Workforce Demand Study, *Future changes driving dietetics workforce supply and demand: Future scan 2012-2022*² and ACEND's *Expanded Standards Committee Background Report*.^{3(p92-97)} Other Academy units conducting their own visioning also shared their reference lists with the Workgroup, including the Foundation's Future of Food Initiative⁴ and ACEND's Rationale for Future Education Preparation of Nutrition and Dietetics Practitioners.³ These lists were reviewed for pertinent references. Also, a systematic review of resources published since 2010 was conducted by the Academy's Knowledge Center based on the five priority categories. Five databases, including Science Direct, Taylor, Cochrane, Ovid and Web of Science, were searched using general key words and phrases (e.g., wellness and health promotion and registered dietitians; employment trends and registered dietitians; trends in population health and agriculture and registered dietitians) to identify references pertaining to the five prioritized scanning framework categories. Finally, the Workgroup reviewed resources available through the World Future Society (WFS) and selected several references related to the priority categories for review. All of these combined search strategies resulted in a total of 357 references. References identified as pertinent to the five prioritized scanning framework categories by the Visioning Process Workgroup were reviewed and analyzed by Workgroup members and analysts from the Academy's Evidence Analysis Library. Reviewers identified if each reference supported any of the change drivers and trends and noted

any new change drivers and trends related to the five priority categories not previously identified.

Based on the Council's standardized process and guidelines for visioning and futures thinking, the Workgroup surveyed members of the CFP's Think Tank (n=49) and individuals representing external Academy alliance organizations (n=15) in February, 2015 to seek their input on priority categories and trends. Individuals identified the top five categories from the 16 scanning framework categories, and related trends they believed would have the most impact on the future of the nutrition and dietetics profession in 10-15 years. A total of 44 responses were received (69% response rate). The results from this survey supported the five categories previously identified as priorities by the Council.

The following draft document, supported by the CFP and the House Leadership Team, is organized around ten priority change drivers and their associated trends impacting the future of nutrition and dietetics and the Academy over the next 10-15 years. Several of the change drivers and trends overlap and interact – for example, technology is a separate change driver but it also impacts the genomics, simulations and wellness-related change drivers. The document is based on the search strategies and input outlined above and the Workgroup's analysis, synthesis and evaluation of all sources of information, as well as its collective judgment. The most common techniques used in futuring include historical analysis, scanning for trends, trend analysis, brainstorming, visioning and consulting others, according to the WFS.⁵ Furthermore, the WFS states that most futurist methods strive for objectivity but rely heavily on subjective human judgment. The Workgroup is utilizing the techniques of the WFS and now asks for your input on the draft change drivers, trends and their implications. The change drivers, their trends and implications, are listed in no particular order and are all important forces impacting the

profession of nutrition and dietetics. Your input will be used to revise the prioritized change drivers, trends and implications, envision a desirable future for the profession, and identify specific ways to move towards the desired future.

The Approaching Gray Tsunami

Change Driver: Exponential growth of the aging population has dramatic and wide-ranging ramifications and economic impacts on government, businesses, families, and health care and support services.

Rationale:

Since 2011, when the first baby boomers turned 65, approximately 10,000 Americans turn 65 each day.⁶ From 2010 to 2030 the 65 and older population in the US will swell from 13% to > 20% as life expectancies, especially at the older ages, continue to increase.⁷ These population trends are projected to escalate the prevalence of chronic disease⁸, functional and cognitive challenges and create a health care cost crisis. A substantial increase in age distributions, racial and ethnic diversity of the older population will also create major changes between now and 2050.⁷ All developing nations are experiencing similar population aging trends, although the US has the largest number of older adults⁷ and the global implications are yet to be determined.

Trend 1: Increasing rates of obesity and chronic diseases among older adults dramatically impact the health care system and the economic burden of disease.

- The risk of preventable chronic diseases and disability dramatically increases with aging.²
- Almost 3 out of 4 older adults⁹ and 2 out of 3 Medicare beneficiaries have multiple chronic conditions.¹⁰
- Treatment for Americans with one or more chronic conditions consumes 86% of health care spending.¹¹
- One quarter of 2006 Medicare dollars went to end of life care in the last year of life.¹²

Trend 2: Demand for health care services is increasing dramatically¹⁴ although fewer funds are available to cover the cost.

- “Roughly 70% of those who turn age sixty-five will have long-term care needs at some point during their lives...”^{13(p 98)} impacting the utilization of hospitals, nursing homes and home care services.^{2,8}
- “The demand for long-term services and supports (LTSS) will outpace the US economy’s growth rate over the next decade and drive significant growth in Medicaid spending.”^{14(p7)}
- Older Americans used more health care per capita than any other age group in 2011; individuals ≥ 80 consumed the largest percentage of Medicare dollars (33% versus 15% for 65-69 year olds).¹⁵
- The number of nursing home residents has declined while the number of those receiving care at home has increased during the last decade.¹⁶

Trend 3: Disease prevention and health maintenance for the aging population are increasingly the focus to improve quality of life and care and contain costs.

- Better nutrition, physical and mental activity can prevent many chronic diseases²; smoking, midlife obesity and physical inactivity, all modifiable risk factors, attribute to approximately 1/3rd of Alzheimer’s disease cases worldwide.¹⁷
- Many older adults are food insecure; 83% do not consume a good quality diet¹⁸; < 1/3rd of those in need, who typically have 2-3 chronic health problems, are served by the Older Americans Nutrition Program.¹⁸

- 159 subjects, aged 65 and older, who participated in ≥ 3 community-based nutrition counseling sessions which included immediate feedback on their blood work, had significant improvements in BMI, cholesterol, glucose and blood pressure.¹⁹
- Up to 71% of elderly hospitalized patients are at nutritional risk or malnourished upon admission.²⁰ Treatment of both over- and under nutrition reduces mortality and costs by decreasing hospital length of stay and probability of readmissions.^{21,22,23}
- Early nutritional supplementation in acutely ill older adults in combination with a rehab program improved calorie/protein intake, slowed the loss of muscle mass and self-sufficiency, supported a better quality of life and saved subsequent medical and social care costs.²⁴
- Medicare began reimbursing for outpatient diabetes self-management training (DSMT) in 2000, but only 5% of newly diagnosed Medicare beneficiaries utilize DSMT services due to disparities in access.²⁵
- The Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014 links payment to quality of health care with goals to improve quality, provide outcome information, and control costs.^{26,27}
- “The cost of 1 day in a hospital equals the cost of 1 year of Older Americans Act Nutrition Program meals...the cost of 1 month in a nursing home equals that of providing mid-day meals 5 days a week for about 7 years.”^{18(p464)}

Trend 4: An aging workforce impacts the economy, businesses, families and health professions.

- The ratio of working-age (18-64) people to retirees will decrease dramatically and strain national resources.⁶ Currently, 100 working people support every 19 people aged 65-84, but this ratio will change to 100:30 by 2028; 33 working age people currently support each person >85 compared to 13:1 in 2046.⁷ Families will assume much of the burden for older adults' care²⁸ as health-related finances are reduced.
- Businesses and health professions will be impacted dramatically as older adults retire or alter their work lives.²
- The profession is continuing to age (2015: median age of 49 years; 35% are 55 or older;²⁹ 2005: median age of 44 years; 15% 55 or older)³⁰, and the anticipated attrition rate of 2 to 5% will impact the future supply of nutrition and dietetics practitioners.²

Implications:

- The movement from costly acute and nursing facility settings to home and community based services will continue.¹⁸
- Sustained engagement in advocacy and public policy is essential for adequate funding and reimbursement of food and nutrition-related programs and services to ensure healthful aging.¹⁸
- Demonstration of the value/cost effectiveness of evidence-based nutrition care in the prevention, treatment and management of malnutrition and chronic disease in older populations is essential.^{3,8,18}

- Training in geriatric nutrition and a variety of geriatric care specialties to support optimal health and improve health outcomes for a diverse aging population in a variety of settings is needed.²
- As the ratio of working-age people to retirees decreases, the resources of the country may shift from education to health and caregiving to meet the needs of the older adult population.⁶
- An adequate supply of RDNs and NDTRs is needed to address the impact of an older workforce and anticipated rate of attrition including retirement.²

Embracing America's Diversity

Change Driver #2: Increasing racial and ethnic diversity of the U.S. population requires innovative solutions to improve health equity, health literacy, cultural competency and the diversity of nutrition and dietetics practitioners.

Rationale:

The racial and ethnic background of the U.S. population has shifted dramatically over the past one and one-half decades and continues to undergo a transformation.³¹ Hispanic and Asian populations have experienced the most significant growth and this trend is expected to continue through 2060.^{31,32,33} By 2044, over 50% of the U.S. population is expected to belong to a minority group.³¹ Racial and ethnic minorities have low health literacy and experience suboptimal health care.³⁴ Although scientific advances have improved U.S. life expectancy and quality of life, these benefits have not translated into equal gains across all racial and ethnic groups. Differences in social determinants of health, such as poverty, access to health care, and socioeconomic status, exist across racial and ethnic groups and contribute to poor health outcomes.³⁵ Minorities experience higher rates of disease and bear the greatest morbidity burden for the same diseases.³⁶ Inadequate data on race, ethnicity, and language lowers the likelihood of effective actions to address health disparities³⁴; however, policy, systems, and environmental interventions show promise in the promotion of health equity and reduction of health disparities.³⁷ Given the current and projected increases in diversity of the U.S. population, health care workforce diversity is also essential in addressing patient-centered care and health disparities.³⁴

Trend 1: Community health workers and other lay educators will continue to be used to reduce health disparities and as a solution to the lack of diversity in the health care workforce.

- Under-represented groups are more likely to access nutrition and other health care services from professionals who they perceive to be similar to themselves.⁸
- Community health workers can provide education about high-risk behaviors and the self-management of chronic conditions, assist clients in applying for food assistance and other social services, and conduct home-based environmental assessments.³⁸
- Shrinking health care dollars and the bifurcation of the health care workforce promote the increased use of community health care workers⁸ who can now receive Medicaid reimbursement for preventive services recommended by a physician or other licensed provider.³⁹
- The percentage of RDNs who are men, black, Asian, or Hispanic changed very little from 2002 to 2011, including the most recent registrants (first five years).⁴⁰

Trend 2: As the U.S. population grows more diverse, stark differences between what health providers intend to convey in written and oral communications and what patients understand may increase and further exacerbate health disparities.⁴¹

- Almost nine out of ten adults are not health literate; those with poor health literacy are more likely to report poor health and utilize more health care resources to treat versus prevent diseases.⁴²
- Low health literacy is more prevalent in the elderly, minority populations and those with less education and income.⁴²

- Elderly patients with cardiovascular disease and higher literacy levels are at lower risk for hospitalization, institutionalization and mortality.⁴³
- Research on specific ways in which health literacy can be used to create positive patient outcomes is lacking.⁴⁴
- The Patient Protection and Affordable Care Act (ACA) directly and indirectly addresses health literacy.⁴¹

Trend 3: Health equity is an increasingly important public health priority because of evolving U.S. racial and ethnic demographics.

- Health disparities continue to exist and some have even widened among certain population groups despite decades of work to eliminate them.³⁷
- The quality of care received by racial and ethnic minorities continues to be suboptimal. Interventions that remove barriers to timeliness, emphasize patient centered care, and promote equitable use of evidence-based guidelines may promote health equity gains.³⁴
- Disparities in disease risk factors, such as fruit and vegetable consumption, are major obstacles to achieving health equity in the U.S.⁴⁵
- The ACA aims to advance health equity by reducing health insurance disparities, improving access to providers, promoting increased workforce diversity and cultural competence, and ensuring that limited English proficiency individuals receive resources to communicate more effectively with health care providers.^{35, 46}
- Hospitals that demonstrate a higher level of cultural competency appear to improve communication between patients and physicians and other hospital staff.⁴⁷

- Compliance to medication and medical nutrition therapy is higher when cultural competence and language are matched between health care provider and patient.⁴⁸

Implications:

- Health practitioners must engage the community, identify needs, develop partnerships and assess and increase capacity at individual, organizational, and community levels to promote intervention success and health equity.^{37,49}
- Principles of social justice, human rights, and social capital, in addition to economic and social barriers that limit the procurement, preparation, and consumption of healthy foods should be addressed in environmental and policy interventions.⁸
- RDNs and NDTRs need community organizing and other capacity building skills to implement sustainable interventions in underserved communities.
- All institutional policies and key practices should include a health impact assessment to determine unintentional variations in health impacts across ethnic and racial groups.
- Comprehensive assessments of health literacy that go beyond readability and numeracy are needed.⁵⁰
- More research is needed to understand the moderating and mediating roles of an individual's health literacy status on nutrition outcomes⁵⁰ and the relationship between health care providers' increased knowledge of diverse cultures and better patient outcomes.^{51,52}
- The growth of community health workers presents an opportunity for RDNs and NDTRs to supervise and educate these practitioners.

- RDNs and NDTRs should be culturally competent to interact effectively and appropriately in the workplace with patients/clients, peers, managers and subordinates from different ethnic and racial groups.
- RDNs and NDTRs need to utilize federal agencies' minimum standard categories for racial and ethnic data collection to track and address disparities in health outcomes.³⁵
- New and innovative ways to recruit and retain minority and underrepresented students in nutrition and dietetics programs are needed.^{53,54}
- There is a need for increased language skills among RDNs and NDTRs, with fluency in Spanish, French and Cantonese being sought most frequently.⁴⁰

Eating to Make the World a Better Place

Change Driver: The public seeks more information about their food across the entire supply chain and has increased awareness of the global ramifications of their food choices.

Rationale:

A growing social movement is underway where consumers desire an increased connection to food and nature.^{2,3(p92-97),55,56} Today's consumers seek transparency on how, where and by whom their food is grown, processed, packaged, and distributed, and how revenues from their purchases are allocated.^{57,58} Recent studies indicate public support, including support among racial minority and lower-income groups, for organic, local, non-genetically modified, and non-processed food.^{59,60} Local food sales have increased from \$5 billion in 2008 to \$11.7 billion in 2014⁶¹ and are expected to outpace total food and beverage retail sales over the next five years to reach \$20 billion in 2019.⁶² Increased public interest in the U.S. food supply is accompanied by global concerns over the world's growing population which is slated to reach 9 billion by 2050.^{63,64} Concurrently, the risk of climate change, high amounts of food waste, and high yield gaps underscore the need to produce more food using the same amount of land and fewer inputs.^{64,65,66} Greater urbanization,^{64,67} growing international trade,⁶⁸ and planet-wide ramifications of poor environmental stewardship require a global approach to food and agricultural systems.^{67,69,70} Agriculture is a major contributor to greenhouse gas emissions.^{65,71,72} If current dietary trends hold, they are projected to create an 80% increase in global greenhouse gas emissions and global land clearing, while simultaneously contributing to high rates of chronic disease.⁷³ In response, increasing numbers of consumers are likely to adopt sustainable diets.⁷⁴

Trend 1: Agricultural challenges and rapidly changing technology present entrepreneurial opportunities as food companies seek innovative ways to meet consumer demand for healthy foods and demonstrate their social responsibility.⁷⁵

- Driverless cars,⁷⁷ drones,⁷⁶ 3D food printers,⁷⁷ and fully automated restaurants⁷⁸ are changing food delivery systems.
- To meet increased demand for local foods, continued growth of food hubs, mobile and shared processing facilities, and other food system innovations are required to scale up and aggregate the yields of local farmers and ranchers.^{56,75}
- Food companies are expected to launch sustainability campaigns, pursue novel methods to reduce their carbon footprint, and seek partners to promote widespread adoption of sustainable diets.⁶⁴

Trend 2: Siloed approaches to agriculture, health, sustainability, and economics are being abandoned for transdisciplinary solutions to reduce hunger, poverty, disease, and environmental destruction.⁶⁷

- Meat and dairy make the greatest dietary contribution to greenhouse gas emissions.^{70,72,74,79,80} In addition, meat and dairy products feed humans with a substantial loss of caloric efficiency since they require the growth of crops to feed livestock.^{65,66} Mediterranean, pescatarian, and vegetarian diets have the potential to reduce chronic disease rates, global greenhouse gas emissions, and land clearing.^{66,73,81}
- About 1/3 of the food produced globally is lost or wasted, and about half of these losses could be mitigated with a more efficient supply chain.^{65,82,83}

- The world food supply relies upon very few crops⁸⁰; agricultural biodiversity is vital to improve crop productivity, increase soil fertility, and promote a varied diet.⁸⁴
- Agricultural policies need to shift from their focus on feeding people to also encompass health and environmental sustainability.⁷⁰
- The urban population has exceeded that of rural areas⁶⁴; growth of urban agriculture and local farming can help create urban-rural links to promote nutrition security and drive economic opportunities.^{55,57,67}

Trend 3: There is a growing interdependence of countries around the world in sustaining the planet's national resources.⁸²

- The global population continues to live longer, requiring more food⁶⁴; as global food production and consumption increase, so will the subsequent environmental impacts.⁷⁰
- The developed world is responsible for the highest rates of meat consumption, and livestock are the largest single contributor to greenhouse gas emissions globally.^{72,80}
- The recommendation for fish consumption (2 servings of fish per week) cannot be met by the fish caught in U.S. waters.^{79,80}

Trend 4: Consumers demand increasing levels of food transparency to meet their health, social justice, and environmental stewardship aspirations.⁸⁵

- The number of consumers who used food label ingredient lists to make purchasing decisions increased by 13% between 2006 and 2014.⁸⁵ Customers seek information on how their food is grown and processed, in addition to nutrition information.^{59,85,86}

Transparency in the use of animal antibiotics, growth hormones, pasteurization, food packaging leaching, pesticides, and genetically modified organisms is desired.^{58,87}

- Consumers are increasingly aware of the environmental consequences of protein overconsumption.⁷⁰ Yet, confusion exists among consumers about the sustainability of fish consumption, despite sustainability labeling of fish.⁷⁹
- Future food transparency efforts that focus on the overall public benefit of foods may yield a new healthy eating index,⁸¹ requiring industry to reformulate foods to improve nutrition,⁸⁸ and promote social justice and environmental stewardship.

Implications:

- Future – focused dietary interventions will encompass ways to improve the health of the planet, including food waste reduction and consumption of foods that minimize greenhouse gas emissions and promote water conservation.^{79,81,89}
- RDNs and NDTRs need education on food systems production practices and policies and should play a key role in educating the public about the relationships among diet, environment, and public health.⁹⁰
- Food sector jobs across all parts of the supply chain will increase, creating opportunities for food business entrepreneurs to utilize their education and leadership skills to create high paying jobs.⁷⁵
- To capitalize on jobs created by the local food movement, RDNs and NDTRs need to understand agricultural systems and how diet choices influence local economies.

- Involvement in Food Policy Councils and other social justice advocacy initiatives enhance RDNs and NDTRs' opportunities to promote better access to healthy foods, minimize food waste, and further local economic development.

Tailored Health Care to Fit My “Genes”

Change Driver: Continuing research and advances in genetics and nutritional genomics, with their ability to predict, prevent and/or delay illnesses and chronic diseases, will become the mainstay of health care in the future.

Rationale:

Genetics research continues to accelerate resulting in exponential advances in medicine and medical knowledge.⁶ Ray Kurzweil, a technology specialist, predicts that the future holds the promise of routinely adding genes which are protective and disabling genes that promote diseases and aging.⁹¹ Genetic testing for diseases for which tests are not currently available will become more readily available, making predictive, preventive, early detection and personalized interventions, including personalized nutrition and lifestyle interventions, possible.² RDNs can assume an increasingly important role in the emerging health care system which focuses on a genetic predisposition model of health and disease,⁹² disease prevention, and integrative health care³ with the possibility of receiving reimbursement for lifestyle and nutrition interventions and counseling.²

Trend 1: Advances in research and increased demand for personalized health and nutrition result in increased availability and decreased costs of genetic testing.

- Since the completion of the human genome project, there have only been 100 cases where genomics have been used for personalized medicine to provide customized therapies and dosages. As technology continues to advance, there will be more and more

opportunities for DNA analysis at the patient's bedside. DNA analysis "should be a must-have before actually prescribing drugs."^{93(p34)}

- Direct to Consumers (DTC) genetic testing via the internet or other marketing venues has become increasingly available. The global DTC genetic testing market is projected to reach \$233.7 million by 2018.⁹⁴ Eventually, some 4,000 hereditary diseases may be prevented or cured through genetic intervention.⁶
- Consumers want to learn about their individual risks for future illnesses to promote their health and prevent disease. Consumers look to DTC genetic testing as a means of predicting risk of disease.⁹⁵
- Costs of genetic testing for consumers have decreased and improved testing technologies are available. "Scientists are approaching the ability to sequence a human genome for \$1,000, perhaps in 2020."^{96(p28)}
- Genetic tests available to consumers generally predict risk of developing complex diseases such as diabetes and cardiovascular disease.⁹⁷ In the future, patients will be able to sequence genomes at home resulting in earlier detection of diseases, simpler and more effective interventions, and reduced risk of developing serious, debilitating, and life-threatening disabilities.⁹³

Trend 2: Health professionals increasingly manage patient care using genetic profiles but the science of genetics must continue to advance to inform practice.

- Epigenetic changes (chemical changes in DNA) can be reversed with lifestyle changes, which can impact obesity.⁹⁸

- Genetic-based nutrition advice may result in behavior change and impact intake of some dietary components, such as sodium.⁹⁹ Personalized nutrition could potentially motivate individuals to make positive food choices to a greater degree than population-based dietary recommendations.
- Genotyping alone will not be sufficient to personalize diet for improved health.¹⁰⁰ The interaction of specific genetic variations with environmental factors can modify genetic outcomes.⁹² Environmental factors, which include nutrients and other bioactive components in foods, play a key role in health.
- Genetics offers much promise in the field of medicine where medical researchers are using variations within genes as biomarkers for diseases, personalized treatments, and drug responses.⁹⁶
- Investment in basic research is yielding a better understanding of gene transcription and the influence of genetic mutations on the development and progression of diseases. The ultimate goal is to identify better approaches to manage the care of individual patients based on their unique genetic profile.¹⁰¹

Implications:

- Consumers are savvy and want to be in charge of their health care. Consumers can readily access DTC genetic testing to learn their risk of chronic diseases, with the goal of preventing disease. Genetic testing has the potential to affect consumer behavior change, and therefore, can ultimately impact health care costs.
- Medicine is moving towards tailoring treatments to individual genetic, environmental and behavioral characteristics to improve patient responses. Advances in nutritional genomics

offer the promise of personalized nutrition and unprecedented opportunities for the RDN, including reimbursement for nutrition and lifestyle interventions.

- The emerging genetic predisposition model of health and disease can position the RDN as a major force in health care.⁹² Designing nutrition interventions that incorporate a patient/client's genetic profile is a task characteristic of an advanced practice RDN.¹⁰²
- The discipline of nutritional genomics is especially promising for the future when additional research is available to support evidence-based practice.⁹⁷
- Advanced practice RDNs specializing in nutritional genomics and working within interprofessional teams will need the scientific knowledge and technical skills to interpret genetic testing and to provide personalized nutrition advice that prevents or modifies disease risk. Specialized and advanced knowledge and skills are needed for RDNs to work in the area of nutritional genomics.^{2,92,97,102}
- RDNs function within and collaborate with interprofessional teams¹⁰³ to interpret genetic testing results and develop personalized nutrition care plans.⁹⁷ RDNs may assume primary management of patients when food and nutrition are the primary intervention.¹⁰⁴

The Buck Stops Here

Change Driver: Increased emphasis on evidence-based practice and accountability for documenting beneficial and cost-effective outcomes become the norm in health care.

Rationale: Health care costs in the United States, which are approximately twice that of other developed countries,¹⁰⁵ have been rising due to the aging of the population and prevalence of chronic disease.^{106,107} According to the Institute of Medicine (IOM), health care is “one of the most complex sectors of the U.S. economy.”^{108(p1)} This complexity creates a greater “need for evidence about what works best for whom in order to inform decisions that lead to safe, efficient, effective, and affordable care.”^{108(p1)} The IOM has set a goal that by “...2020, 90 percent of clinical decisions will be supported by accurate, timely, and up-to-date clinical information and will reflect the best evidence.”^{108(p 8)} Additionally, current and emerging health care delivery models are driving the demand for utilization of research as the basis for policy development.^{38, 108,109,110,111} Additional emphasis on evidence-based policies help inform^{112,113,114,115} practices that increase hospital revenue or lead to cost savings.^{105, 116, 117} Hospitals are interested in generating revenue or gaining cost savings due to reductions in Medicare payments. Some hospitals experienced Medicare reimbursement losses as much as 2% in 2012 for excessive readmissions with the potential to lose 5% by 2017.¹⁰⁵ Health care providers must demonstrate to internal stakeholders, as well as external stakeholders, such as the Centers for Medicare and Medicaid Services (CMS), other payers and those granting funding, that the care provided and the outcomes achieved meet or exceed targets. Demonstration of an intervention’s efficacy and/or benefits, such as reduced costs, complications, and readmissions is essential in garnering organizational and third party payment for interventions in the future.

Trend 1: Health care evolutions necessitate increased research and quality improvement activities.

- The ACA aims to rein in health care costs and improve quality of care as well as outcomes. Several strategies are imbedded in the ACA to achieve these goals, including Accountable Care Organizations (ACOs), Patient Centered Medical Homes (PCMHs), Value Based Purchasing (VBP), CMS financial penalties for hospitals with high readmission rates and no payment for “never events”, such as hospital acquired pressure ulcers.¹⁰⁵
- Mega-hospital systems are becoming more prevalent as hospital systems merge to gain market share, reduce operating and capital expenditures and improve patient outcomes. Hospital system mergers may or may not be beneficial for the organizations and patients. Successful mergers require careful planning and tough decisions to achieve the projected efficiencies and improved outcomes.¹¹⁸
- Malnutrition is present in 30 to 50% of hospitalized patients and necessitates attention due to its negative impact on quality of life, complications, hospital length of stay, costs and mortality.^{105,119}
- Quality improvement initiatives, research and tracking outcomes, which may have been “nice to have” in the past, are now essential and indeed mandatory activities in many settings in order to survive and thrive under the current health care financial reimbursement environment.^{108,109,110,120}

Trend 2: The application of informatics facilitates and optimizes the retrieval, organization, storage and use of data and information for decision-making.

- The use of electronic health records in health care facilities and physician offices has exploded over the past decade.¹²¹ Other electronic sources of data include claims data used for billing and patient portals. These data offer the opportunity to generate evidence for the best interventions based on actual practice, decreasing the time and expense associated with clinical research.¹⁰⁸
- Technology, including electronic health records and other large databases, can be used to improve productivity and efficiently extract information to establish the link between interventions and outcomes.^{110,121,122,123, 124}

Trend 3: Practicing RDNs infrequently evaluate and conduct research or access evidence-based resources on a regular basis for guidance in clinical practice.^{125,126}

- Health care decisions and funding are increasingly driven by the conduct and analysis of research, dissemination of research results, and implementation of evidence-based practices.¹⁰⁸
- RDNs understand the importance of research but have limited involvement in research activities. Perceived barriers to research are numerous and include lack of confidence, expertise, skills, time, funding and administrative support.¹²⁶
- Approximately 50% of RDNs consult evidence-based resources and read professional journals less than once a month.¹²⁵

- RDNs are more likely to engage in research activities when they are knowledgeable about evidence-based practice, possess a higher level of education, have taken a research course and frequently read research articles.¹²⁶
- Additional emphasis on research, combined with education and mentoring, are necessary to enhance the involvement of RDNs in research.

Implications:

- Organizations increasingly rely on data and outcomes to drive decisions about priorities, including how and where their limited resources are utilized.
- RDNs require the necessary skills to read, interpret and apply research in their practice settings, conduct outcomes research and utilize informatics to enhance their ability to show positive outcomes. Outcomes research is especially vital for the survival and advancement of the nutrition and dietetics profession and should be routinely conducted by RDNs.¹²⁶
- RDNs must promote their unique role in the identification, promotion and documentation of how nutrition interventions are cost effective, lead to cost reductions/savings, and improve outcomes (clinical and patient-centered) to facilitate adoption of effective interventions into institutional and/or public policies.^{20,24,127,128}
- RDNs must be adept at identifying, treating and documenting malnutrition to ensure positive patient outcomes and reimbursement for health care facilities to cover the costs of caring for malnourished patients.
- RDNs need to be proficient in the facilitation of behavior change and improve their behavioral counseling skills to address the increasing incidence and cost of caring for

people with chronic diseases. These skills can enhance the management and positive outcomes of those with one or more chronic diseases and potentially prevent diseases in those who are at risk.

- Organizations and RDNs with data and outcomes to support their interventions and validate their professional contributions are more likely to receive reimbursement and other funding in the current and future environment of limited health care dollars.
- RDNs and NDTRs who are unable to illustrate their worth through improved outcomes or other cost-benefit analyses may be replaced by other professionals.

Making the Healthy Choice the Easy Choice

Change Driver: Health care in the U.S. increasingly focuses on population health to improve effectiveness and reach and slow the growth of health care costs.

Rationale:

Transformative change to improve the health of populations and reduce health care costs is underway in the U.S.¹²⁹ Forces converging to bring a national focus to population health include the ACA, aging of the U.S. population, and surge in nutrition-related chronic conditions.^{129,130} The ACA promotes population health by its focus on better care, better health and lower costs.^{8,129} A culture change is revolutionizing institutions as they move beyond wellness programs to engage people at every level of their organizations in shifting their focus towards health promotion and disease prevention and creating a culture of health as part of their daily practices.¹¹⁵ With passage of the ACA, hospitals are playing a central role in creating a culture of health.^{115,129} Even the institutional kitchen is now at the forefront of an institution's wellness mission.¹³¹ People spend time in schools, workplaces, food outlets, neighborhoods and communities which are all important targets for environmental, policy and systems level interventions as part of a social ecological, comprehensive population health approach.^{8,132}

Trend 1: Evidence-based and multifactorial interventions that access levels of influence at the environmental, policy and systems level of the social ecological framework are essential to address population health priorities.

- Health behaviors are complex and influenced by physical and social environments and must address both individual and environmental determinants of health and disease.¹³³

- The social ecological model utilizes a multifactorial “systems perspective” and addresses individual and environmental factors as well as their interactions.^{8,133}
- A review of food environment interventions targeting young adults’ dietary behavior in university settings revealed that 13 out of 15 studies showed positive improvements in outcome measures; useful intervention strategies included the use of nutrition messages/nutrient labeling; increased availability of healthy options; and portion size control of unhealthy foods.¹³⁴

Trend 2: Institutions, organizations and governments are increasingly striving for policy changes that are informed by research, help create a culture of health, and make healthy choices the easy choices.

- The Robert Wood Johnson Foundation’s vision is to build a culture of health to enable our nation’s diverse society to lead healthier lives now and for generations to come.¹³⁵
- United Healthcare, a major insurer, is piloting a Healthy Savings Card which helps members save money when they purchase healthy foods at the grocery store.¹³⁶
- Institutional kitchens and menus are playing central roles in health promotion by bringing together culinary arts, foodservice expertise and evidence-based principles of Food as Medicine; based on signage and health messages, customers can select foods that provide the health benefits that meet their individual nutrition and health needs.¹³¹
- Policies based on fiscal measures, such as taxes, subsidies and vouchers, and standards for foods available for consumption, may be more effective at changing behavior than nutrition labeling efforts.¹³⁷

- Multicomponent interventions in religious organizations that include policy change, religious organizational involvement and community health workers have improved eating behaviors.¹³⁸

Trend 3: The ACA paves the way for tremendous growth and unprecedented opportunities in workplace health promotion and disease prevention interventions.¹¹²

- As of September 2015, nearly 149 million adults are employed full time¹³⁹ and spend an average of 7.8 hours/day at the workplace.¹⁴⁰
- Employee workplace wellness programs offer a positive return on investment by positively impacting employees' health; increasing employee retention; reducing insurance premiums and worker's compensations claims; decreasing absenteeism and increasing productivity.^{113,115}
- 74% of employers surveyed offer wellness programs, while another survey reports that employers expect their investment in these programs to grow.¹¹²
- Workplaces are ideal settings for health promotion programs targeting young adults; approximately 70% of young adults, aged 18-34, are employed in the U.S. workforce.¹⁴¹
- Workplaces that encourage healthy lifestyle practices are associated with fewer obese employees among millennials; adjusted rates of obesity were 24% and 17% among those reporting low (≤ 1 characteristic) versus high (≥ 3 characteristics) exposure to healthful food environments, respectively.¹³²
- Workplace organizational policies can address healthy food procurement, vending choices and foods served at meetings, physical activity and alternative transportation options, and incentives for disease management.¹⁴²

- A multicomponent workplace lifestyle intervention that focused on changing dietary intake and eating behavior patterns for weight loss in obese and overweight employees resulted in clinically important reductions in body weight ($- 8.0 \pm 0.7$ kg in intervention subjects versus $+ 0.9 \pm 0.5$ kg in control subjects) and improved cardiometabolic risk factors.¹⁴³

Trend 4: Hospitals redefine their roles in the continuum of health care services and become immersed in the daily culture of the communities they serve.

- Non-profit hospitals must conduct a community health needs assessment at least every 3 years and adopt an implementation strategy to meet identified community needs and address social determinants of health based on ACA requirements.¹²⁹
- Hospitals are natural leaders for workplace and community wide health promotion interventions due to their mission, reach and influence; hospitals can adopt model policies and practices that promote the health of both their employees and patrons.¹¹⁵
- Some hospitals serve between several thousand and up to one million meals/year to employees, patients and visitors, with each meal representing an opportunity to promote a healthy choice.¹¹⁵

Implications:

- Scientific evidence to inform interventions and shape nutrition-related policies that offer sustainable solutions to population health problems is imperative.^{8,85}

- More RDNs and NDTRs must position themselves for new and expanded practice roles to address environmental, policy and systems level interventions based on the social ecological model.⁸
- The profession should adjust training models to reflect emerging areas of practice in health promotion in community settings where people live, work and play.^{144,145}
- RDNs need skills to track effects of and evaluate policy change initiatives designed to address the underlying causes of environments that foster poor dietary intake.^{115,133}
- Sustained engagement in advocacy and public policy is essential to champion RDNs as qualified providers of population health interventions.^{85,146}
- Nutrition is a key component of workplace health promotion; RDNs and NDTRs have unique qualifications to practice in these settings.^{8,112,114}

Creating Collaborative-Ready Health Professionals

Change Driver: Transdisciplinary professionalism and interprofessional education are the cornerstones of patient/client centered care to help solve problems, improve safety and quality, and drive innovation.

Rationale:

In the late 1990s, the IOM reported that as many as 98,000 deaths occurred in U.S. hospitals each year.¹⁴⁷ The IOM has published three seminal publications beginning in 1999 that focused on health care quality, patient safety and their relationship to health professions education.^{147,148,149} These publications, along with the Institute for Healthcare Improvement (IHI) 2008 “Triple Aim” of better care, better health and lower costs¹⁵⁰ provided a major impetus and urgency for rethinking team-based care and interprofessional relationships and restructuring health professions education.¹⁵¹ The ACA reflects the “Triple Aim” and is responsible for the resurgence of interprofessional education (IPE).¹⁴⁹ IPE and collaborative practice are keys to transitioning a fragmented health system to one capable of improved health outcomes.¹⁵² IPE informs a pedagogy and curricula redesign for preparing a new health care workforce capable of optimizing health system performance in a collaborative-ready, shared decision making model.¹⁵³ All health professions should integrate IPE into their curricula to prepare practitioners with the knowledge and skills to be effective 21st century members of the health care team. Professions that remain uninformed, outdated and static are at-risk of being left behind. IPE offers RDNs a significant advantage in securing a place at the “health care table.”

Trend 1: Transdisciplinary professionalism is becoming an essential ideology for a 21st century health care system.

- Successful transdisciplinary collaboration requires a critical point where society demands reform in health care practice and education of the health care workforce.¹⁵⁴
- Transdisciplinary professionalism requires the flattening of hierarchies to adopt a more collaborative environment and break down professional “silos” and “turf battles.”¹⁵⁴

Trend 2: IPE is an increasingly essential strategy for preparing the health care workforce for a patient-centered, coordinated and effective health care system.

- IPE goals are to deliver patient-centered care that is safe, timely, efficient, effective and equitable.¹⁵⁵
- IPE helps develop the knowledge, skills and attitudes for a reformed, “collaboration-ready” health workforce.^{152,153}
- “Interprofessional health care teams understand how to optimize the skills of their members, share case management, and provide better health services to patients...”^{152(p196)}
- For health care professionals to work interprofessionally, they must be educated interprofessionally.¹⁵²
- A systematic review of six studies on IPE found the vast majority reported positive learner-focused outcomes, i.e. changes in attitudes, knowledge, skills and perceptions of other professionals; a small number reported positive changes in organizational practices, such as referrals, documentation and working patterns; a smaller number addressed

changes to patient care delivery, including changes in clinical outcomes (i.e. infection rates, error rates, and length of stay).¹⁵⁶

- Students completing the IPE curriculum at St. Louis University report that it breaks down negative stereotypes, improves their confidence in communicating across professions, and positively influences their willingness to continue learning together.¹⁵⁷

Trend 3: A resurgence of interest in IPE has occurred with the goal of team-based care becoming the norm in health care.

- The Interprofessional Education Collaborative was formed in 2012 to improve collaboration and patient-centered care skills among nursing, medicine, pharmacy, dentistry, public health and other health professions.¹⁵⁸
- The American Association of Medical Colleges released a set of IPE competencies in 2013 for medical students which can also be used by all health professions.¹⁵⁹
- St. Louis University has integrated IPE into the curricula of 9 health profession programs; expectations are that IPE training facilitates patient-centered care, reduces fragmentation of care and medical errors, and optimizes health outcomes.^{157,160}
- Students completing the integrated St. Louis University IPE curriculum receive a Certificate in Interprofessional Practice and the innovative program has been instrumental in recruiting students and faculty.¹⁵⁷
- The Accreditation Council for Education in Nutrition and Dietetics (ACEND) recognizes the growing importance for health professionals to be educated interprofessionally and work more interprofessionally.³

Trend 4: Many difficulties and challenges exist to the successful implementation of IPE but innovative approaches can help overcome some of the challenges.

- Challenges to IPE success include costs, creating a cultural shift and dealing with the logistics of a prescribed, overloaded curricula, limited flexibility and room for expansion in the curricula, and creating common blocks of time ^{157,161,162}
- Success of IPE programs is based on the level of investment by administration, commitment and buy-in of faculty, and support from students. ^{157,161}
- Students attending an Australian University were overwhelmingly positive about their experiences with an online, web-based module to facilitate IPE; students increased their understanding of health professions' roles and observed patient-centered care delivery across different professions which they were unable to experience in their clinical placements. ¹⁶²
- Dietetics students want to learn about the roles and responsibilities of and interact with other health professions but dietetics education programs are participating in IPE in limited ways. ¹⁶³

Implications:

- The profession should collaborate with other health profession accreditation bodies to establish core educational requirements and shared competencies; accreditation agencies can provide an impetus by requiring an IPE dimension in their guidelines. ¹⁶¹
- The profession should consider including core and outcome IPE competencies as a standard for licensure and certification.

- Dietetics educators can adopt relevant IPE competencies for their programs from the Association of American Medical Colleges.¹⁶³
- Nutrition and dietetics practitioners need sufficient IPE literacy and leadership skills to join and lead teams where nutrition plays an important role.²
- Dietetics educators can increase opportunities for students to learn from and with other health professions students by building on existing community-based events (e.g. health fairs and student run clinics).¹⁶³
- Dietetics educators should embrace innovative ways to incorporate IPE into their programs (e.g. simulations and web-based resources).¹⁶³
- Engaging in IPE is an opportunity to actively promote a broader understanding and appreciation of the RDNs' role and how it differs from someone providing general nutrition advice; RDNs need to be “at the table” now to be recognized and included as an essential interprofessional health team member, particularly as one payment for services continues to be the direction of future reimbursement.¹⁰⁹
- Well-designed studies to determine how IPE affects patients, populations and health system outcomes are needed.^{163,164}

Food as Medicine

Change Driver: Nutrition and medical nutrition therapy (MNT) become even more critical in current and future emerging health care models for their pivotal roles in wellness, health promotion, disease prevention and disease management.

Rationale:

Once relegated to conversations among “health nuts” nutrition is now a mainstream topic of conversation. From 1991 to 2011, based on The Nutrition and You: Trends 2011 survey, the percentage of men and women who responded that "diet and nutrition are very important to me personally" increased from 42% to 67%.¹⁶⁵ The public’s explosion of interest in nutrition and wellness is transforming food retailers who are positioning themselves as health care destinations.¹⁶⁶ As health care is disrupted and transitions from the medical model to one of prevention and wellness, nutrition is poised to take center stage in health promotion and disease prevention programs in worksites and other community-based settings.^{8,114,133} The following forces are converging to position nutrition and MNT as indispensable to health and well-being: the prevalence of obesity and its comorbidities, especially among younger adults; the large human and financial burdens and costs of diseases associated with obesity and an aging population; and the recent revelation that poor diet is the biggest contributor to early death globally.¹⁶⁷

Trend 1: Innovations by food and nutrition-related industries are capitalizing on consumers' growing passion for nutrition and health.

- Consumers are actively using foods as medicine, including functional and fortified foods, to address their health concerns and medical conditions.⁸⁵
- Food industries are overhauling products to cater to consumers' desires for safe and healthy foods;¹⁴⁴ Campbell Soup is removing all artificial flavors and ingredients from its products in North America by 2018.¹⁶⁸
- Food retailers are increasingly investing in health and wellness; 70% of those surveyed perceive health and wellness programs as a significant growth opportunity and envision pharmacists and dietitians as taking the lead.¹⁶⁶
- Supermarket dietitians are increasing in numbers and can impact public health by reaching millions of shoppers;¹⁶⁹ 95% of supermarkets hire dietitians at the corporate, regional and store levels.¹⁶⁶

Trend 2: Unprecedented opportunities to lead preventive aspects of health arise from health care reform and emerging models of health care.

- Nationally, the percentage of people without health insurance coverage decreased sharply between 2013 (41.8 million or 13.3%) and 2014 (33 million or 10.4%), when many of the provisions of the Patient Protection and Affordable Care Act (ACA) took effect.¹⁷⁰
- A transformation in health care is underway, with primary care leading the way and the concepts of prevention, wellness and public health growing in popularity.¹¹⁴
- The locus of control for obesity is increasingly shifting from clinical settings into the communities where people live, work and play.¹⁴⁴

- Lifestyle risk factor modification and weight management are essential components of health promotion and disease prevention programs in worksites, schools, community clinics, health clubs, social service programs and other community settings.⁸
- The emerging PCMH model of care includes acute and chronic care and preventive nutrition-related services, but few RDNs are integrated into and valued members of the PCMH team.¹¹¹

Trend 3: Nutrition and MNT are poised for primetime with the high prevalence of obesity and its related diseases.

- Obesity prevalence remains high; >1/3rd (34.9% or 78.6 million) of U.S. adults are obese and approximately 17% (or 12.7 million) of children and adolescents 2-19 years are obese.¹⁷¹
- Obesity-related conditions, including heart disease, stroke, type 2 diabetes and certain types of cancer, are some of the leading causes of preventable death.¹⁷²
- Health care costs could be dramatically reduced by reductions in obesity and related risk factors; the estimated annual medical cost of obesity in the U.S. was \$147 billion in 2008; the medical costs for obese individuals were \$1,429 (or approximately 42%) higher than for those of normal weight.¹⁷³
- Obesity-related medical costs could drop by \$84.9 billion (\pm 9.3 billion) by 2030 with only a 1% decline from anticipated obesity trajectories.¹⁷⁴
- Increased body weight is associated with early development of disease; the effects of excess weight on years of life lost is greatest for younger individuals; estimates indicate obese men and women, aged 20-30, lost 5.9 and 5.6 years of life, respectively.¹⁷⁵

- Poor diet and high blood pressure are the top two contributors to early death globally based on an assessment of 79 behavioral, environmental, occupational and metabolic risks in 188 countries, between 1990 and 2013.¹⁶⁷
- MNT is the cornerstone of prevention and treatment for overweight, obesity and most obesity-related conditions, including diabetes, hypertension and cardiovascular disease.^{8,111}
- Demand for medically-tailored, home-delivered meals for managing critical and chronic illnesses has surged 20-45% in some U.S. cities.¹⁷⁶

Implications:

- Food sector jobs may increase in food and nutrition-related industries to support the public's interest in nutrition and healthier lifestyles and meet the ACA mandates for nutrition labeling on restaurant menus and vending machines.^{2,8}
- RDNs must be proactive in promoting nutrition and positioning themselves as an essential and valued part of PCMHs and other emerging models of health care
- Increased encroachment and competition in the areas of wellness, health promotion and disease prevention may occur due to explosion in the number of nutrition-related credentials and lack of regulatory standards.¹⁷⁷
- Adjustments in educational models and credentials to reflect emerging areas of practice, such as wellness and health promotion, may be necessary to remain competitive in the changing health care environment.¹⁴⁴
- The prevention and wellness movement will continue to accelerate and diet, fitness and wellness programs will prosper.⁶

Technological Obsolescence is Accelerating

Change Driver: Advances in technologies are having dramatic impacts on health care, education, employment and food systems.

Rationale:

Twenty years into the technology revolution, the acceptance and spread of digital products and services have been historically unparalleled.¹⁷⁸ In 1997, only 18% of U.S. households had access to the Internet; 74% had Internet access and 63% had smartphones in 2013.^{179,180} In 2014, 4 in 10 U.S. households had cell phones only which is double the number from 2009.¹⁸¹ Technology is transforming the way we learn, work and live. Our lives now revolve around access to worlds of information, instant communication and online shopping.¹⁷⁸ The “perfect storm” has arrived in health care as digital technologies and online platforms emerge.⁹³ Patients can get a secure video doctor consultation via their smartphones for \$30-40.¹⁸² Telehealth enables society to address health care workforce shortages in rural America as never before.¹⁸³ Consumers will become “CEOs of their own health” in the future, as biometric sensors monitor their health status and provide warnings to stop disease before it happens.^{184,185} Higher education’s foundation is shifting and it must reinvent itself as demand increases for personalized learning and online courses and programs.¹⁸⁶ Robots will perform most physical tasks in the future, creating challenges for society to upgrade its workforce to match the demands of the digital era.⁷⁷ Our food system landscape is also changing, with “perfect” foods from 3-D printers⁷⁷ and fully automated restaurants.⁷⁸ As digital citizens, we should value and appreciate the many benefits of technological innovations, but we must also understand the many implications and unanticipated consequences to shape the technological future we desire.¹⁷⁸

Trend 1: Innovative digital technologies personalize, revolutionize and increase access to health care.

- Expanded electronic medical records and virtual health care teams result in fewer emergency department visits, more satisfied patients and increased RDN referrals.^{116,187}
- Video consultations by RDNs can potentially reduce barriers to implementation of best practices for obesity management.¹⁸⁰
- Interactive and self-navigated online web-based educational interventions can produce changes in patients' self-care behaviors.¹⁸⁸
- Telemedicine interventions are as good as or better than traditional approaches to care.¹⁸⁹
- A teledietetics model is more cost effective than a face-to-face model for long term weight reduction.¹⁹⁰
- Health and fitness apps are the fastest growing category with an estimated worth of \$4 billion in 2014, likely to increase to \$26 billion by 2017.¹⁹¹
- Nutrition apps, mostly geared to weight loss, support adherence to diet monitoring.¹⁹²
- Future medicalized smartphones¹⁸² and doctor designed, patient customized mobile apps⁹³ can potentially decrease the use of doctors and health care costs, reduce the need for expensive clinical trials,⁷⁷ speed up care and increase patients' control over their own care.¹⁸²
- Future digestible, embedded, and wearable technological sensors will monitor vital signs and health parameters 24 hours a day; then transmit data to the cloud and send alerts to medical systems in real time.^{91,93,182,184,185}

- Robot assistants in health care facilities will perform many routine tasks like moving patients and drawing blood.⁹³
- More objects will be printed with 3-D printers, including drugs, cells, organs, and living tissues.⁹³

Trend 2: Technological applications, economics and student demands disrupt traditional educational institutions.

- Given more choices in educational delivery modes, students increasingly “buy” education on their own terms, based on timeliness, availability on demand, affordability, and relevance to their needs.^{77,186}
- Education in the U.S. is moving rapidly to the Internet⁶; many institutions are making online courses available for free, shifting the role of faculty from teachers to course designers.^{77,186}
- Massive open online courses (MOOCs) have soaring enrollments. The first MOOC offered in 2011 had an enrollment of 160,000; however, MOOCs have low completion rates (rarely >15%).¹⁹³
- For-profit learning institutions are capitalizing on on-line academic curricula.¹⁸⁶
- Fifty percent of all traditional colleges are projected to collapse by 2030, paving the way for a new, lean educational model of personalized learning; micro-colleges, which require < 6 months of training and apprenticeship to switch professions, may emerge.^{77,91}
- Despite growth in online education, many traditional college age students’ desire to have a “college experience” and their parents’ need to send them “off to college” remain strong.¹⁸⁶

- Universities are challenged to keep pace with new information technology increasingly being used to manage courses, student enrollments, student records, and campus communications.¹⁸⁶

Trend 3: Technological advances impact work settings and change how, when and where people work.

- Telecommuting is growing rapidly; about 80% of companies worldwide have employees who work at home, up from 54% in 2003.⁶
- Robots will take over more and more jobs that are routine, remote, or risky.⁶
- Artificial intelligence, data mining, and virtual reality will help industries and governments assimilate data and solve problems beyond the capability of today's computers.⁶
- The Internet is fostering a new generation of entrepreneurs by making it easier and cheaper to establish a profitable business.⁶
- Basic computer programming will become a core skill, required in > 20% of all jobs by 2030.⁷⁷

Trend 4: The digital age is transforming next generation food systems.

- Robotic farming equipment will fertilize, plow and harvest future crops.¹⁸⁴
- Humanoid robots that operate 24/7 will eventually replace migrant workers.¹⁸⁴
- Vertical, urban farming will use robots and sensors to provide ideal light, pH and nutrients to maximize crop yields; the miles food travels from farm to fork will decrease dramatically.¹⁸⁴

- Supermarkets will provide individuals and families with foods tailored to their specific lifestyle and health needs.¹⁹⁴
- On-line grocery sales will be \$18 billion by 2018 and may account for 50% of US grocery sales by 2030.^{195,196}
- Automation allows restaurant customers to order, pay for and receive their food without ever interacting with a person, which decreases labor cost and increases speed.⁷⁸
- Next generation foods may come from 3-D printers capable of printing perfect, personalized foods in terms of size, color, texture, taste, aroma and health properties.⁷⁷

Implications:

- RDNs should shift to higher level skills and services that cannot be automated or programmed into expert systems.²
- RDNs and NDTRs can become leaders in mobile app development and research, focusing on their ability to produce dietary behavior change.^{181,192}
- RDNs and NDTRs who can develop technological innovations will be in demand.²
- Digital literacy should be a part of the official curriculum to prepare all health care professionals for digital health care technologies.⁹³
- Barriers to utilizing teledietetics need to be addressed in order for RDNs to embrace this technology.^{180,181,183}
- To remain competitive, universities must develop high quality online courses and programs, but faculty require additional resources and support staff.¹⁹³

- Massive data collected through health information systems represent an untapped resource to improve nutrition and health care outcomes; RDNs and NDTRs should be proficient in data management and utilization skills.¹⁰⁸

Simulations Stimulate Strong Skills

Change Driver: The use of simulation as an instructional methodology and the amount of research focused on simulations in health care education have become increasingly popular in the last few decades.

Rationale:

Simulations have been traditionally applied in fields where significant risk is associated with the activities being practiced, including the military, law enforcement, and aviation.^{197,198} The use of simulation in health care education is now also growing substantially. Simulation experts project that simulation programs in health care must grow at least 100% over the next five years to reach the level of programs in other fields.^{197,198} By simulating actual work settings,¹⁹⁷ simulations play a vital role in training prior to employment, as well as updating skills of current practicing professionals.¹⁹⁹ In the health care area, simulation has historically been implemented in medical and nursing education and has more recently gained popularity in health professions curricular, with educators noting many advantages associated with the use of simulations. When compared with clinical experience, research has shown similar or improved learner attainment of knowledge and skills from simulation.²⁰⁰ Although limited in number, research studies have also shown favorable outcomes of using simulations in nutrition and dietetics.²⁰¹ The use of simulations in dietetics education will continue to expand because they are effective pedagogical tools, consistent with competency-based education and have the potential for cross-discipline competency development.¹⁹⁸

Trend 1: Simulations help address increased complexity of health care, higher patient acuity levels and patient safety.

- Consistency in students' simulated experiences can enhance the quality of patient care.^{200,201,202}
- Learners can make mistakes in simulated scenarios, learn from their mistakes and rehearse clinical behaviors in a low-risk environment, thus decreasing harm to patients.^{198,199,200,202,203}
- Simulations that promote team settings, where professionals learn from, with and about each other can improve patient safety and outcomes.^{198,199,202}
- Learners can practice with complex situations in a safe, simulated environment before experiencing similar cases in real practice, which results in increased learner skills, confidence and potential for employment.^{197,200,201,202,203}
- Simulations used for continuing professional education help maintain high standards of care that regulatory bodies, professions and the public demand better than traditional education strategies.¹⁹⁹

Trend 2: Accountability of care, pay for performance and financial penalties for provider errors spur interest in simulations.

- Team-based simulations can promote interprofessional communication skills which can result in better patient outcomes.^{198,199,202}
- A meta-analysis on simulation based medical education revealed superior results to traditional methods of medical education in terms of learning and patient outcomes.²⁰⁴

Trend 3: The use of simulations increases in response to cost-cutting in higher education and reduction in the availability of clinical placements for students.

- A severe shortage of supervised practice sites for clinical placements for students remains a challenge for dietetic education programs that are under pressure to recruit and maintain preceptors.²⁰²
- By decreasing the amount of time learners must spend in facilities and relieving some of the pressure on supervised practice sites, simulations can optimize scarce clinical education resources.²⁰²
- Simulations can address the unequal quality of various practice sites and the inconsistent experiences students obtain during clinical placements.²⁰²
- In 2012 and 2013, the Academy of Nutrition and Dietetics' Foundation offered up to \$200,000 in grant funding for the development of simulations in dietetics to address the Accreditation Council for Education in Nutrition and Dietetics' (ACEND) required supervised practice competencies and the shortage and quality of clinical placement sites.²⁰²

Trend 4: The desire to improve critical thinking skills of learners drives the development and use of simulations.

- Simulations based on best education practices can achieve optimal learning outcomes in an organized fashion by facilitating the progression of learning from simpler to more complex skills and helping learners connect new learning with previous learning.
- Simulations can improve documentation of student achievement and outcomes in education.^{197,198,202,203}

- Critical thinking skills and desired learning outcomes are possible through simulations delivered in a variety of methods, including computer-based, peer to peer, and unfolding case studies.^{198,202}

Implications:

- Accreditation and licensing bodies and educational and health care authorities should support the integration of simulation into the education of all health provider groups.
- Adequate resources are needed for the development of standardized, high quality simulations which can provide consistency across health care professional training programs, including simulations that facilitate demonstration of ACEND - required nutrition and dietetics competencies.^{197,198,202}
- Resources focused on low fidelity simulations can provide a higher return on investment because the number of education programs with access to a high fidelity simulation lab may be small.
- Simulations should be gradually implemented and integrated into existing curricular structures with deliberation and adequate evaluation to ensure program quality; research and evaluation should focus on the optimal method and frequency of exposure, quality of assessment tools, and impact on individual learners and patient care.²⁰²
- Adequate time and resources are needed for training dietetics educators in simulation methodology and use.²⁰²
- Simulations in dietetics education have the potential to decrease the number of required hours in actual practice settings, improve preparation for supervised practice and improve

critical thinking skills, but simulations cannot and should not be used to replace supervised practice experiences.^{198,202,203}

- Simulations designed for use in dietetics education programs could also be used to re-train and update the skills of experienced RDNs and NDTRs.¹⁹⁹
- Collaboration should be encouraged among dietetics educators with respect to the development of simulation topics, design of simulations based on best education practices, and simulation evaluation data.^{197,198,202}
- Collaboration with other health professional education programs experienced in simulations should be encouraged, especially nursing which addresses a number of competencies also used in nutrition and dietetics practice.^{197,198,202}

GLOSSARY

Accountable Care Organization: a model of health care in which groups of physicians, health care providers and hospitals align to provide coordinated, high quality care to their patients both inside and outside of the hospital.¹⁰⁵

Advanced practice: the practitioner demonstrates a high level of skills, knowledge and behaviors. The individual exhibits a set of characteristics that include leadership and vision and demonstrates effectiveness in planning, evaluating and communicating targeted outcomes.²⁰⁶

Brainstorming: the generation of new ideas among members of a small group gathered to think creatively about a topic; useful in identifying possibilities, opportunities, and risks.⁵

Capacity building skills: methods for sharing knowledge, developing skills, and creating institutional systems and capacity among a target population, such as training, technical consultation, information packaging and dissemination, and technology transfer activities.²⁰⁷

Change drivers: issues, events, developments and trends coming together as a major force of change.¹

Community health care worker: a frontline public health worker who is a trusted member of and/or has an especially close understanding of the community being served that allows them to serve as a liaison between health, social services, and the community to improve the quality and cultural competency of service delivery.²⁰⁸

Community organizing: a process through which communities are helped to identify common goals or problems, mobilize resources, and develop and implement strategies for reaching their established goals.²⁰⁹

Consulting others: asking other people - often experts - for their opinions about the future.⁵

Cultural competence: the ability of health organizations and practitioners to recognize the cultural beliefs, values, attitudes, traditions, language preferences, and health practices of diverse populations, and to apply that knowledge to produce a positive health outcome. Additionally, competency includes communicating in a way that is linguistically and culturally appropriate.⁴²

Culture of health: the result of what happens when an organization moves beyond wellness programs and undergoes “a fundamental shift toward health promotion as part of the daily practice of the organization and engages people at every level”^{115(p8)}

Evidence-based practice: an approach to health care wherein health practitioners use the best evidence possible, i.e., the most appropriate information available, to make decisions for individuals, groups and populations.²⁰⁶

Food as medicine: a proactive and preventive approach to health where consumers actively choose foods and ingredients, based on how they function in the body, to address health issues and medical conditions.^{8,131}

Food hub: a centrally located business-type facility that facilitates the aggregation, storage, processing, distribution and/or marketing of locally and regionally produced food products.⁶³

Food Policy Council: collaborations between stakeholders representing various segments of a local food system; typically composed of citizens and government officials who study the operation of a local food system and make recommendations for improvement through public policy change; provides a voice for groups who have been historically underserved or underrepresented by agricultural institutions.⁶³

Health disparity: a type of difference in health that is closely linked with social or economic disadvantage. Health disparities negatively affect groups of people who have systematically experienced greater social or economic barriers to health.²¹⁰

Health equity: the attainment of the highest possible level of health for all people, which requires that all persons are valued equally with focused and ongoing societal efforts to eliminate disparities.³⁷

Health literacy: the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.⁴²

Historical analysis: the study of historical events to anticipate the outcome of current developments.⁵

Humanoid robots: robots built to resemble the shape of the human body.⁹³

Integrative health care: health care that is person-centered, oriented to healing, and uses both conventional and complementary therapies; represents a broader paradigm than traditional health care.²¹¹

Interprofessional education: “occurs when students from two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes.”

152(p196)

Long term services and supports (LTSS): a broad range of health-related and social services that assist individuals who have limitations in their ability to perform self-care due to physical, cognitive, developmental or other chronic health conditions that is expected to continue for an extended period of time.¹⁴

Massive open online courses (MOOCs): free, large-scale open access courses on the Internet that are asynchronous, use interactive user forums, and provide an opportunity to earn a document of completion or achievement.¹⁹³

Medical nutrition therapy (MNT): an evidence-based application of the Nutrition Care Process. The provision of MNT (to a patient/client) may include one or more of the following: nutrition assessment/ re-assessment, nutrition diagnosis, nutrition intervention and nutrition monitoring and evaluation that typically results in the prevention, delay or management of diseases and/or conditions.²⁰⁶

Micro-colleges: “any form of concentrated post-secondary education oriented around the minimum entry point into a particular profession.”^{77(p15)}

Nutritional genomics: broad term encompassing nutrigenetics, nutrigenomics, and nutritional epigenomics, all of which involve how nutrients and genes interact and are expressed to reveal phenotypic outcomes, including disease risk.⁹⁷

Nutrition informatics: the effective retrieval, organization, storage and optimum use of information, data and knowledge for food and nutrition related problem solving and decision making. Informatics is supported by the use of information standards, processes and technology.²⁰⁶

Older adult: chronological age of 65 years or greater.²¹²

Patient Centered Medical Home (PCMH): a model of the organization of primary care that delivers the following five core functions of primary health care: comprehensive care; patient-centered care; coordinated care; accessible services; and quality and safety.²¹³

Population health: “the health outcomes of a group of individuals, including the distribution of such outcomes within the group.”^{214(p380)} Population health also addresses determinants of

health, such as medical care, public health programs, social factors, physical environment, personal behavior, and genetics. Examples of populations include geographic regions, ethnic groups, employees, patients in a health care setting, or groups sharing other common characteristics, such as disabled persons or prisoners.

Scanning: an ongoing effort to identify significant changes in the world beyond the group doing the scanning; typically based on a systematic survey of resources for indication of changes likely to have future importance.⁵

Simulation: "...a technique used to replace or amplify real experiences with guided experiences that evoke or replace substantial aspects of the real world in a fully interactive manner."^{205(pe58)}

Social ecological framework: a conceptualization of intervention targets and levels of influence on behavior and behavior change, including: the individual level includes people's knowledge, skills and attitudes; the interpersonal level includes social and peer influences; the institutional/organization level includes changes in organizational policies, practices and environments; the community level includes neighborhoods and community environments; and policy and systems levels include changes in policies and social structures and systems through policy advocacy and political actions.⁸

Social justice: a fair disbursement of common advantages and the sharing of common burdens.²¹⁵

Sustainable diets: diets with low environmental impacts that are economically fair and affordable and contribute to food and nutrition security and healthy lives for present and future generations.⁷⁴

Team-based learning: "... an instructional approach aimed at preparing students for effective, collaborative work within a cohesive group."^{2(pS16)}

Telehealth: “the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration. Telehealth will include both the use of interactive, specialized equipment, for such purposes as health promotion, disease prevention, diagnosis, consultation, therapy, and/or nutrition intervention/plan of care, and non-interactive (or passive) communications, over the Internet, video-conferencing, e-mail or fax lines, and other methods of distance communications, for communication of broad-based nutrition information.”^{206(p31)}

Telemedicine: “applicable to physicians and other practitioners, and is the use of medical information exchanged from one site to another via electronic information and telecommunications technologies to improve patients' health status, to engage in the diagnosis and treatment of medical conditions, to support clinical care, or to provide health services or aid health care personnel at distant sites.”^{206(p31)}

Telenutrition: “involves the interactive use, by a Registered Dietitian or Registered Dietitian Nutritionist, of electronic information and telecommunications technologies to implement the Nutrition Care Process (nutrition assessment, nutrition diagnosis, nutrition intervention/plan of care, and nutrition monitoring and evaluation) with patients or clients at a remote location, within the provisions of their state licensure as applicable.”^{206(p32)}

3 D printer: “an object creation technology where the shape of the objects are formed through a process of building up layers of material until all of the details are in place; a relatively slow process requiring several hours to complete.”^{77(p4)}

Transdisciplinary professionalism: An approach to creating and carrying out a shared social contract that ensures multiple health disciplines/professions, working in concert, are worthy of the trust of patients and the public.¹⁵⁴

Trend analysis: examination of a trend to identify its nature, causes, speed of development and potential impacts.⁵

Trends: a string of issues, events or developments that build momentum; a direction of change, usually a long-term development, that usually influences society, systems, organizations, institutions and sometimes nations and the world.¹

Value based purchasing: “...a financial plan that links provider payment to improved performance by the health care provider.”¹⁰⁵

Visioning: a process in which a group describes the future it wants; visioning creates a picture of the desired future status, affirms the best of what could be, visualizes what excellence looks like, and shows the best scenario for the time; it illustrates how an organization or profession wants to “look” to insiders and outsiders and some say the vision is what you would describe if you had an overnight epiphany that illustrates the perfect position for an organization or profession.¹

World Future Society: a chartered nonprofit educational and scientific organization founded in 1966 in Washington, DC; it is an association of people interested in how social and technological developments are changing the future; serves as a neutral clearinghouse for ideas about the future, including forecasts, recommendations, and alternative scenarios, that help people anticipate what might happen in the next five, 10 or more years ahead.⁵

Yield gap: the difference between the actual and the attainable crop yield.⁸³

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