



Dairy's Role in Today's Global Nutrition Environment

Matthew Pikosky, PhD, RD
MI Dairy Industry Conference
May 16, 2019

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Bringing to life the dairy community's shared vision of a healthy, happy, sustainable world, with science as our foundation

The U.S. Dairy Stewardship Commitment. <http://commitment.usdairy.com/>

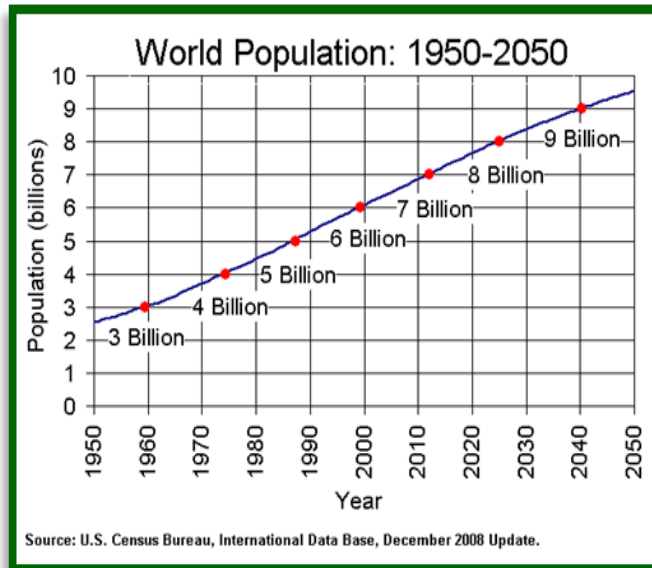
Greatest Challenge of Our Generation: Nourishing a Growing Global Population with Limited Natural Resources



Food production will need to increase by 70% to feed to world by 2050



Global middle class will triple by 2030



70% of the world population will live in cities by 2050



70% of suitable agricultural land is already in use



52% of world population could have severe water scarcity by 2050

Malnutrition is in the crosshairs



The world faces a grave nutrition situation...



2 billion people lack key micronutrients like iron and vitamin A



155 million children are stunted



52 million children are wasted



2 billion adults are overweight or obese



41 million children are overweight



88% of countries face a serious burden of either two or three forms of malnutrition

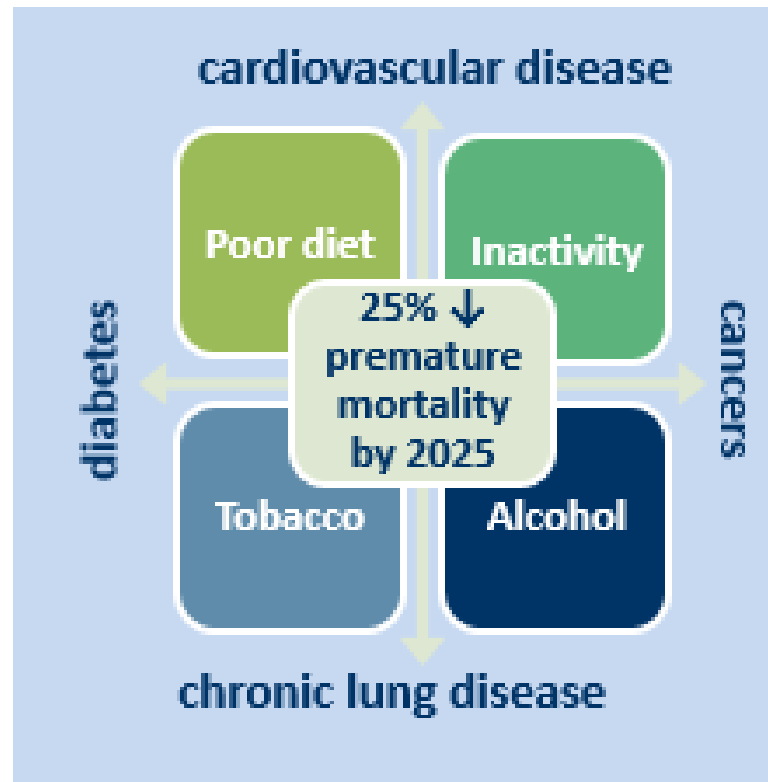


And the world is off track to meet all global nutrition targets

The Global Nutrition Report <http://www.sdg2advocacyhub.org/GNR2017>

The rise of non-communicable diseases

Non-communicable diseases
are responsible for 3 out of 5 deaths worldwide





SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



Sustainable diets as defined by FAO

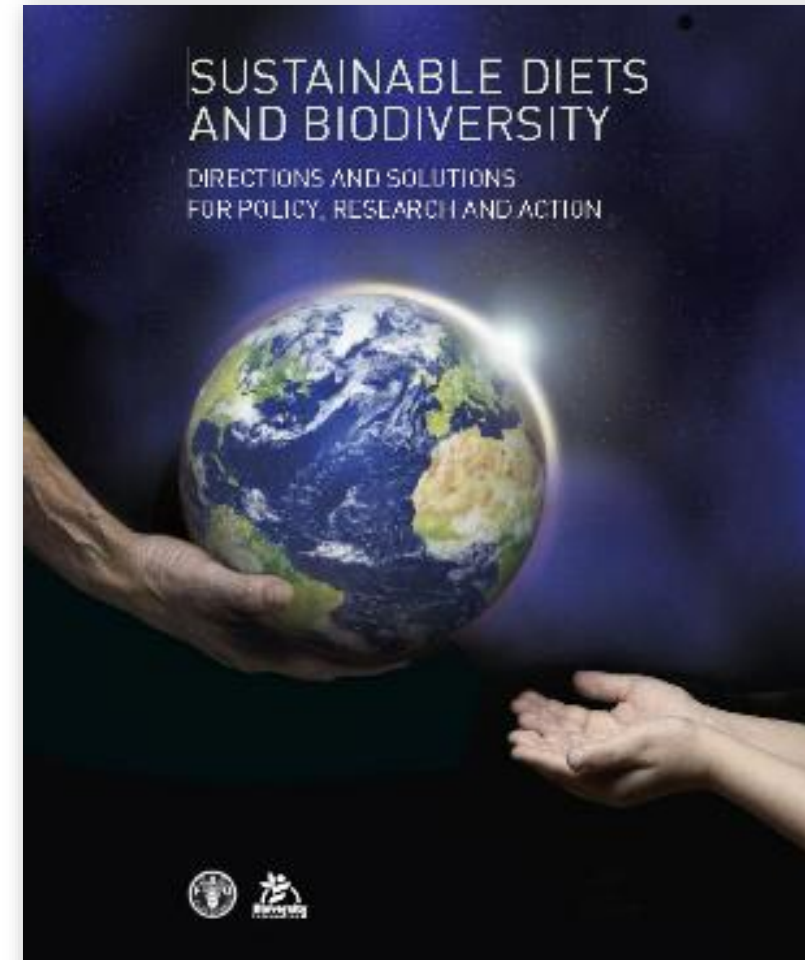
“Sustainable Diets are those diets with low environmental impacts which

The ongoing science-based pursuit for solutions that provide affordable, accessible, nutrient-rich foods that can nourish the world’s growing global population, while also protecting environmental resources.

and healthy; while optimizing natural and human resources.”

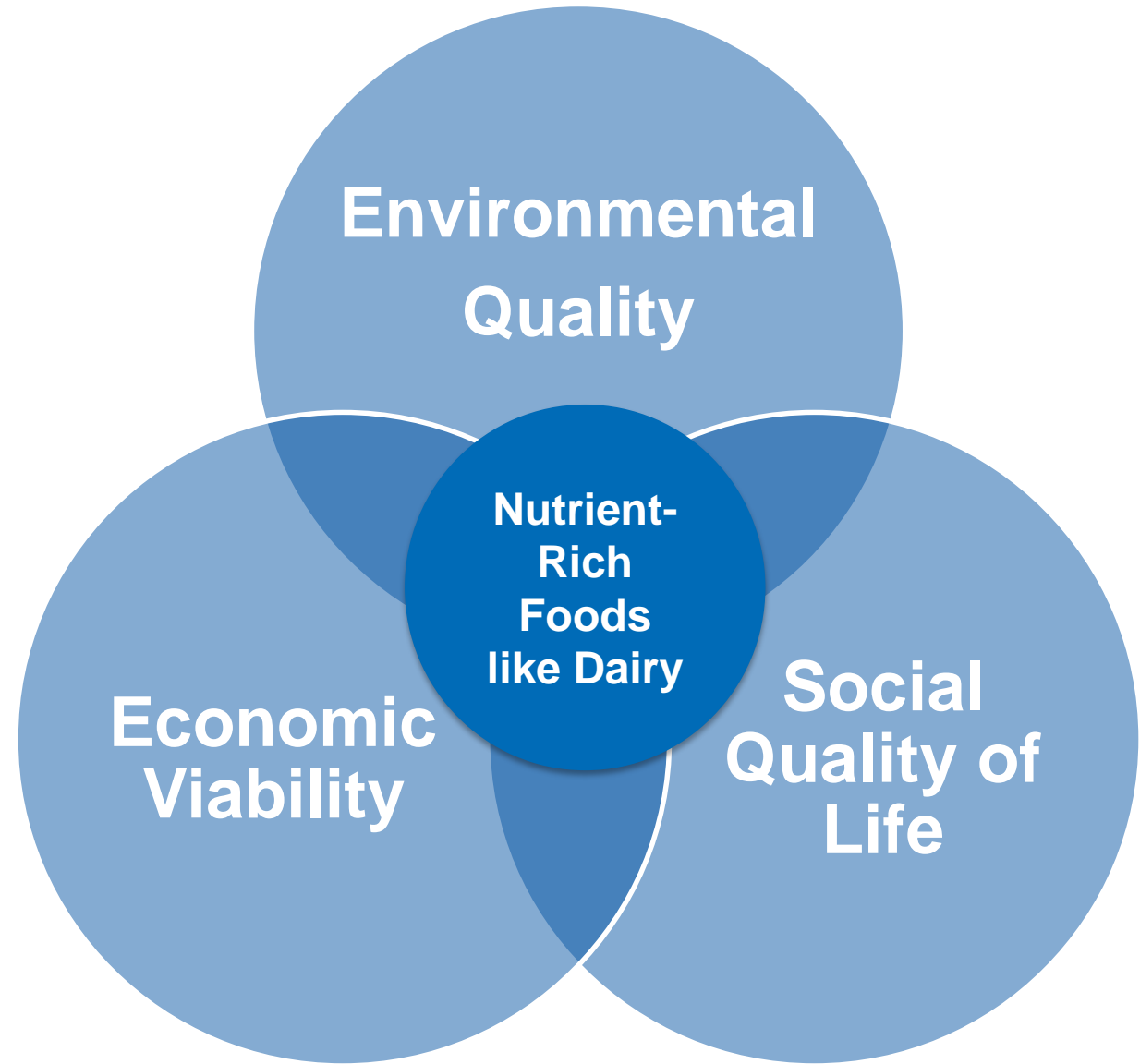


FAO and Biodiversity International 2012



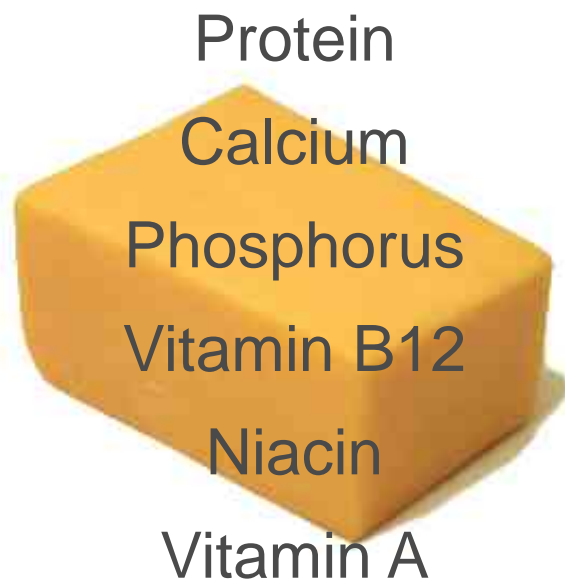
Proceedings of the International Scientific Symposium,
BIODIVERSITY AND SUSTAINABLE DIETS UNITED
AGAINST HUNGER, 3–5 November 2010, FAO
Headquarters, Rome

The dairy sector plays a critical role to help provide food security, environmental sustainability and economic prosperity worldwide



Social / Nutrition

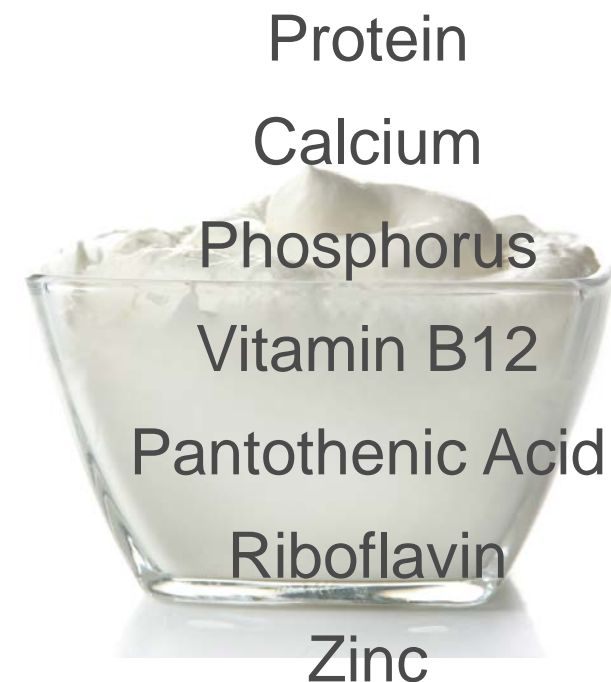
Cheese*:
6 essential
nutrients



Milk:
9 essential
nutrients



Yogurt:
7 essential
nutrients



*Nutrients based on USDA Database for Cheddar #01009



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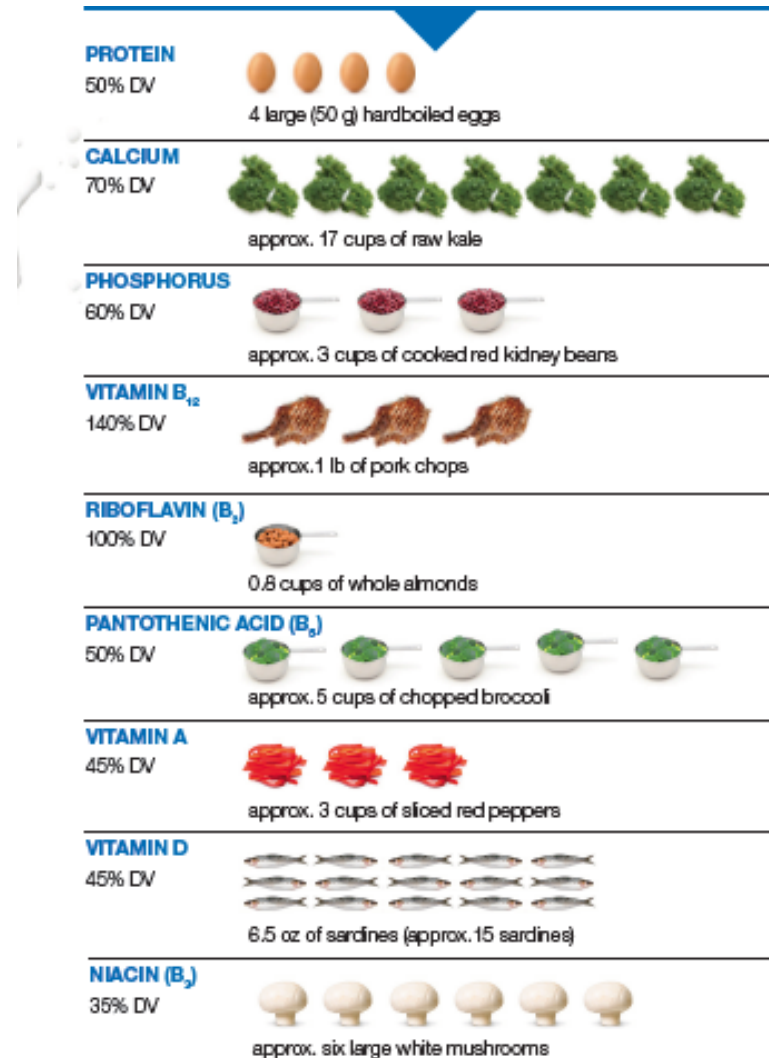
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3 Servings of Milk Deliver a Unique Nutrient Package



Three servings of milk provide the same level of nutrients found in these foods



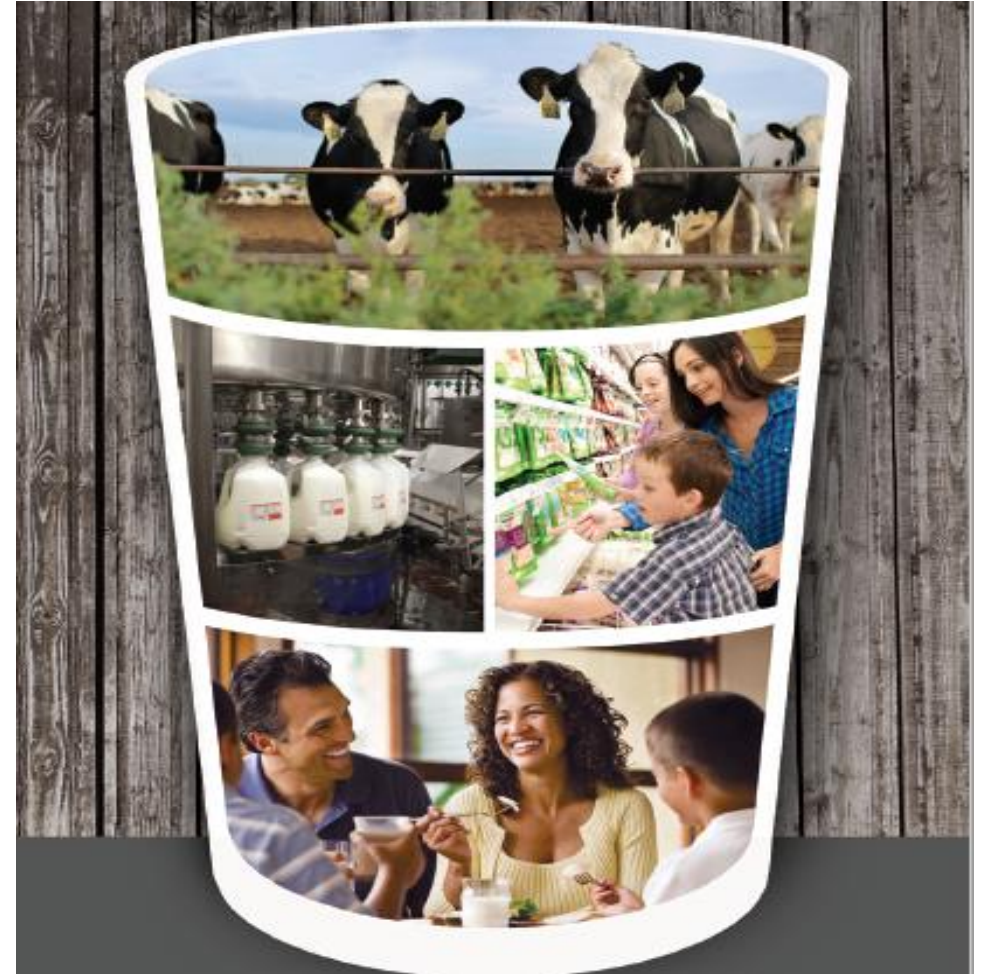
“... the **amount** of many potential alternatives to provide sufficient calcium would provide **too many calories** and/or be a **large amount to consume daily.**”

“...**bioavailability** of the calcium in vegetable products has not been addressed and **could pose a concern.**”

*2015 Dietary Guidelines
Advisory Committee
Report. Appendix E3.6*

Dairy Foods Contribute Essential Nutrients to Diets

56% Vitamin D
54% Calcium
29% Vitamin A
28% Phosphorus
27% Vitamin B12
24% Riboflavin
18% Protein
17% Zinc
14% Potassium



Data from NHANES 2011-2014 (n=15,829).

Citation:

National Dairy Council. NHANES 2011-2014. Data Source: Centers for Disease control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey Data. Hyattsville, MD: U.S. Department of Health and Human Services.<http://www.cdc.gov/nchs/nhanes.htm>.



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The NEW ENGLAND JOURNAL of MEDICINE

Changes in Diet and Lifestyle and Long-Term Weight Gain in Women and Men

Dariush Mozaffarian, M.D., Dr.P.H., Tao Hao, M.P.H., Eric B. Rimm, Sc.D.,
Walter C. Willett, M.D., Dr.P.H., and Frank B. Hu, M.D., Ph.D.

3 Cohort Studies (NHS I & II, HPFS)
>120,000 women and men

Each serving of yogurt/d was associated with -0.82
lb. weight change over a 4 year period

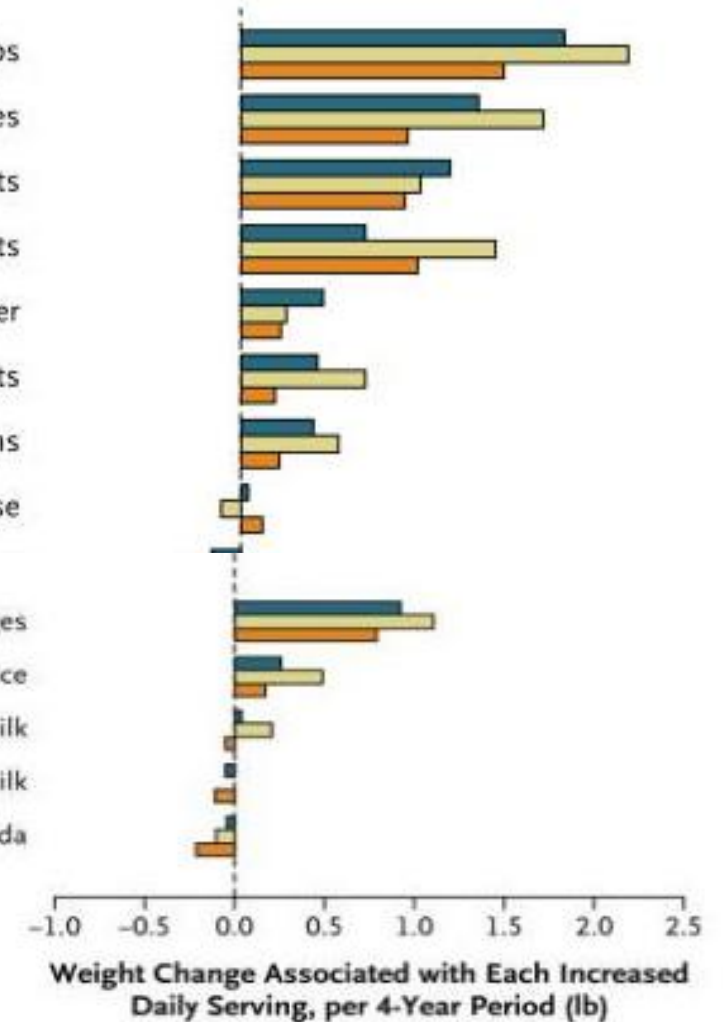
Foods

Potato chips
Potatoes or fries
Processed meats
Unprocessed red meats
Butter
Sweets and desserts
Refined grains
Cheese

Beverages

Sugar-sweetened beverages
100%-Fruit juice
Low-fat or skim milk
Whole milk
Diet (zero-calorie) soda

NHS (women)
NHS II (women)
HPFS (men)



Mozaffarian D et al. *NEJM*; 2011. 364:2392-2404.



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Preponderance of Evidence: Dairy Food Consumption has a Neutral or Beneficial Association with Reduced Risk for Chronic Diseases

NDC Science Summary on Cardiovascular Disease, Blood Pressure and Type 2 Diabetes

SCIENCE SUMMARY: Cardiovascular Disease

Dairy food consumption is not linked to higher CVD risk and may be linked to lower stroke risk



Overview

Dairy foods patterns. The vitamin D and Dietary Guid recommend consumption artery disease further supp 2015 DGA.

Healthy eating patterns can help lower risk for CVD

CVD is the leading cause of death in the U.S., accounting for 1 in 4 deaths. The heart and blood vessels that can impair heart function are arteries that feed the heart muscle or the brain.^{2,3} Annual costs of CVD in the U.S. are estimated to be \$316.6 billion.¹ The 2015 DGA recommends 3 daily servings of low-fat or fat-free dairy foods for those aged 2 and older. In the Healthy U.S.-Style Eating Pattern.⁴ In 2016, AHA/American College of Cardiology Guidelines on diet and lifestyle recommendations for primary prevention of CVD, guidance similar to the DGA regarding daily consumption of dairy foods.

The 2015 Dietary Guidelines for Americans notes that current evidence indicates healthy eating patterns, which include low-fat or fat-free dairy foods, are linked to lower risk for CVD among adults.²

Research explores links between dairy food consumption and lower risk for CVD

The 2015 DGA recommendation to include dairy foods in healthy eating patterns builds on conclusions that emerged in the 2010 DGA, including that dairy food consumption is associated with lower risk for CVD. The 2010 DGA conclusions were based on studies published through 2009, and evidence on the association between dairy food consumption and CVD has continued to grow.¹ In 2016, Drouin-Chartier, et al., published a comprehensive systematic review of prospective research on dairy and chronic diseases, including CVD, CAD and stroke, and findings from the Drouin-Chartier review⁵ and two meta-analyses^{6,7} have been published.

¹ Research published between 2009 and 2016 (8-29) has explored the association between dairy food consumption and CVD in 21 total prospective cohort studies plus 11 prospective cohort studies.
² Drouin-Chartier et al. (5) reviewed eight meta-analyses (11-18), two meta-analyses (19-21), and four additional prospective cohort studies (18-21).
For more information, please visit: <https://www.nationaldairyCouncil.org/science-summary>
©2018 NATIONAL DAIRY COUNCIL: Cardiovascular Disease

SCIENCE SUMMARY: Blood Pressure

Total dairy food consumption is linked to lower risk for high blood pressure



Overview

Dairy foods patterns. The vitamin D and Dietary Guid recommend consumption artery disease further supp 2015 DGA.

Healthy eating patterns can help lower risk for high blood pressure

High blood pressure is a major risk factor for cardiovascular disease. The leading cause of death in the U.S. is heart disease, and total health care costs and disability (average) totaled \$48.6 billion.¹ Lifestyle guidelines for blood pressure management include a reduced-fat diet containing up to 3 servings of dairy foods, avoidance, limited alcohol consumption and healthy eating patterns. A reduced-fat diet containing up to 3 servings of dairy foods demonstrated to lower elevated blood pressure and recommended eating patterns also include low-fat or fat-free dairy foods. The DGA recommends 3 daily servings for children 4-8 years, and 2 for children 2-3 years. Healthy eating patterns are associated with lower risk for high blood pressure.

Drouin-Chartier, et al., concluded that high blood pressure is linked to lower risk for CVD among adults.²

Research continues to explore links between dairy food consumption and lower risk for high blood pressure

The 2015 DGA recommendation to include dairy foods in healthy eating patterns builds on conclusions that emerged in the 2010 DGA, including that dairy food consumption is associated with lower risk for high blood pressure. The 2010 DGA conclusions were based on studies published through 2009, and evidence on the association between dairy food consumption and high blood pressure has continued to grow.¹ In 2016, Drouin-Chartier, et al., published a comprehensive systematic review of prospective research on dairy and chronic diseases, including high blood pressure, and findings from the Drouin-Chartier review⁵ and two meta-analyses^{6,7} have been published.

¹ Research published between 2009 and 2016 (7-12, 14-30) has explored the association between dairy food consumption and high blood pressure in 21 total prospective cohort studies plus 8 prospective cohort studies.
² Drouin-Chartier et al. (5) reviewed eight meta-analyses (11-18), two meta-analyses (19-21), and four additional prospective cohort studies (18-21).
For more information, please visit: <https://www.nationaldairyCouncil.org/science-summary>
©2018 NATIONAL DAIRY COUNCIL: Blood Pressure

SCIENCE SUMMARY: Type 2 Diabetes

Dairy food consumption is linked to lower risk for type 2 diabetes



Overview

Dairy foods such as milk, cheese and yogurt are foundational foods in healthy eating patterns. The dairy group contributes important shortfall nutrients, including calcium, vitamin D and potassium to the U.S. diet. Low-fat and fat-free dairy foods are part of the Dietary Guidelines for Americans (DGA) dietary recommendations. A growing body of research indicates that dairy food consumption is associated with multiple health benefits, and a 2016 review concluded that high- to moderate-quality evidence indicates dairy foods are associated with a lower risk for type 2 diabetes (T2D). This research provides further support for consuming low-fat or fat-free dairy foods as recommended in the 2015 DGA.

Healthy eating patterns can help lower risk for T2D and decrease public health costs

T2D affects nearly 29 million American adults and accounts for 90-95% of all diagnosed cases of diabetes. More than 20% of health care spending is spent on people diagnosed with diabetes.¹ Poor diet and physical inactivity are recognized as key contributors to the epidemics of overweight, obesity and diet-related chronic diseases, including T2D.^{2,3,4} The DGA states that healthy eating patterns are associated with lower risk for several chronic diseases, including cardiovascular disease (strong evidence) and T2D (moderate evidence).² The DGA recommends 3 daily servings of low-fat or fat-free dairy foods for those 9 years and older, 2½ for children 4-8 years, and 2 for children 2-3 years in the Healthy U.S.-Style Eating Pattern.²

The 2015 Dietary Guidelines for Americans notes that current evidence indicates healthy eating patterns, which include low-fat or fat-free dairy foods, are linked to lower risk for T2D among adults.²

Research explores links between dairy food consumption and lower risk for T2D

The 2015 DGA recommendation to include dairy foods in healthy eating patterns builds on conclusions that emerged in the 2010 DGA, including that dairy food consumption is associated with lower risk for T2D. The 2010 DGA conclusions were based on studies published through 2009, and evidence on the association between dairy food consumption and T2D has continued to grow.¹ In 2016, Drouin-Chartier, et al., published a comprehensive systematic review of prospective research on dairy and chronic diseases, including T2D, and rated the quality of evidence.^{5,6} This Science Summary highlights the findings from the Drouin-Chartier review,⁵ and includes findings from emerging research on links between dairy fat consumption and lower risk for T2D. Current evidence indicates dairy food consumption is associated with lower risk for T2D, and some individual foods may provide benefits.

¹ Research published between 2009 and 2016 (6, 7-12, 18-21) has explored the association between dairy food consumption and T2D in six meta-analyses (7-12) that examined 21 total prospective cohort studies, plus four prospective cohort studies not included in those meta-analyses (18-21).
² Drouin-Chartier et al. (6) reviewed six meta-analyses on T2D (7-12), published beginning in 2010, plus four additional prospective cohort studies (18-21).
For more information, please visit: <https://www.nationaldairyCouncil.org/science-summary>
©2018 NATIONAL DAIRY COUNCIL: Type 2 Diabetes



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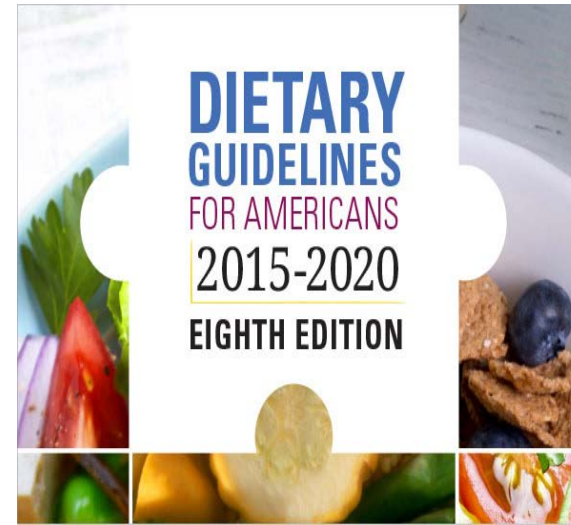


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2005, 2010, 2015* Dietary Guidelines Recommend 3 Daily Servings of Dairy Foods for Those ≥ 9 years

*3 servings for Americans 9 years and older in the Healthy U.S.-
Style and Healthy Vegetarian Eating Patterns.



The 2015 DGA states that healthy eating patterns, including low-fat or fat-free dairy foods, are associated with reduced risk for several chronic diseases, including cardiovascular disease (strong evidence) and type 2 diabetes (moderate evidence). Research has also linked dairy intake to improved bone health, especially in children and adolescents.

Dietary Guidelines for Americans, 2015-2020



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Environmental



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In Only 70 Years, We've Reduced our Impact...

90%
less land

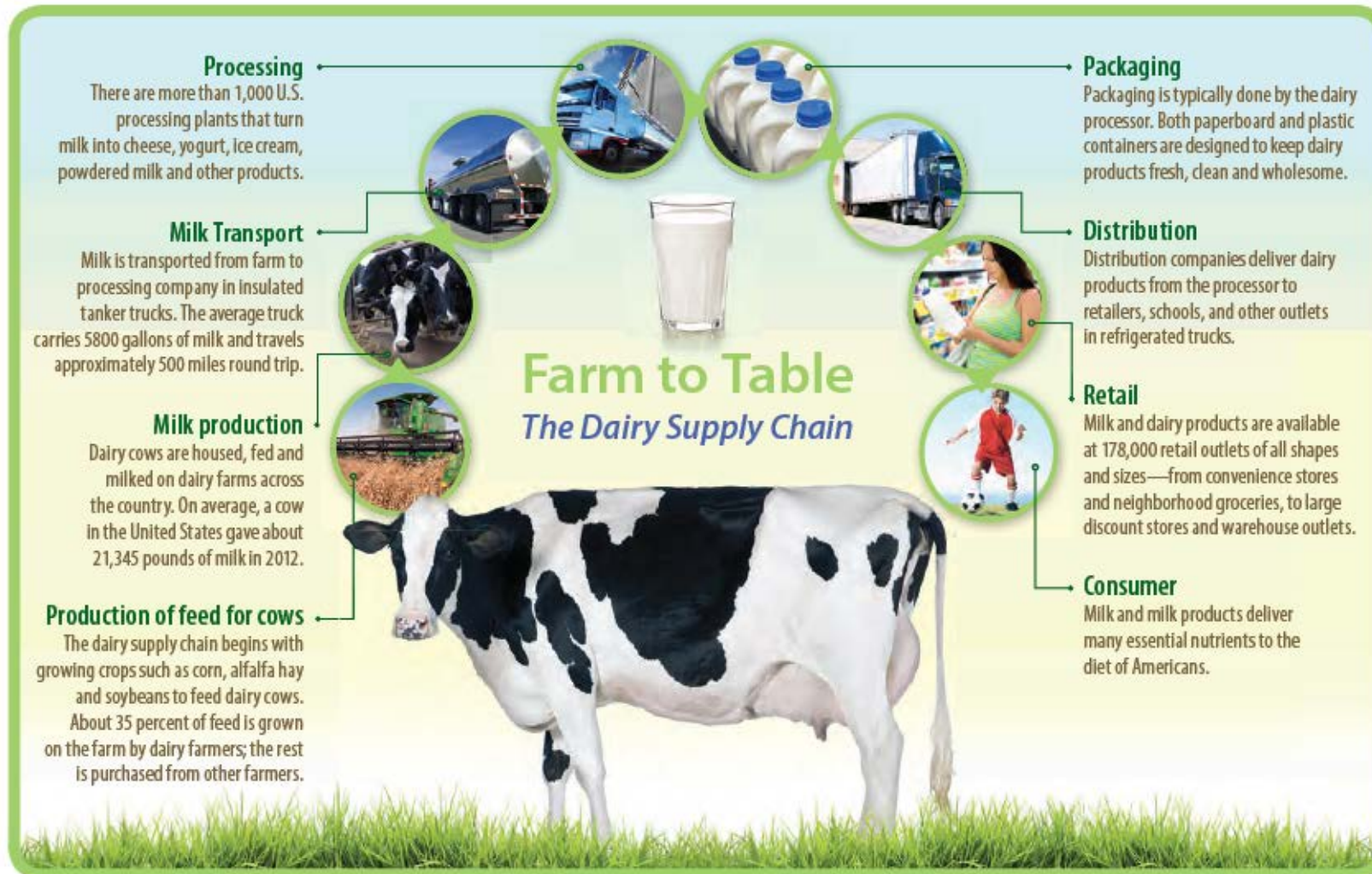
65%
less
water

76%
less
manure

63%
less
GHG

**The dairy community has a voluntary commitment to
further reduce GHG 25% by 2020**

Dairy Life Cycle Assessment (LCA): Understanding dairy's impact from grass to glass

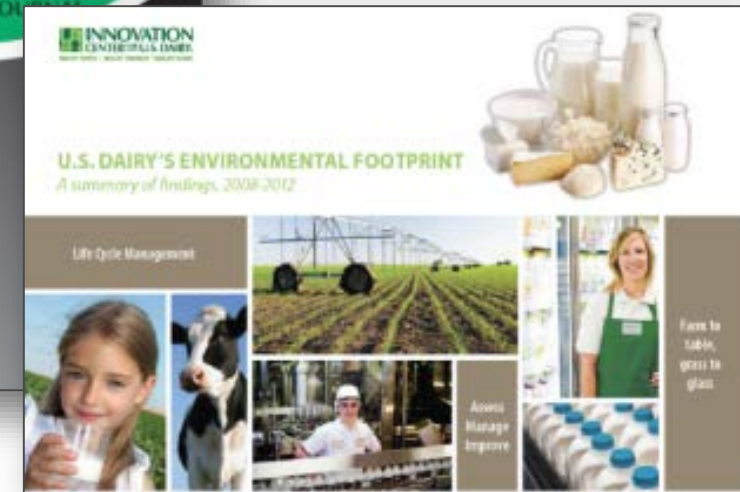
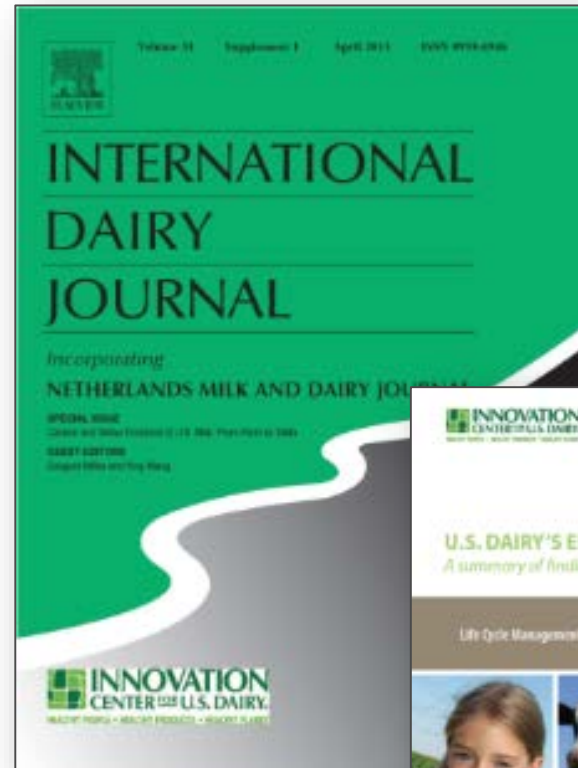


Dairy's environmental impact: Grounded in science

- Life cycle science establishes baseline environmental footprint for U.S. Dairy
- Peer-reviewed, published, and contributed to open-source National Agricultural Library

U.S. Dairy is:

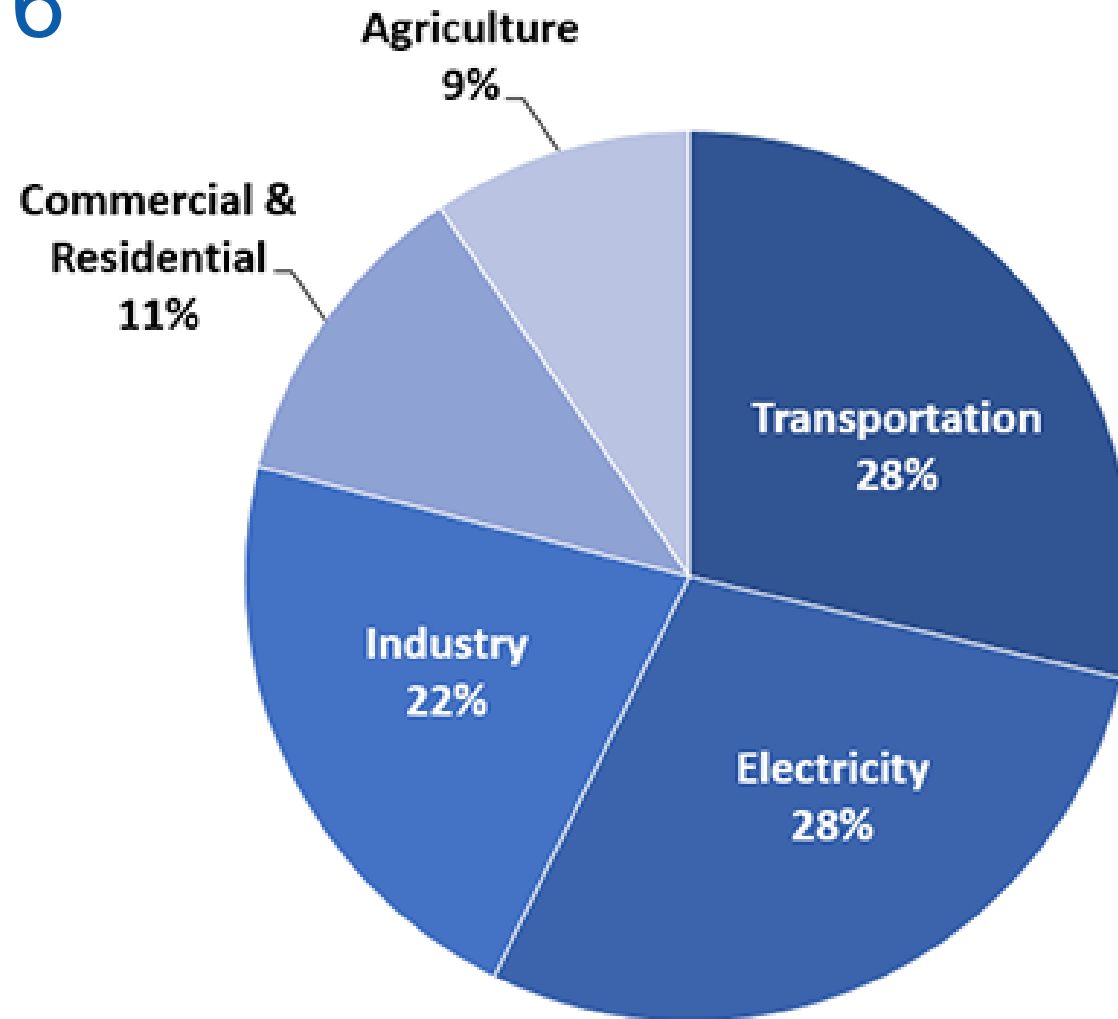
- **2%** of U.S. GHG emissions
- **5.1%** total water withdrawal
- **3.7%** of total U.S. farmland



Dairy community has set a voluntary GHGe reduction goal of 25% by 2020

International Dairy Journal, Volume 31 Supplement 1 April 2013
<http://www.usdairy.com/sustainability/environmental-research>

Total U.S. Greenhouse Gas Emissions by Economic Sector in 2016



US Environmental Protection Agency (2018). US Inventory of Greenhouse Gas Emissions. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>



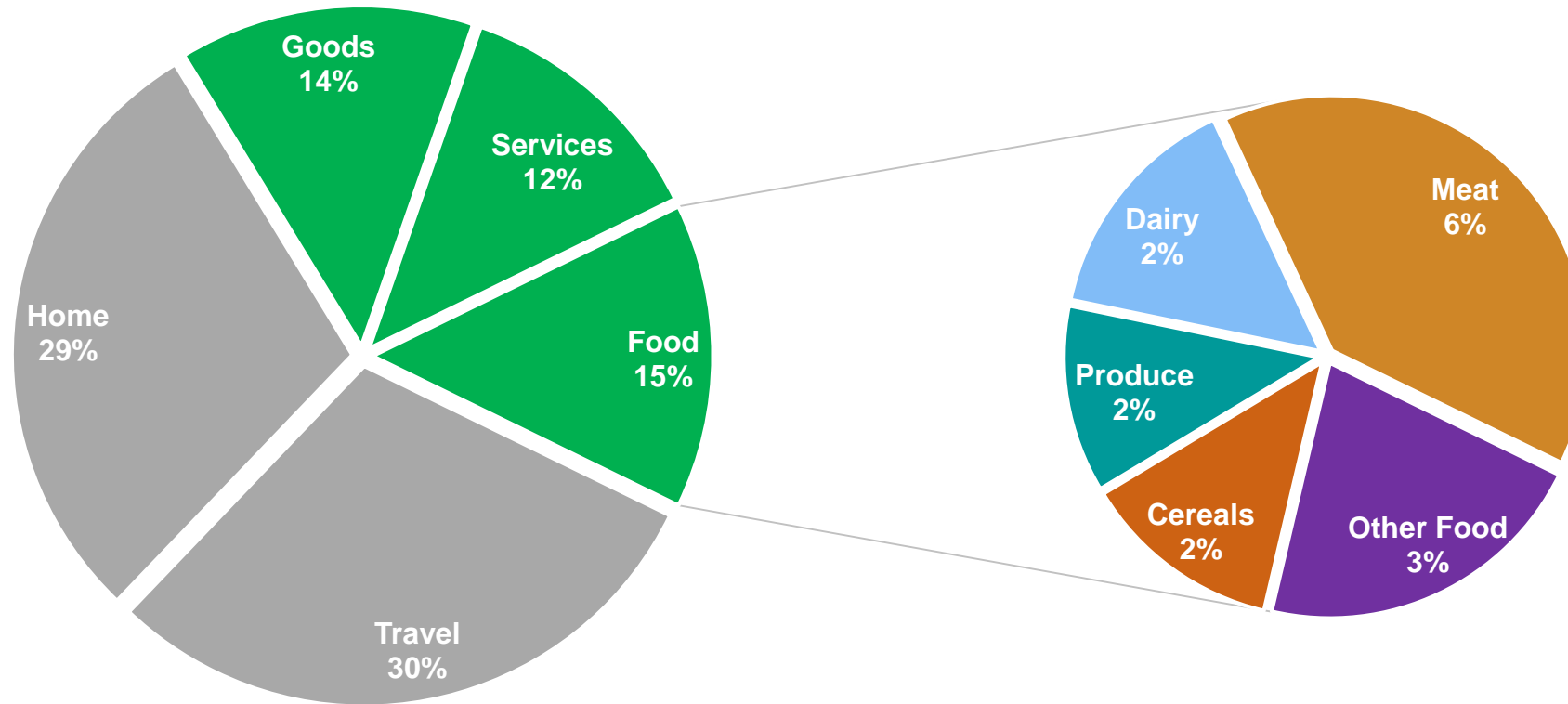
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The Average U.S. Household Carbon Footprint



■ Travel ■ Home ■ Goods ■ Services ■ Other Food ■ Cereals ■ Produce ■ Dairy ■ Meat

Christopher M. Jones and Daniel M. Kammen. Quantifying Carbon Footprint Reduction Opportunities for U.S. Households and Communities. *Environ. Sci. Technol.*, 2011, 45 (9), pp 4088–4095.



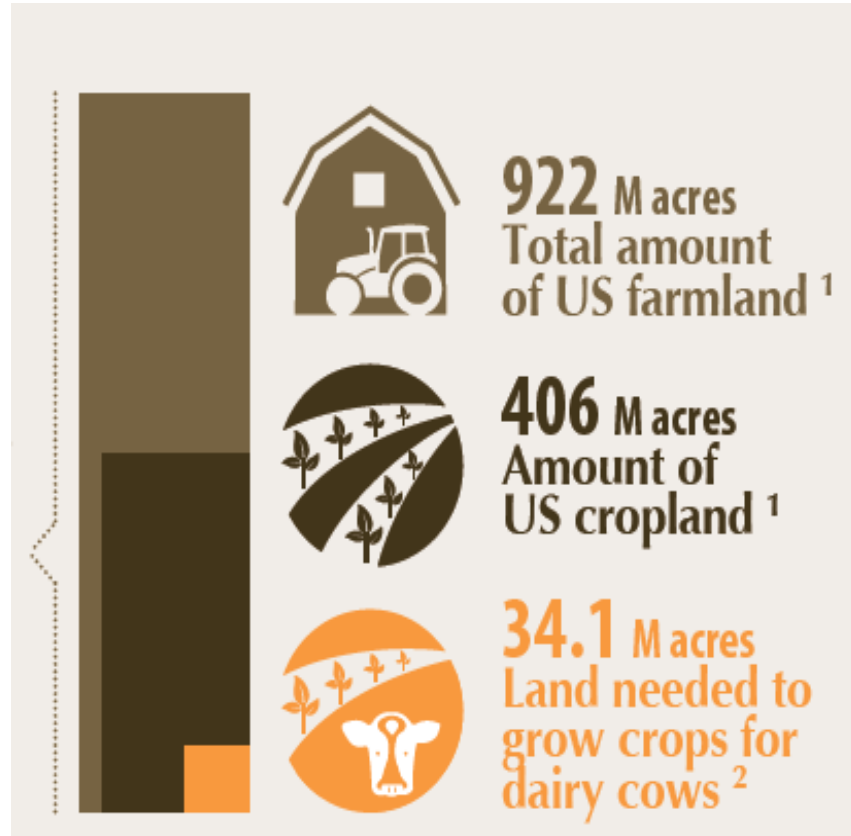
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Dairy's land use is modest, particularly when the nutritional value of the food produced is considered

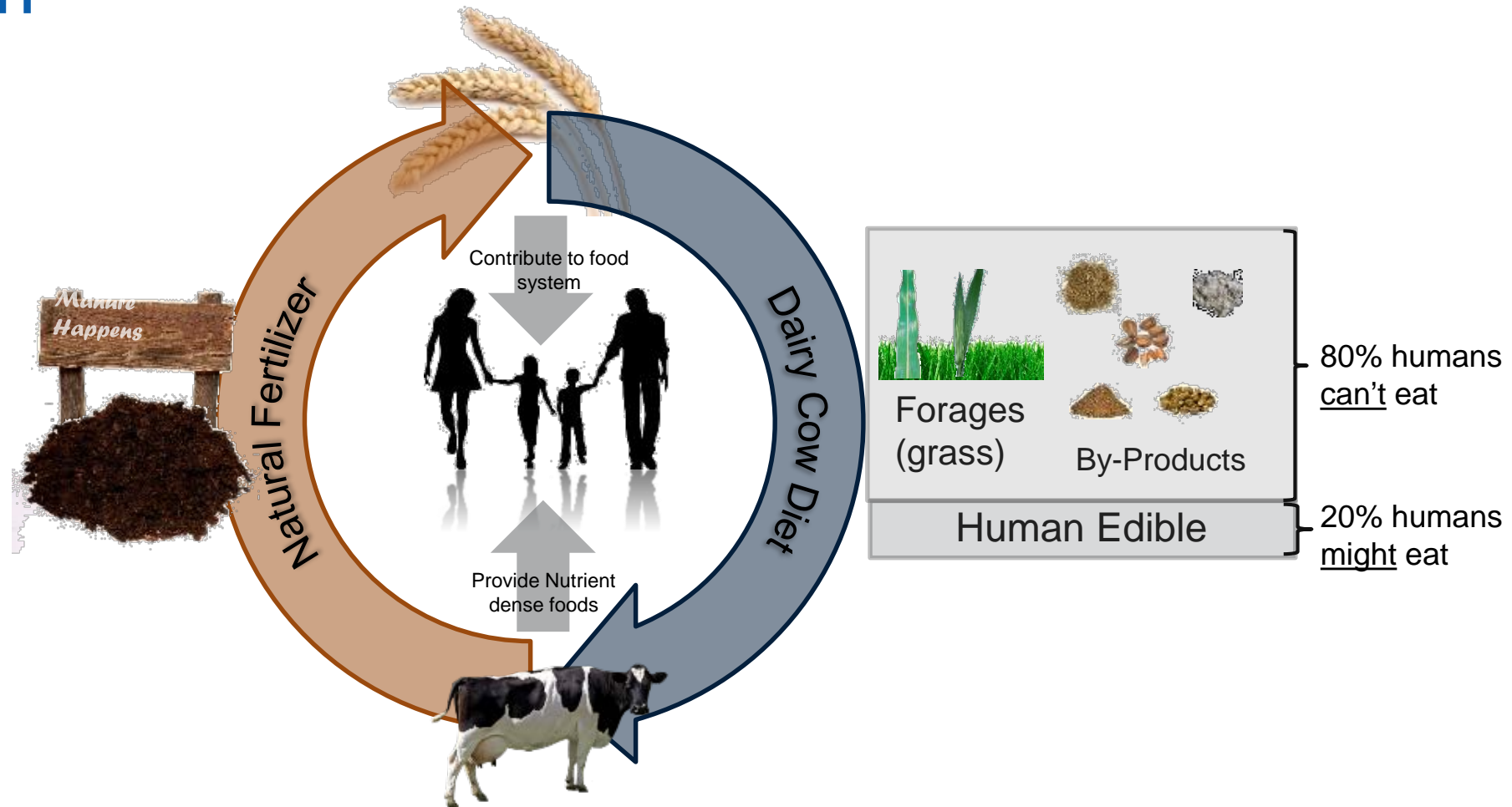


Dairy's daily contribution to the average American diet:

- 56% Vitamin D
- 54% Calcium
- 29% Vitamin A
- 28% Phosphorus
- 27% Vitamin B12
- 24% Riboflavin
- 18% Protein
- 17% Zinc
- 14% Potassium

Henderson, A., Asselin, A., and Heller, M., et al., U.S. Fluid Milk Comprehensive LCA. University of Michigan & University of Arkansas, 2012
National Dairy Council. NHANES 2011-2014 - Table 1, Americans 2+ Years of Age (<https://www.usdairy.com/science-and-research/dairys-role-in-the-diet>)

Dairy cows contribute to the nutrient cycle of the food system



Economic

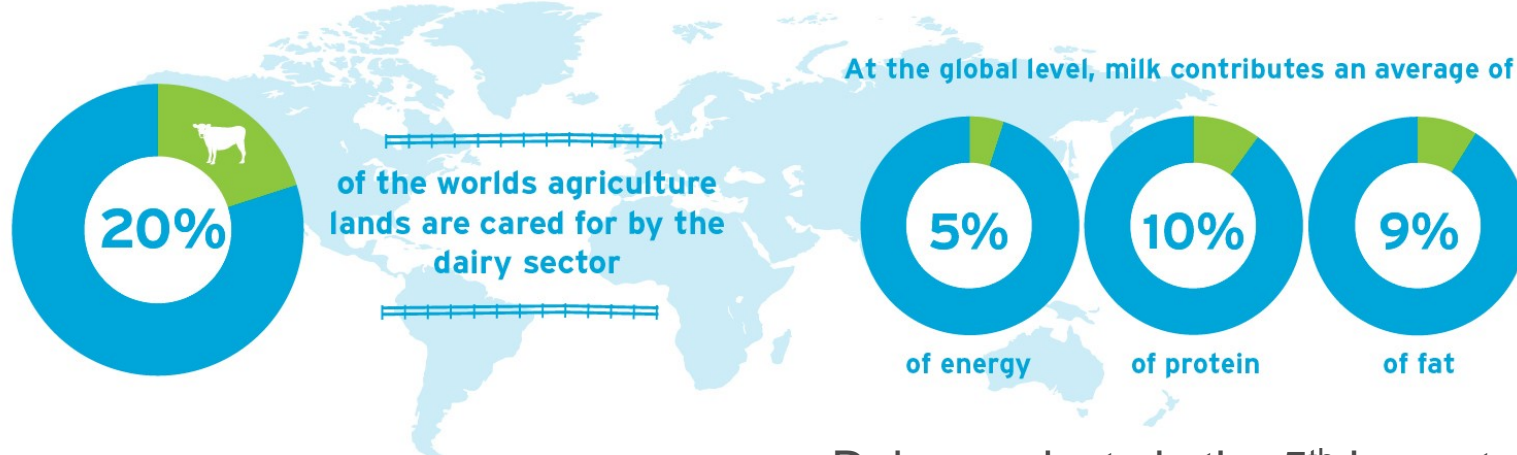


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Global dairy is important contributor to economy and human wellbeing



Dairy products is the 5th largest provider for energy, 3rd largest provider for protein and fat



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Chronic disease is a major driver of health care costs



Obesity costs the US health care system \$147 billion/year



Heart disease and stroke cost our health care system \$199 billion/year



The cost of cancer care is expected to reach ~ \$174 billion by 2020



Diabetes

Diabetes costs the US health care system and employers \$237 billion/year



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Following healthy eating patterns is projected to save billions in healthcare costs.



RESEARCH
Original Research



Health Economic Evaluation Modeling Shows Potential Health Care Cost Savings with Increased Conformance with Healthy Dietary Patterns among Adults in the United States

Carolyn G. Scrafford, PhD, MPH; Xiaoyu Bi, MPS; Jasjit K. Multani, MPH; Mary M. Murphy, MS, RD; Jordana K. Schmier, MA; Leila M. Barraj, ScD

ARTICLE INFORMATION

Article history:

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Accepted 1 October 2018

Keywords:

Chronic health outcomes
Costs and cost analysis
Dietary pattern
Healthy Eating Index
Mediterranean Diet

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<https://doi.org/10.1016/j.jand.2018.10.002>

ABSTRACT

Background Many American adults have one or more chronic diseases related to a poor diet, resulting in significant direct and indirect economic impacts. The 2015-2020 Dietary Guidelines for Americans (DGA) recognized that dietary patterns may be more relevant for predicting health outcomes compared with individual diet elements and recommended three healthy patterns based on evidence of favorable associations with many chronic disease risk factors and outcomes. Health economic assessments provide a model to estimate the potential influence on costs associated with changes in chronic disease risk resulting from improved diet quality in the US adult population.

Objective To estimate the impact on health care costs associated with increased conformance with the three healthy patterns recommended in the 2015-2020 DGA, including the Healthy US-Style, the Healthy Mediterranean-Style, and the Healthy Vegetarian eating patterns.

Methods Recent moderate- to high-quality meta-analyses of health outcomes associated with increased conformance with the Healthy US-Style eating pattern as measured by the Healthy Eating Index (HEI) or the Healthy Mediterranean-Style eating pattern measured by a Mediterranean diet score (MED) were identified. Given the lack of quantification of the association between an increased conformance with a vegetarian pattern and health outcomes, the analysis was limited to studies that evaluated Healthy US-style and Healthy Mediterranean-style eating patterns. The 2013-2014 What We Eat in America data pro-

In this health economic evaluation, modeled increases in conformance with the Healthy US-Style and Healthy Mediterranean-Style eating patterns as measured by the Healthy Eating Index and the Mediterranean diet score, respectively, resulted in cost savings of more than \$15 billion associated with the potential reduced risk of adverse chronic health outcomes including heart disease, cancer, type 2 diabetes, hip fractures, and Alzheimer's disease in the US adult population.

Scrafford et al., *J Acad Nutr Diet*. 2018



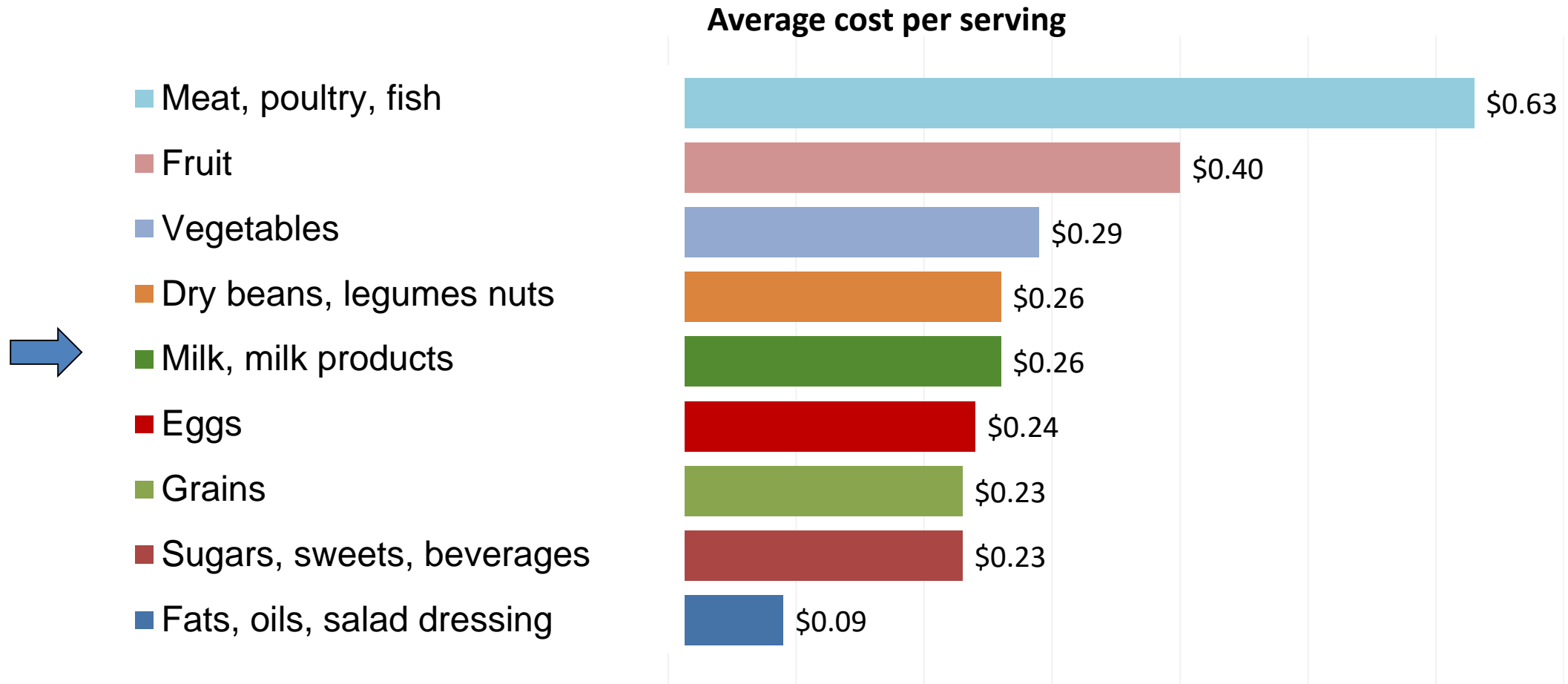
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Each serving of dairy is affordable source of key nutrients



Values, 2001-2002 USDA CNPP database, Serving size, Reference Amount Customarily Consumed.

Drewnowski, 2010



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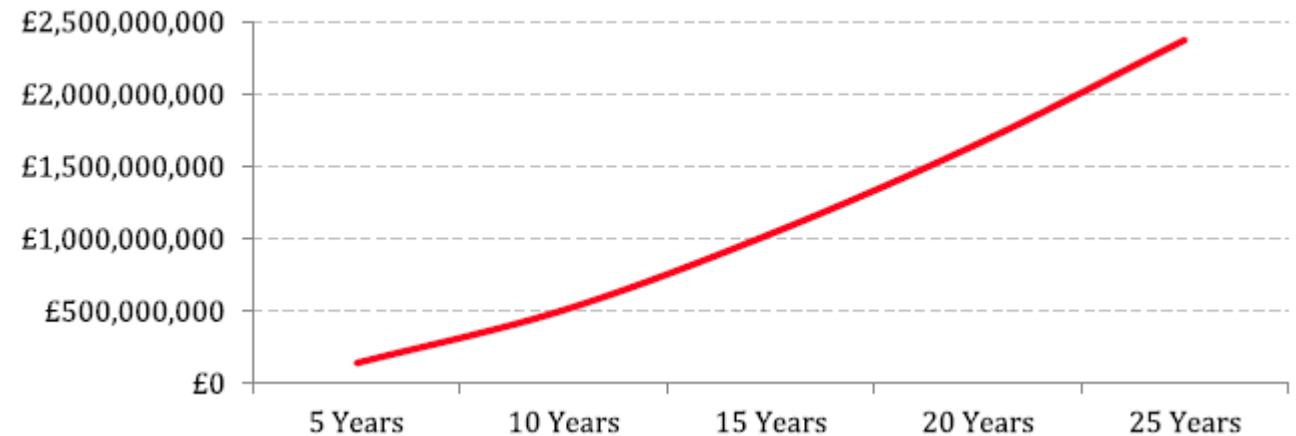
Adequate dairy intake projected to reduce health care costs



Estimated cost of direct health care spending attributable to low dairy product consumption in 2010–2011 was AUD\$2.0 billion [U.S. equivalent of \$2.1 billion]

Doidge et al. J Nutr 2012: doi:10.3945/jn.111.154161

Estimated UK population cost savings



Increasing average yogurt consumption by 100g/d could result in 388,000 fewer people developing T2D, which could save the UK £2.3bn

Lenoir-Wijnkoop et al. BMC Nutrition (2016) 2:77



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Bringing it all Together



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Sustainable Diets are More than Carbon Footprint

LOW ENVIRONMENTAL IMPACTS

PROTECTIVE AND RESPECTFUL OF BIODIVERSITY AND
ECOSYSTEMS

CONTRIBUTE TO FOOD AND NUTRITION SECURITY AND TO
HEALTHY LIFE

CULTURALLY ACCEPTABLE

ACCESSIBLE

ECONOMICALLY FAIR AND AFFORDABLE

NUTRITIONALLY ADEQUATE

SAFE AND HEALTHY

OPTIMIZING NATURAL AND HUMAN RESOURCES



Removal of animal agriculture from US food system results in negligible differences in GHG emissions and a diet deficient in a number of essential nutrients.

A Modeling Study

Compared nutritional adequacy and greenhouse gas emissions from least-cost diets with and without animal-based foods

- 23% increase in total U.S. food supply, but mostly in the form of high-calorie crops like corn and soybeans.
- Need to eat more food to meet nutrient requirements due to the lower essential nutrient density in plant-based foods.
- Greater excess calories eaten by people.
- Deficiencies in the essential nutrients calcium, vitamins A and B12, and arachidonic, eicosapentaenoic (EPA) and docosahexaenoic (DHA) fatty acids.
- Plant-only diets unable to support the nutritional needs of the U.S. population in the long or short term without nutrient supplementation.
- A 2.6% reduction in total U.S. greenhouse gas emissions

White RR et al., Proc Natl Acad Sci USA, 2017



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Summary / Conclusions

- The landscape with which food/diets are evaluated is evolving; Context of Sustainable Nutrition. Happening on a global scale.
- Dairy has a strong story to tell within the context of sustainable nutrition
 - Social: Dairy foods provide essential nutrients, improve diet quality and reduce risk of chronic disease
 - Environmental: U.S. dairy's environmental impact: 2% GHG, 5% water withdrawal, 4% land use
 - Economic: Dairy industry fuels a global economy and improves health which reduced healthcare costs
- The science in the area of sustainable nutrition continues to evolve; dairy is focused on continuous improvement and is well positioned to secure its value in this new dialogue now and in the future.



Thank you!



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