



**Food is medicine: actions to integrate food and nutrition
into healthcare**

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Analysis

Food is medicine: actions to integrate food and nutrition into healthcare

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Sarah Downer and colleagues review new efforts to incorporate food and nutrition into prevention, management, and treatment of diet-related disease within healthcare systems; they identify research investment, clinician education, funding, and an established infrastructure of intervention providers, as primary drivers of broad integration of nutrition interventions into healthcare.

KEY MESSAGES

- In the face of the global epidemic of diet-related chronic disease, there is increased interest in the use of food and nutrition interventions delivered

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within healthcare systems to prevent, manage, and treat illness.

- **Promising interventions include medically tailored meals, medically tailored groceries, and produce prescription programs.**
- **Supportive actions for robust integration of these interventions into healthcare include investment in rigorous research to test different approaches and address knowledge gaps, clinician education and training on the appropriateness and use of these interventions, and identification of sustained funding streams to ensure equitable access and availability for patients.**

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46 With the global epidemic of diet-related chronic disease has come renewed interest in using
47 food as a formal part of individual care and treatment. One out of every five deaths across
48 the globe are attributable to suboptimal diet, more than any other risk factor including
49 tobacco.¹ Individual interactions with the healthcare system represent a significant
50 opportunity to offer evidence-based food and nutrition interventions. An emerging body of
51 research suggests that such interventions delivered within the healthcare system may
52 improve health outcomes and reduce healthcare usage and costs.^{2-9, 13}

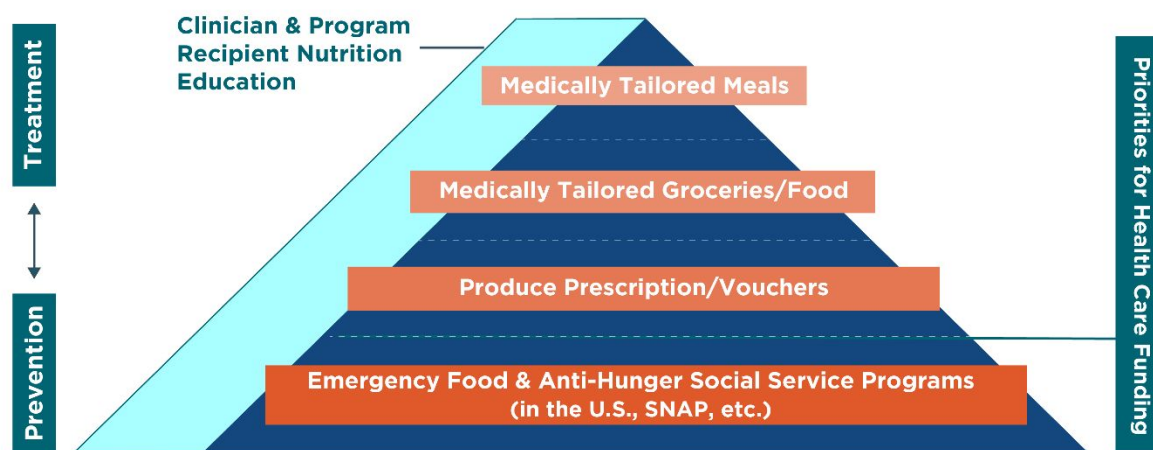
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54 In the face of social inequality, widespread public confusion about what constitutes a healthy
55 diet, and a global food system that results in less healthful, nutrient-poor foods being most
56 accessible, most affordable, and heavily marketed, individuals are at a distinct disadvantage
57 when seeking to adhere to established dietary recommendations.¹⁰ Education and
58 knowledge, while important, are generally not sufficient by themselves to meaningfully alter
59 people's dietary patterns or address systemic problems with food access.¹¹ Thus, system
60 reforms are crucial to empower individuals to eat more healthfully. Among these reforms,
61 innovations that include referrals and financial support for food within the healthcare system
62 may be effective and expedient ways to improve health, even if they do not comprehensively
63 address root structural causes of suboptimal diet. Recognizing this reality, healthcare
64 systems across the globe are beginning to implement and evaluate "food is medicine"
65 interventions. However, efforts remain largely local and often dependent on philanthropic,
66 rather than organizational or institutionalized, support.

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68 This article reviews the characteristics of and evidence for effectiveness of specific food and
69 nutrition interventions within the healthcare system and identifies conditions and actions
70 necessary for increased integration of such interventions into healthcare. We focus herein on
71 novel interventions that utilize food to improve health as opposed to more traditional medical
72 nutrition interventions such as those that focus on vitamin or other nutrient supplements,
73 inpatient clinical nutrition, or medical foods.

74
75 **Key Food is Medicine Interventions within Healthcare**

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77 [BEGIN FIGURE 1] **The Food is Medicine Pyramid: A Hierarchy of Key Food and**
78 **Nutrition Interventions Deployed within Healthcare Systems**

79
80 Figure 1



81
82 Interventions currently being implemented in the U.S. and other nations are represented in
83 their relative order of intensity (highest at the top) and estimated breadth of population
84 coverage (highest at the bottom). Across the spectrum of individual need, the success of
85 these programs rests on educating healthcare professionals in the evidence-based
86 interventions available to them. Equally valuable is empowering clinicians with the
87 knowledge to effectively communicate the importance of food for their patient's health while
88 being equipped to offer substantive dietary advice. Finally, opportunities for nutrition
89 education should be embedded within all of these interventions, supporting sustainable shifts
90 in diet when individuals have or obtain access to the requisite food environment, tools, and
91 resources.

92 See manuscript text and Table 1 for details.

93
94 [END FIGURE 1]

95
96 A range of food and nutrition interventions are currently being implemented and evaluated
97 within healthcare systems. These interventions vary in intensity and breadth of patient
98 coverage (Figure 1, Table 1). Medically tailored meals, the most intensive and complex in
99 composition, target a relatively small percentage of individuals with serious health conditions
100 who can account for a large proportion of healthcare utilization. For individuals with less
101 serious illness, medically tailored groceries or produce prescriptions are less intensive
102 interventions that can improve nutrition and health with potential for greater population
103 coverage.

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3 105 Healthcare systems are increasingly used as a funding mechanism and/or
4 106 delivery/connection point for these types of “Food is Medicine” interventions. Quasi-
5 107 experimental and pilot studies of medically-tailored meals (prepared meals that are designed
6 108 by a Registered Dietitian Nutritionist to be appropriate for specific health conditions) have
7 109 shown associations with fewer individual hospital admissions, emergency department visits,
8 110 emergency transportation use, and overall net monthly healthcare costs in individuals with
9 111 multiple serious comorbidities.²⁻³ They have also been associated with improved adherence
10 112 to antiretroviral therapy in individuals with HIV, as well as with decreased diabetes distress,
11 113 decreased poor mental health days, and fewer instances of hypoglycaemia in individuals
12 114 with type 2 diabetes.⁶⁻⁷ For less ill individuals, small uncontrolled studies suggest that
13 115 nutritious grocery packages and vouchers for produce (often known as produce
14 116 prescriptions) are associated with decreased haemoglobin A1c levels in individuals with type
15 117 2 diabetes,⁴ increased consumption of fruits and vegetables, fewer trade-offs in purchasing
16 118 food versus filling prescribed medications,^{4-5, 8} and lower BMI,⁹ with a decrease in cost of
17 119 care where claims have been evaluated.¹² Modelling and other simulation studies suggest
18 120 that food and nutrition interventions can be highly cost-effective or even cost-saving while
19 121 reducing disparities when targeting key sociodemographic subgroups at highest risk.¹³
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25 123 At the base of the pyramid, general anti-hunger and other food assistance programs (such
26 124 as the Supplemental Nutrition Assistance Program and the National School Lunch Program
27 125 in the U.S.) are less specific in relation to both the targeted populations and types of food
28 126 offered due to their typical focus on addressing food insecurity in broad populations. Such
29 127 programs have historically been designed, funded, and implemented outside healthcare,
30 128 with little to no coordination with healthcare systems. However, the traditionally separate
31 129 worlds and corresponding programs of food assistance for the vulnerable and healthcare
32 130 intervention for those most at risk are beginning to intersect more frequently, with
33 131 stakeholders pushing for greater alignment and coordination.¹⁴
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37 133 [TABLE 1]
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39 135 **Table 1. Characteristics of Novel Food is Medicine Interventions within Healthcare**
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Intervention	Description	Target Populations	Select Outcomes Observed
Medically Tailored Meals	Fully prepared meals designed by a Registered Dietitian Nutritionist or other nutrition professional based on an individual nutrition assessment. Typically, the intervention includes individualized nutrition counseling as needed. Meals address the individual's medical diagnoses with the goal of ensuring the best possible health outcomes.	Individuals with significant complex medical conditions such as cancer, HIV, chronic heart failure, poorly controlled diabetes, End Stage Renal Disease, etc., who also have food insecurity and/or limitations in completing necessary daily tasks, which makes it challenging to have a healthy diet.	<ul style="list-style-type: none"> • Decreased inpatient hospital admissions²⁻³ • Decreased emergency department use³ • Lower rate of emergency transports³ • Fewer admissions to skilled nursing facilities² • Lower overall health care costs²⁻³ • Increased diet quality⁶ • Fewer days where mental health interfered with quality of life⁶ • Increased adherence to medication regimens⁷ • Less hypoglycemia in people with diabetes⁶

			<ul style="list-style-type: none"> • Decrease in self-reported depressive symptoms⁷ • Decrease in tradeoffs in food versus filling prescription medications⁷
Medically Tailored Groceries/Food	A package of non-prepared grocery items selected by a Registered Dietitian Nutritionist or other nutrition professional as part of a treatment plan for an individual with a defined medical diagnosis. Individuals typically pick up the food at a variety of locations (e.g. on-site at a hospital or clinic or at a community distribution point such as a food pantry) and prepare the food at home.	Individuals with diet-related chronic and acute conditions such as diabetes, cardiovascular disease, etc. who are also food insecure and who are able to cook and prepare food at home.	<ul style="list-style-type: none"> • Decreased hemoglobin A1c in people with diabetes⁴ • Increased medication adherence⁴ • Increased fruit and vegetable consumption⁴
Produce Prescription/ Voucher	Vouchers or debit cards for free or discounted produce, distributed by health care providers to address an individual's specific health condition or health risk. Can be redeemed at various locations throughout the community.	Individuals who have or are at risk for diet-related chronic conditions such as obesity or prediabetes and who are food insecure.	<ul style="list-style-type: none"> • Decreased HbA1c in people with diabetes⁵ • Increased fruit and vegetable consumption⁸ • Decreased fast food consumption⁸ • Decreased BMI⁹

[END TABLE 1]

Laying the groundwork for increased integration of food and nutrition within healthcare: conditions and actions necessary for success

The ability to integrate food and nutrition into healthcare depends on many factors. Among these, we believe some of the most important are:

- (1) Data on effectiveness of different food and nutrition interventions in relation to an individual's health profile and preferences.
- (2) Clinician nutrition knowledge and familiarity with food and nutrition interventions, along with systems and incentives for implementing such interventions in practice.
- (3) Payment systems for food and nutrition interventions within and/or outside of healthcare.
- (4) An infrastructure of experienced peri-healthcare organizations and vendors to supply the appropriate interventions to patients.

1: More data on effective interventions and appropriate target populations

156

157 Fundamentally, integration of food and nutrition interventions into healthcare should be
158 based on sound research. While growing evidence supports the effectiveness and cost-
159 effectiveness of specific food and nutrition interventions for improving diet quality, reducing
160 food insecurity, and improving health outcomes (Table 1), a number of important questions
161 have yet to be addressed.

162

163 Most studies to date are quasi-experimental or small, short-term pilot interventions. The
164 promising findings observed in these studies must be evaluated with further, larger
165 implementation studies, including randomized trial designs with appropriate comparison
166 groups, or other research designs with low risk of bias. Additional key evidence gaps include
167 the comparative efficacy of different nutrition interventions on physical, social and mental
168 health outcomes and healthcare utilization, heterogeneity of treatment effects (i.e., which
169 interventions work best for which groups, defined by both clinical and social circumstances),
170 and the optimal intensity and duration of nutritional intervention needed for different clinical
171 and social situations. Further, given that food and nutrition interventions may have effects
172 throughout the life course, the appropriate timescale to assess benefits should also be
173 considered. Supportive evidence can be derived from careful modelling and microsimulation
174 studies to forecast and compare dietary, health, and utilization/cost benefits for different
175 interventions and scenarios over both shorter-term and longer-term periods.

176

177 For food and nutrition interventions to be most effective, engagement of the participant and
178 evaluation of the participant experience is crucial. Dietary patterns are shaped by a number
179 of factors, from personal preference, age, gender, and education to early life exposures,
180 cultural, familial and community norms, and local food environments.¹⁵ Food and nutrition
181 interventions must acknowledge and respond to what people want to consume. Beyond the
182 factors that shape an individual's desired diet, realities such as oral health, financial
183 resources, physical access, and ability and capacity to purchase and prepare food, all
184 influence what people eat. Further qualitative research will better integrate individual
185 perspectives into the design of food and nutrition programs and reveal how, why, and in
186 what context nutrition interventions work best for participants.¹⁶ For example, an intervention
187 that requires cooking and preparing food at home will not be effective if the household lacks
188 appropriate knowledge or facilities. One crucial consideration is the scope of the
189 intervention: individual vs. household. For those living in multi-person households, an
190 intervention that provides food and nutrition support only for one individual may be much
191 less effective, as that individual is likely to share food or even feed others (e.g. dependents)
192 first.¹⁷ Food and nutrition interventions should also be culturally appropriate, and the
193 healthcare entities should recognize that mistrust of the healthcare system may be an
194 important barrier to overcome. Research to integrate food and nutrition services into
195 healthcare and bring them to scale should therefore contemplate co-design of interventions
196 with eligible participants and appropriate community-based organizations, and utilize trusted
197 community-based organizations in service delivery.¹⁸

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199 A robust new investment in clinical, systems, and qualitative research is critical to the
200 integration of these services into healthcare.

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2: Increased nutrition knowledge among healthcare clinicians, familiarity with food and nutrition resources, and tools for referral

In order to fully realize the benefits of incorporating food and nutrition interventions into healthcare, clinicians must be knowledgeable about food and nutrition, able to recognize a patient's nutritional needs, and able to make appropriate recommendations or referrals. However, this is not the case in many countries. In the U.S., for example, healthcare professionals (other than Registered Dietitians) receive very little or no food and nutrition education during training, with less than one percent of lecture hours spent on nutrition education in medical school.¹⁹ While significant recommendations have been made over the last 20 years to advance policies to increase nutrition education,²⁰ change remains elusive. A majority of physicians recognize their lack of sufficient nutrition education, and would like more information to address this key driver of health.²¹

Acknowledgment of this deficit has led to calls to require nutrition training for healthcare professionals within undergraduate, graduate, and residency programs, and in lifelong learning programs. As inter-professional training has been shown to improve patient outcomes in other arenas;²² nutrition training delivered across disciplines holds the promise of more effective patient nutrition education and treatment. In the U.S. and other nations, including the U.K. and Spain, Culinary Medicine movements are blending clinical medicine with individual nutrition education focused on the practical aspects of food preparation and cooking. Such educational efforts support a healthcare professional's ability to recognize nutrition needs in the clinical setting and provide appropriate and practical nutrition advice to patients.²³ Research has shown that Culinary Medicine programming has a positive impact on nutrition-related competencies and attitudes amongst healthcare professionals in training.²⁴ Beyond ensuring that clinicians are prepared to offer evidence-based dietary counselling, nutrition curricula must also address approaches to screen for and evaluate food security and dietary quality, effective strategies for nutrition counselling and behaviour change,²⁵ and the range and efficacy of available interventions that provide food in addition to individual nutrition education (as a subset of patients will not have the resources to purchase certain foods or the ability to prepare food at home).

Clinicians must have familiarity with the range of available food and nutrition interventions as well as relevant accompanying systems and incentive structures to use them in practice. Many food and nutrition interventions, from medically tailored meals to lifestyle change programs, will be sourced, accessed, or received in a community setting that also offers a variety of non-medical services to a broader population. True integration of these services into healthcare will require a seamless referral system leveraging technology that can both assist clinicians in connecting individuals to community-based services, and subsequently allow them to incorporate information about services received into patient records and treatment plans.

Requiring comprehensive nutrition training as a component of healthcare clinician education will ensure equitable patient access to nutrition expertise across specialties and geographies. It will also spur the incorporation of nutrition assessment into patient Electronic Health Records and prepare clinicians to make referrals for food and nutrition interventions. In the U.S., researchers at Harvard Law School have identified several pathways to ensuring incorporation of nutrition content into clinician curricula, including making government

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3 250 funding for schools contingent upon such requirements.²⁶ In addition to tying government
4 251 funding to incorporation of food and nutrition into curricula, rapid adoption of nutrition
5 252 education in clinical training can be mandated by statute, incorporated into accreditation
6 253 standards, and included on board and other qualifying examinations.²⁶

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10 256 **3: Payment systems to sustainably support food and nutrition interventions within** 11 257 **and outside of healthcare**

13 258

14 259 In the absence of financial mechanisms to fund food and nutrition interventions, individuals
15 260 who struggle to purchase and prepare recommended foods at home are unlikely to be able
16 261 to adhere to clinician nutrition advice. Moreover, the absence of sustainable funding
17 262 mechanisms for medically tailored meals or other complex food and nutrition interventions
18 263 means that in many locations, these services may simply not be available. Thus, sufficient
19 264 implementation of food and nutrition interventions, particularly those delivered through the
20 265 healthcare system, requires payment models that support these services.

22 266

24 267 In many conventional healthcare systems, financial coverage is available for interventions
25 268 such as enteral or intravenous feeding support or nutrition supplements for defined clinical
26 269 deficiencies. In contrast, payment for food or meals is often allowed in only narrow
27 270 circumstances – for example, for inpatients or individuals residing (or eligible to reside) in an
28 271 assisted living facility or nursing home. However, such a restrictive strategy may not be a
29 272 wise choice. In the U.S., an individual can receive 7 months of medically-tailored meals,
30 273 nutrition counselling, and case management for the average cost of one inpatient hospital
31 274 admission.²⁷ Where the provision of food is found to affect the rate of hospital admissions
32 275 and other high-cost services, health policymakers have a powerful incentive to alter
33 276 healthcare funding restrictions in order to ensure individuals can receive the most effective
34 277 and cost-effective interventions. Encouragingly, some U.S. health system entities, including
35 278 healthcare payers and provider organizations, are leveraging recent changes to healthcare
36 279 funding parameters to provide nutrition interventions to individuals who meet certain criteria
37 280 (see examples in Table 2).

40 281

42 282 Payment mechanisms need not necessarily involve the healthcare system, as long as they
43 283 are designed with health promotion in mind and are integrated with interventions
44 284 administered through the healthcare system. Better coordination and integration between
45 285 healthcare and food assistance programs can be an effective way to leverage existing
46 286 resources for health promotion in many countries. For example, systems can be developed
47 287 so that healthcare payers and providers can automatically screen, refer, and enrol patients in
48 288 separately funded food and nutrition programs. Diagnosis of a specific diet-sensitive health
49 289 condition could qualify an individual to be enrolled in such programs for increased or more
50 290 specific benefits.

53 291

54 292 Overall, direct integration of funding support for food and nutrition interventions via the
55 293 healthcare system may be the most efficient and sustainable path to ensuring patients can
56 294 access appropriate nutrition supports to improve their health. When food and nutrition
57 295 interventions meet a standard of evidence that demonstrates desired levels of impact on
58 296 individual health outcomes and/or other desirable outcome measures, these services should
59 297 be fully integrated into healthcare payment models. Reimbursement will also increase

298 access to interventions, especially more complex services like medically tailored meals, by
299 providing a sustainable funding source for these services across all geographies.

300

301 **4: Infrastructure of organizations and vendors that can deliver complex food and** 302 **nutrition interventions**

303

304 Individual access to food and nutrition interventions across sociodemographic groups and
305 geographic contexts will require a well-developed network of community providers and
306 vendors that have substantial expertise in food and nutrition interventions and are capable of
307 working closely with healthcare entities. In some cases, as with on-site medically tailored
308 food pantries, health care entities themselves will administer a nutrition intervention.
309 However, the majority of food and nutrition interventions, including education, will be
310 available in the community or delivered to the patient's home. Nonprofits specializing in
311 emergency food response may not have the technological tools to partner with healthcare,
312 although many are rapidly developing this capacity as they work to respond to the
313 prevalence of diet-related chronic health conditions in their client population; some of these
314 entities have evolved into extremely sophisticated peri-healthcare organizations. For-profit
315 nutrition ventures that have the advantage of leveraging economies of scale may not
316 typically serve individuals who are vulnerable and have very limited resources. Creating an
317 infrastructure of organizations that can work with complicated and sensitive health
318 information to deliver sophisticated food and nutrition interventions to anyone who meets
319 eligibility criteria will therefore likely require both public and private investment.

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321

322 [TABLE 2]

323 **Select examples of integration of food and nutrition interventions in healthcare in the** 324 **U.S.**²⁹

325 In the U.S., risk-bearing payment models are driving experimentation and adoption of food
326 and nutrition interventions, as health insurers hope for a return on investment from
327 reductions in high-expenditure healthcare claims and increased use of preventive and
328 primary care services. In light of emerging evidence, policymakers are experimenting with
329 loosening the parameters of value-based or capitated payment structures to allow public
330 insurance dollars to be spent on food and nutrition interventions. This flexibility can be
331 expanded, administratively or via legislation, to all public insurance programs. However,
332 large scale uptake of newly created flexibility to pay for food depends on payer confidence
333 that food and nutrition interventions, as opposed to other aspects of medical care, are
334 clinically effective and will be cost-effective.

335

Healthcare Program and Payment Mechanism	Food & Nutrition Intervention(s)	Target Population	Anticipated Outcomes/Metrics of Success
Medicaid Accountable Care Organizations (Massachusetts) – Demonstration Initiative *Medicaid is the U.S. public insurance program for some low-	<ul style="list-style-type: none"> Home-delivered meals (medically tailored and non-medically-tailored) Medically tailored food Assistance applying for non-healthcare 	<p>Medicaid members with one of three risk factors AND who meet one of five health needs-based criteria.</p> <p>Health needs-based criteria include:</p>	<ul style="list-style-type: none"> Reduced emergency department use Reduced inpatient hospital admissions Reduced overall health

<p>income populations or individuals living with a disability. Within the U.S., the program varies in operation from state to state.</p>	<p>nutrition programs; and legal advocacy for benefits</p> <ul style="list-style-type: none"> • Household supplies to meet dietary needs (cooking implements) • Nutrition skills development • Transportation to meet nutritional needs 	<ul style="list-style-type: none"> • Has a mental health condition • High risk pregnancy • Has a complex health condition • Has visited the ER more than twice in the six months • Has one or more limitation in activities of daily living <p>Risk factors include:</p> <ul style="list-style-type: none"> • Experiencing homelessness • At risk of homelessness • At risk of nutritional deficiency or imbalance due to food insecurity 	<p>care expenditures</p> <ul style="list-style-type: none"> • Improved clinical outcomes • Increased ability to live independently in the community
<p>Medicaid in California – Demonstration Initiative</p>	<p>12 weeks of medically-tailored meals, nutritional counseling, and case management</p>	<p>Individuals enrolled in Medicaid diagnosed with Congestive Heart Failure with an inpatient hospital admission in the past 12 months</p>	<ul style="list-style-type: none"> • Reduction in inpatient admissions • Lower overall health care costs
<p>Medicare Advantage (at the discretion of the insurer, with approval from the federal government)</p> <p>*Medicare is the public health insurance program for individuals over age 65. In the Medicare Advantage, private insurance companies administer the required benefits and have some flexibility to provide nutrition-related supplemental benefits.</p>	<p>Wide range of nutritional supports, including medically tailored meals, packages of unprepared foods, transportation to food retailers, etc.</p>		<p><u>Metrics common to all food and nutrition interventions:</u></p> <ul style="list-style-type: none"> • Improvement in metrics that contribute to plan quality ratings • Improved patient experience and satisfaction
	<p>Healthy food debit cards (with a value of \$25-\$50 USD per month)</p>	<p>Individuals who are low-income with complex medical conditions</p>	<ul style="list-style-type: none"> • Decreased emergency department use • Decreased inpatient admissions

			<ul style="list-style-type: none"> Improved self-reports of “healthy days”
	Medically tailored meals delivered on the 4 th week of each month (when other food assistance programs are generally exhausted)	Individuals living with diabetes	<ul style="list-style-type: none"> Decreased emergency department use Decreased inpatient admissions Improved hemoglobin A1C
<p>Medicaid received through the Indian Health Service (funded via an agriculture program)</p> <p>*The Indian Health Service is a public health insurance program serving indigenous nations within the U.S. Some tribes are using federal agriculture funding to create produce prescription programs administered by health centers.</p>	Nutritional counseling and a produce prescription (voucher redeemable for produce at a local retailer)	Women with pregnancies deemed to be high-risk	<ul style="list-style-type: none"> Increased participation in prenatal appointments Increased rate of pregnancies carried to term Frequency of infant birthweight in normal range

336

337 [END Table 2]

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339

340 **Conclusions and Future Directions**

341

342 Integration of food and nutrition interventions into healthcare depends in large part on new
 343 investment in research to significantly add to the evidence base. Improved clinician training
 344 and referral capacity, together with increased financial support for interventions both within
 345 and outside the healthcare system, will ensure that patients are assessed and referred to
 346 appropriate nutrition interventions available in every community. Access to interventions will
 347 be supported by the proliferation of organizations and entities that are able to deliver a range
 348 of food and nutrition interventions, some of which are quite complex.

349

350 Beyond these critical factors, other nascent efforts and new developments are likely to
 351 influence the incorporation of nutrition within the healthcare system. For example, given that
 352 hospitals and other healthcare facilities are anchor institutions in many communities,
 353 procurement policies that prioritize healthier food for patients and employees can help create
 354 cultural shifts toward increased availability of healthy food across the community. Metrics on
 355 nutrition assessment and status can be integrated into Electronic Health Records. These can
 356 include a brief “nutrition vital sign” screening and a more comprehensive annual “nutrition
 357 physical” that includes detailed information about individual nutrition needs. The emerging
 358 convergence and synergies between government food assistance programs that target food
 359 insecurity and children’s meals and healthcare system interventions that target social
 360 determinants of health including nutrition must be fully recognized and leveraged. Finally, the
 361 growing recognition of the crucial role of the food system in climate change and resource

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3 362 sustainability of water, land, and the oceans may also influence the pace and breadth of
4 363 integration of food and nutrition in healthcare. As governments increasingly recognize the
5 364 critical need to address food systems in order to meet the health and sustainability aims of
6 365 the United Nations Sustainable Development Goals, they will value complex, innovative
7 366 multi-stakeholder approaches that address and align policies related to food, health,
8 367 resource use, economic development, and investment.²⁸
9 368

10 369 The global pandemic of COVID-19 has brought the fragility of food and healthcare systems
11 370 across the globe into sharp relief, with skyrocketing rates of food insecurity and individuals
12 371 living with diet-related illness struggling with increased barriers to healthy food access.
13 372 Healthcare systems where food and nutrition interventions are fully integrated will enable
14 373 more resilient systemic responses to such crises. An integrated system will support an
15 374 infrastructure of nutrition intervention providers and access pathways that can be utilized to
16 375 meet increased demand for healthy food support.
17 376

18 377 As healthcare systems continue to evolve to address the global crisis of nutrition-related
19 378 disease, food and nutrition interventions must be centre stage. Such strategies must be held
20 379 to rigorous standards when implementation, coverage, and care decisions are made. But
21 380 they can no longer be categorically excluded as outside of or ancillary to healthcare delivery,
22 381 as they have been in the past across many healthcare systems. Integration of food and
23 382 nutrition interventions into healthcare holds significant promise for meeting immediate
24 383 nutrition needs while working in harmony with broader, long-term health and food system
25 384 reforms.
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27 386

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8 489 Service staff interviews with Sarah Downer, Mar 2020, notes on file with author.

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12 13 491 **Contributors and sources**

14 492 The expertise of the authors includes dietary patterns (DLO, TSH, SAB, DM), nutrition and health-
15 493 related public policy (SD, DLO, and DM), clinician nutrition education and training (TSH and DM),
16 494 primary care and health-related social needs interventions (SAB, DLO), and socioeconomic inequities
17 495 in diet and health (all). SAB, DLO, TSH, and DM are clinicians. All authors contributed to drafting
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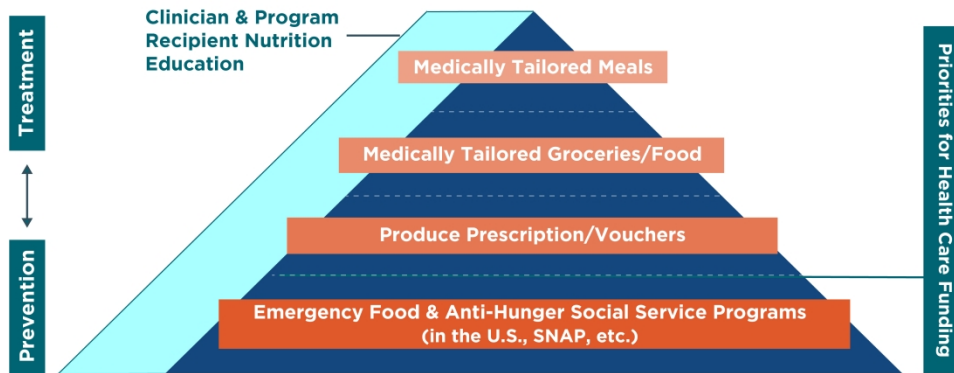
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Title of Figure 1: The Food is Medicine Pyramid: A Hierarchy of Key Food and Nutrition Interventions Deployed within Healthcare Systems

Interventions currently being implemented in the U.S. and other nations are represented in their relative order of intensity (highest at the top) and estimated breadth of population coverage (highest at the bottom). Across the spectrum of individual need, the success of these programs rests on educating healthcare professionals in the evidence-based interventions available to them. Equally valuable is empowering clinicians with the knowledge to effectively communicate the importance of food for their patient’s health while being equipped to offer substantive dietary advice. Finally, opportunities for nutrition education should be embedded within all of these interventions, supporting sustainable shifts in diet when individuals have or obtain access to the requisite food environment, tools, and resources.

See manuscript text and Table 1 for details.