Frameworks and Strategies for Driving Action on Dementia Risk Reduction Through Behavior Change

May 14-15, 2024
Charlotte, North Carolina

PUBLIC HEALTH CENTER OF EXCELLENCE
ALZHEIMER'S ASSOCIATION
DEMENTIA RISK REDUCTION

Wake Forest® School of Medicine

Suggested Citation:
Public Health Center of Excellence on Dementia Risk Reduction and Wake Forest University School of Medicine. (2025, December). Frameworks and Strategies for Driving Action on Dementia Risk Reduction Through Behavior Change. Chicago, IL: Alzheimer's Association; 2025. https://www.alz.org/getmedia/b400b1f2-a6c4-4040-94d9-8f72380030fe/public-health-dementia-risk-reduction-behavior-change.pdf

The Public Health Center of Excellence on Dementia Risk Reduction is made possible by the Centers for Disease Control and Prevention of the U.S. Department of Health and Human Services as part of a financial assistance award totaling $3,707,435, with 100 percent funded by CDC/HHS. The contents of this document are those of the Alzheimer's Association and do not necessarily represent the official views of, nor an endorsement by, CDC/HHS or the U.S. Government.

INTRODUCTION AND OVERVIEW

On May 14-15, 2024, the Wake Forest University School of Medicine and Alzheimer's Association BOLD Public Health Center of Excellence on Dementia Risk Reduction held a Public Health Research Roundtable at the Sanger Heart and Vascular Institute in Charlotte, North Carolina to review and discuss the scientific evidence on how to best drive effective public health action.

The event was attended by nationally recognized subject matter experts and public health professionals. Presentations were given by subject matter experts, and following the evidentiary presentations, dementia researchers, public health academics, and public health practitioners engaged in dialogue about the greater understanding of behavior change, reaching people, economics, communication, policy and systems change, and how public health might best act to address these issues. The roundtable included representation from public health officials from Centers for Disease Control and Prevention, Arizona, Mississippi, Tennessee, Vermont, and Washington, highlighting the diverse perspectives and regional insights brought to the discussions.

This report summarizes the proceedings of the roundtable, capturing the key discussions and outcomes that will serve as a bridge between research, public health practice and implementation, informing future strategies and interventions geared towards reducing dementia risk.

The Alzheimer's Association wishes to thank the following individuals for their presentations at the Public Health Research Roundtable. Their insights contributed to a deeper understanding of the themes explored in this report:

- Donald E. Edmondson, Ph.D., MPH, Columbia University
- Amy Eyler, Ph.D., Washington University in St. Louis
- Ann Sheehy, M.D., M.S., University of Wisconsin
- Steven M. Teutsch, M.D., MPH, University of Southern California

To support the translation of these findings into practice, the Public Health Center of Excellence on Dementia Risk Reduction developed an accompanying resource, Developing Public Awareness Campaigns On Brain Health: A Toolkit For Public Health Agencies. The toolkit highlights the report's insights and offers guidance in launching public awareness campaigns around dementia risk reduction and the importance of brain health messaging.

UNDERSTANDING MODIFIABLE RISK FACTORS FOR DEMENTIA

Alzheimer's and other dementias are increasingly recognized as a public health issue. More than 7 million Americans aged 65 and older are living with Alzheimer's dementia and this number is projected to rise to 13.8 million in 2060.1 Certain health conditions and changeable behaviors — known collectively as modifiable risk factors — influence many chronic conditions, including cardiovascular disease, cancer, diabetes, and obesity. Dementia risk factors that are not modifiable include age, the primary risk factor for dementia, genetics and a family history of dementia. However, there are several modifiable factors that are associated with an increased risk of dementia, including education and cognitive engagement, traumatic brain injury, hypertension, diabetes and obesity, exercise, smoking, sleep, diet and nutrition. Summaries of the science around these modifiable risk factors are available here. These summaries synthesize current scientific evidence on how lifestyle and health factors — such as physical inactivity, hypertension, and social engagement — can influence dementia risk, helping public health professionals guide evidence-based interventions. Recognizing the importance of behavior change to reduce one's dementia risk is the next step before exploring the barriers that can make those changes difficult. With millions of people affected by dementia worldwide and lifestyle factors playing a significant role in risk, it is essential for public health to address these risk factors through supporting behavior change.

BEHAVIOR CHANGE

To support meaningful lifestyle changes to reduce the risk of dementia, it's helpful to understand how behavior change works and what strategies are most effective. Familiarity with standard behavior change theories can guide the development of effective interventions. Examples of behavior change models are listed in the table below.

Behavior Change Models	
Model	**Description**
Health Belief Model	Beliefs about health risks, benefits of taking action, and barriers influence readiness to change behavior.
Transtheoretical Model	Describes the process by which individuals pass from precontemplation through intentional behavior change, with appropriate interventions for each stage.
Theory of Planned Behavior	Attitudes, subjective norms, and perceived behavioral control shape intentions and subsequent behavior.
Social Cognitive Theory	Emphasizes the reciprocal interaction among personal factors, behavior, and environmental influences, including observational learning and self-efficacy.

Public Perceptions
To encourage population-wide adoption of healthy behaviors, it is essential to understand public perceptions of dementia and its risk factors. A systematic review of over 50 studies found that belief systems, cultural context and trust in educational sources significantly influence willingness to adopt risk reduction behaviors. Interventions that combine education, self-regulation, and social support, while being co-designed with focus communities, are more likely to succeed. Tailored support and inclusive strategies that consider age, culture, and lived experiences can enhance engagement and lead to meaningful, lasting change. These approaches align with behavior change models such as the Health Belief Model and Theory of Planned Behavior, which emphasize the role of beliefs, perceived control, and social norms in shaping readiness to change.

Behavioral Economics Concepts
Behavioral economics helps explain why people resist or adopt health behaviors. Concepts like immediacy (preference for short-term rewards), endowment (valuing what one already has), and status quo bias (resistance to change) are key. For instance, the BE ACTIVE trial found that gamification — using game-like elements such as points and rewards — and loss-framed financial incentives — where participants risk losing a reward if they don't meet goals — increased physical activity. However, these strategies may not work for individuals dealing with trauma or stress. Gain-framed messaging, which emphasizes benefits rather than risks, is often more effective for promoting physical activity and smoking cessation. Techniques like motivational interviewing and positive reinforcement, as outlined in the Behavior Change Strategies table, can complement behavioral economics approaches by helping individuals explore ambivalence and celebrate progress.

Motivating Change Through Self-Determination and Broader Benefits
Self-determination theory emphasizes the importance of autonomy, competence and relatedness. Interventions that support individuals' sense of agency, provide relevant skills and knowledge, and foster a sense of community can enhance intrinsic motivation and encourage sustained behavior change. Healthy behaviors also offer benefits beyond physical health, including improved mental well-being, stronger social connections, and environmental sustainability. For example, reducing red meat intake supports both heart health and climate goals, while active transportation promotes fitness and social interaction. Strategies such as SMART goal setting, self-monitoring, and social support, highlighted in the Behavior Change Strategies table, directly support the principles of self-determination theory by enhancing autonomy, competence, and relatedness.

Recent studies show that messaging which highlights these multifaceted benefits can be effective. Research involving parents and college students found that messages highlighting the health and environmental harms of red meat consumption reduced intake, with some lasting effects. Combining traditional behavior change strategies with newer, personalized approaches, like digital feedback, memory cafés, and value-driven public campaigns, can build motivation, strengthen community support, and ultimately help reduce dementia risk.

Environmental Strategies
Environmental restructuring can support individuals with low motivation by reducing exposure to unhealthy cues. For example, smoking bans and improved access to healthy food options can make it easier to adopt healthier behaviors. Relocation is another opportunity. Data shows people are more open to changing habits during the three-month window after moving houses. Low-cost informational programs during this period can promote sustainable travel behaviors like walking, cycling or public transit. These environmental strategies reflect principles from Social Cognitive Theory, which highlights the reciprocal relationship between behavior, personal factors, and environmental influences.

Translating Cardiovascular Prevention Strategies to Dementia Risk Reduction
Advocates for behavior change to reduce dementia risk can look to strategies used successfully to reduce cardiovascular disease. Strategies that have proven effective include tailoring interventions to specific populations, using evidence-based approaches like motivational interviewing and goal setting, leveraging social support networks, and creating environments that facilitate healthy behavior.[6] Community-based programs, such as walking groups, cooking classes, and community gardens, have been successful in promoting physical activity, healthy eating, and social support for behavior change.[7] Policy and environmental changes, such as smoke-free laws, taxes on unhealthy foods, and improving access to safe walking and cycling paths, have been effective in creating environments that support healthy behavior. Synchronizing and applying cardiovascular disease prevention strategies to dementia risk reduction can be effective by focusing on lifestyle factors (e.g., physical activity and diet), community programs (e.g., integrating stress reduction techniques into workplace wellness programs), and policy initiatives (e.g., improving air quality and enhancing educational opportunities).[6] Many of these approaches are reflected in the Behavior Change Strategies table and can be adapted for dementia risk reduction.

Communicating and Supporting Behavior Change
To promote healthy behavior adoption, use clear, culturally relevant language and engaging visuals. Tailor messages to your audience's background and provide practical, achievable recommendations. When motivation is low, explore underlying barriers and apply motivational interviewing techniques. Examples of behavior change strategies are listed in the table below.

Behavior Change Strategies	
Model	**Description**
SMART Goal Setting	Encourages setting **s**pecific, **m**easurable, **a**chievable, **r**elevant, and **t**ime-bound goals related to reducing dementia risk factors.
Self-Monitoring	Provides tools and techniques for individuals to track their progress, identify barriers, and adjust strategies accordingly.
Social Support	Fosters a supportive environment by involving family, friends, or support groups to provide encouragement and accountability.
Positive Reinforcement	Promotes celebrating small wins and progress along the journey to reinforce positive behavior changes and maintain motivation.
Motivational Interviewing	Uses a client-centered approach to explore ambivalence, enhance intrinsic motivation, and facilitate behavior change.

SOCIAL AND STRUCTURAL FACTORS IN DEMENTIA RISK REDUCTION

Social Determinants of Health and the Exposome

Social determinants of health (SDOH) are the conditions in which people are born, live, work, and age, and they significantly influence health outcomes and risks.[9] These include factors like education, healthcare access, economic stability, neighborhood conditions and social context. Because inequities are not evenly distributed, risk reduction efforts must be tailored to the unique needs of each community. The concept of the exposome — which refers to the totality of environmental exposures an individual experiences throughout their life and how these exposures interact with biological processes — expands this understanding by considering all environmental exposures across the life course that may influence gene expression and health.[20] This offers a more holistic and personalized approach to understanding chronic disease risk and guiding interventions. However, measuring these needs can be difficult due to gaps in data, especially in electronic health records. These limitations hinder the ability to design responsive and equitable interventions.

Bridging the Gap Between Evidence and Implementation

To address these challenges between research and action, tools like the Area Deprivation Index (ADI) have been developed to assess socioeconomic conditions at the neighborhood level and identify communities with limited access to resources and services.[11,13] The ADI, used in platforms like the *Neighborhood Atlas*, helps identify communities in need by analyzing factors such as poverty and crime. This data-driven approach supports focused interventions, such as improving maternal care in rural areas or prioritizing neighborhoods for infrastructure improvements like lead pipe replacement.[12]

The city of Milwaukee used the ADI tool as one of three criteria to prioritize neighborhoods for replacing lead service lines, aiming to reduce lead exposure in children. Increasingly, healthcare providers, insurers and government agencies are adopting data-driven tools such as the ADI to promote health equity.[4] The Affordable Care Act further supports this effort by requiring hospitals to assess and address community health needs every three years, often using tools like the ADI to inform their strategies.

Despite these advances, challenges remain. Data gaps, limited resources and inconsistent adoption of tools across regions can slow progress. Translating data insights into meaningful action also requires collaboration across sectors and a commitment to sustainability efforts.

Still, recognizing the impact of social and environmental conditions is essential for understanding health disparities. Tools that measure community conditions, when combined with open access to data, can support more responsive and equitable health efforts that reflect the specific needs of different communities.

ECONOMIC EVALUATION OF HEALTH INTERVENTIONS

Assessing Feasibility and Cost-Effectiveness
When deciding whether to implement a health intervention — clinical, environmental or policy-based — decision makers must assess feasibility, potential benefits and harms, and overall cost-effectiveness. This involves comparing the costs of sustaining the intervention with the benefits it delivers. Health problems are typically described by their incidence, severity, impact on quality of life, and the financial burden they place on individuals, families, and communities. These costs can be direct (e.g., medical expenses), indirect (e.g., lost productivity), or intangible (e.g., pain and suffering).

Interventions also carry costs. Their net cost, or savings, is calculated by adding the intervention cost to the difference in care costs with and without the intervention. Cost-effectiveness is then expressed as a ratio of net cost to net benefit, though this can be challenging when benefits are intangible. In other words:

NET COST = COST OF INTERVENTION +
(cost of care with the intervention - cost of care without the intervention)

Choosing the Right Evaluation Perspective
The perspective of the analysis — whether from the viewpoint of patients, insurers, employers or society — determines which costs and benefits are included. A societal perspective is the most comprehensive, but individuals may prioritize their own financial and emotional burdens.

Considering Time Horizons in Public Health Planning
Another key factor is the time horizon. Long-term analyses, often spanning a lifetime, are ideal for capturing all relevant costs and benefits, especially for chronic conditions. Short-term analyses may miss long-term benefits, skewing results. Additionally, the timing of costs and benefits matters; people generally prefer immediate benefits and delayed costs. This preference is accounted for through discounting, which reduces the value of future outcomes compared to near-term ones.

Balancing Cost-Effectiveness with Equity and Feasibility
It is also important to distinguish between cost-effectiveness and value. While cost-effectiveness focuses on financial efficiency, value also considers feasibility and equity. An intervention may be cost-effective but still lack value if it is impractical or fails to address inequities. Economic evaluations must balance quantitative analysis with broader considerations to guide sound health decisions.

POLICY AND SYSTEMS CHANGE TO SUPPORT RISK REDUCTION

The Role of Policy in Public Health
Policy includes formal laws, rules, and regulations enacted by elected officials, organization-specific practices and social norms that influence behavior. Health interventions can focus on both public and organizational policies. In the socioecological model of health, public policy represents the outermost layer of influence, shaping environments and behaviors across communities.[16]

Using Policy to Shift Norms and Address Complex Issues
Because of their broad reach, policies are often used to address complex public health issues and shift social norms. The policymaking process involves several stages: setting priorities, formulating the policy, deciding whether to adopt it, implementing it and evaluating its effectiveness. Policies must be designed with financial constraints in mind and should promote fairness and equity across diverse populations. While evidence should guide policy development, there is often a gap between the evidence needed and what is available, especially regarding health equity. As a result, policies may be based on varying levels of evidence, from well-established to untested.

Evaluating Policy for Public Health Impact
Three key domains are considered in policy evaluation:

- Process: Strategies to increase the likelihood of adoption
- Content: Specific elements that enhance effectiveness
- Outcome: Measuring the policy's impact

Effective policies should be maintained, while ineffective ones should be revised or discontinued. Continuous monitoring helps ensure that resources are allocated efficiently and that successful policies remain in place.

Local Policy Innovation and Collaboration
In the United States, policy-making is decentralized, with thousands of states, counties, cities and Tribal nations each having their own rules. Local policies can influence neighboring jurisdictions, creating opportunities for collaboration and shared learning. Advocates can strengthen their efforts by comparing regional policies, forming coalitions and sharing best practices and success stories with public officials to support broader policy adoption and implementation.

DISCUSSION

The Public Health Research Roundtable provided a timely and important forum for integrating scientific evidence with public health practice. The discussions highlighted the complexity of addressing dementia as a public health issue and the necessity of taking a multi-level, interdisciplinary approach. Participants emphasized that while individual behavior change remains a key component, it must be supported by structural interventions, policy reform, and community engagement to be truly effective.

A central theme that emerged was the importance of equity in all aspects of dementia risk reduction. The roundtable highlighted how SDOH, such as income, education, housing, and access to care, shape individuals' ability to engage in risk-reducing behaviors. As such, public health strategies must go beyond awareness campaigns and incorporate systemic changes that reduce barriers and promote health equity. Tools like the ADI were recognized as valuable for identifying underserved communities and guiding focused interventions.

The roundtable also illuminated the need for improved communication strategies that resonate with diverse populations. Presenters stressed that messaging must be culturally relevant, accessible and delivered through trusted community channels. This is particularly important in addressing populations that have historically been marginalized or excluded from public health initiatives. By fostering trust and tailoring communication, public health professionals can enhance engagement and promote sustained behavior change.

Economic considerations were another focal point of discussion. Participants acknowledged the growing need for cost-effectiveness analyses that capture the full spectrum of dementia-related costs, including caregiver burden and lost productivity. However, they also cautioned against relying solely on economic metrics to determine the value of interventions. Broader considerations, such as feasibility, community impact, and alignment with equity goals, must be integrated into decision-making frameworks.

Policy and systems change were identified as essential levers for achieving population-level impact. The socioecological model served as a useful framework for understanding how public policy can influence individual and community behaviors. Participants called for stronger collaboration between public health agencies, healthcare systems, academic institutions, and community organizations to drive policy innovation and implementation. They also emphasized the importance of ongoing policy evaluation to ensure accountability and continuous improvement.

Finally, the roundtable reinforced the importance of data democratization and evidence-informed action. Making data accessible to communities and partners not only supports transparency but also empowers local decision-making. Participants advocated for closing evidence gaps, particularly around the effectiveness of interventions in diverse populations, and for investing in research that informs equitable public health strategies.

Observations for Public Health	
Behavior Change and Dementia Risk	• Tailor interventions to the cultural, educational and socioeconomic contexts of the intended populations. • Use clear, jargon-free language and engaging visuals to improve understanding and retention. • Incorporate interactive elements such as quizzes, polls and community discussions to increase engagement. • Address motivational barriers by applying techniques like motivational interviewing and environmental restructuring. • Measure behavioral mechanisms (e.g., self-efficacy, outcome expectancies) to identify what drives change in specific populations. • Regularly evaluate and adapt strategies based on community feedback and behavioral outcomes to ensure relevance and effectiveness.
Communicating and Supporting Behavior Change	• Develop consistent, evidence-informed messaging that resonates with diverse audiences. • Leverage trusted messengers within communities to enhance credibility and reach. • Utilize multimedia formats (e.g., videos, infographics, social media) to broaden accessibility. • Promote data transparency to build public trust and support informed decision-making. • Frame messages to emphasize immediate and tangible benefits of healthy behaviors, which may be more motivating than risk-based messaging.
Economic Evaluation of Health Interventions	• Conduct cost-effectiveness analyses that include direct, indirect, and intangible costs of dementia and related interventions. • Adopt a societal perspective in economic evaluations to capture the full impact on patients, caregivers, and communities. • Use long-term time horizons to fully assess the benefits of risk reduction interventions. • Balance cost-effectiveness with equity and feasibility to ensure interventions are both efficient and just. • Present economic findings in accessible formats to support decision-making across diverse audiences.
Policy and Systems Change to Support Risk Reduction	• Leverage public policy as a tool to influence environments and behaviors at scale. • Use tools like the Area Deprivation Index (ADI) to identify and prioritize high-need communities. • Promote cross-sector collaboration among public health, healthcare, academia and community organizations. • Encourage local innovation and share best practices across jurisdictions to accelerate policy adoption. • Ensure policies are evaluated for effectiveness, equity, and sustainability over time. • Establish mechanisms for ongoing policy review and revision to ensure continued relevance and impact
Data and Evidence Use for Equitable Action	• Close evidence gaps by investing in research on policy impacts, especially related to health equity. • Support data democratization to empower communities and partners with actionable insights. • Monitor and adapt interventions based on real-time data and community feedback. • Engage communities in interpreting and applying data to ensure insights are locally meaningful and actionable.

In summary, the roundtable discussions reflected a shared commitment to advancing dementia risk reduction through integrated, equity-focused public health approaches. The insights and recommendations generated during this roundtable offer a guide for future action that prioritizes collaboration, inclusivity, and sustained impact.

REFERENCES

1. Alzheimer's Association. (2025). 2025 Alzheimer's disease facts and figures. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 21, e70235. https://doi.org/10.1002/alz.70235

2. Alzheimer's Association. (n.d.). 10 Healthy Habits For Your Brain. Retrieved from https://www.alz.org/help-support/brain_health/10-healthy-habits-for-your-brain

3. Boulware LE, Harris GB, Harewood P, et al. Democratizing health system data to impact social and environmental health contexts: a novel collaborative community data-sharing model. J Public Health (Oxf). 2020;42(4):784-792.

4. City of Milwaukee. Lead Service Line Replacement Program. https://city.milwaukee.gov/water/LeadPipes/EPP. Accessed May 14, 2025.

5. Curran, E., Chong, T. W. H., Godbee, K., Abraham, C., Lautenschlager, N. T., & Palmer, V. J. (2021). General population perspectives of dementia risk reduction and the implications for intervention: A systematic review and thematic synthesis of qualitative evidence. PloS one, 16(9), e0257540. https://doi.org/10.1371/journal.pone.0257540

6. Fanaroff, A. C., Patel, M. S., Chokshi, N., Coratti, S., Farraday, D., Norton, L., Rareshide, C., Zhu, J., Klaiman, T., Szymczak, J. E., Russell, L. B., Small, D. S., & Volpp, K. G. M. (2024). Effect of Gamification, Financial Incentives, or Both to Increase Physical Activity Among Patients at High Risk of Cardiovascular Events: The BE ACTIVE Randomized Controlled Trial. Circulation, 149(21), 1639–1649. https://doi.org/10.1161/CIRCULATIONAHA.124.069531

7. Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. Annals of behavioral medicine : a publication of the Society of Behavioral Medicine, 43(1), 101–116. https://doi.org/10.1007/s12160-011-9308-7

8. Grummon, A. H., Goodman, D., Jaacks, L. M., Taillie, L. S., Chauvenet, C. A., Salvia, M. G., & Rimm, E. B. (2022). Awareness of and reactions to health and environmental harms of red meat among parents in the United States. Public health nutrition, 25(4), 893–903. https://doi.org/10.1017/S1368980021003098

9. Healthy People 2030, U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Retrieved 5/14/2025, from https://health.gov/healthypeople/objectives-and-data/social-determinants-health

10. Hunt, J. F. V., Buckingham, W., Kim, A. J., Oh, J., Vogt, N. M., Jonaitis, E. M., Hunt, T. K., Zuelsdorff, M., Powell, R., Norton, D., Rissman, R. A., Asthana, S., Okonkwo, O. C., Johnson, S. C., Kind, A. J. H., & Bendlin, B. B. (2020). Association of Neighborhood-Level Disadvantage With Cerebral and Hippocampal Volume. JAMA neurology, 77(4), 451–460. https://doi.org/10.1001/jamaneurol.2019.4501

11. Kind, A. J. H., & Buckingham, W. R. (2018). Making Neighborhood-Disadvantage Metrics Accessible - The Neighborhood Atlas. The New England journal of medicine, 378(26), 2456–2458. https://doi.org/10.1056/NEJMp1802313

12. Kind AJH, Buckingham W. Making Neighborhood Disadvantage Metrics Accessible: The Neighborhood Atlas. New England Journal of Medicine, 2018. 378: 2456-2458. DOI: 10.1056/NEJMp1802313. PMCID: PMC6051533. AND University of Wisconsin School of Medicine Public Health. 2015 Area Deprivation Index v2.0. Downloaded from https://www.neighborhoodatlas.medicine.wisc.edu/ September 29, 2025.

13. Kind, A. J., Jencks, S., Brock, J., Yu, M., Bartels, C., Ehlenbach, W., Greenberg, C., & Smith, M. (2014). Neighborhood socioeconomic disadvantage and 30-day rehospitalization: a retrospective cohort study. Annals of internal medicine, 161(11), 765–774. https://doi.org/10.7326/M13-2946

14. National Institute of Environmental Health Sciences. Exposure Biology. https://www.niehs.nih.gov/research/supported/exposure/bio. Accessed May 14, 2025.

15. Powell, W. R., Vilen, L., Zuelsdorff, M., Goutman, S. A., Salamat, S., Rissman, R. A., Bendlin, B. B., & Kind, A. J. H. (2024). Association between military service and Alzheimer's disease neuropathology at autopsy. Alzheimer's & dementia : the journal of the Alzheimer's Association, 20(2), 1468–1474. https://doi.org/10.1002/alz.13520

16. Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological Models of Health Behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), Health Behavior and Health Education: Theory, Research, and Practice (4th ed., pp. 465-486). San Francisco, CA: Jossey-Bass. https://api.semanticscholar.org/CorpusID:166337249

17. Scarneo, S. E., Kerr, Z. Y., Kroshus, E., Register-Mihalik, J. K., Hosokawa, Y., Stearns, R. L., DiStefano, L. J., & Casa, D. J. (2019). The Socioecological Framework: A Multifaceted Approach to Preventing Sport-Related Deaths in High School Sports. Journal of athletic training, 54(4), 356–360. https://doi.org/10.4085/1062-6050-173-18

18. Taggart Wasson, L., Shaffer, J. A., Edmondson, D., Bring, R., Brondolo, E., Falzon, L., Konrad, B., & Kronish, I. M. (2018). Posttraumatic stress disorder and nonadherence to medications prescribed for chronic medical conditions: A meta-analysis. Journal of psychiatric research, 102, 102–109. https://doi.org/10.1016/j.jpsychires.2018.02.013

19. Vermeulen, R., Schymanski, E. L., Barabási, A. L., & Miller, G. W. (2020). The exposome and health: Where chemistry meets biology. Science (New York, N.Y.), 367(6476), 392–396. https://doi.org/10.1126/science.aay3164

20. Wild C. P. (2005). Complementing the genome with an "exposome": the outstanding challenge of environmental exposure measurement in molecular epidemiology. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology, 14(8), 1847–1850. https://doi.org/10.1158/1055-9965.EPI-05-0456

21. Woelfle, M., Olliaro, P., & Todd, M. H. (2011). Open science is a research accelerator. Nature chemistry, 3(10), 745–748. https://doi.org/10.1038/nchem.1149

22. Wolstenholme, E., Poortinga, W., & Whitmarsh, L. (2020). Two Birds, One Stone: The Effectiveness of Health and Environmental Messages to Reduce Meat Consumption and Encourage Pro-environmental Behavioral Spillover. Frontiers in psychology, 11, 577111. https://doi.org/10.3389/fpsyg.2020.577111