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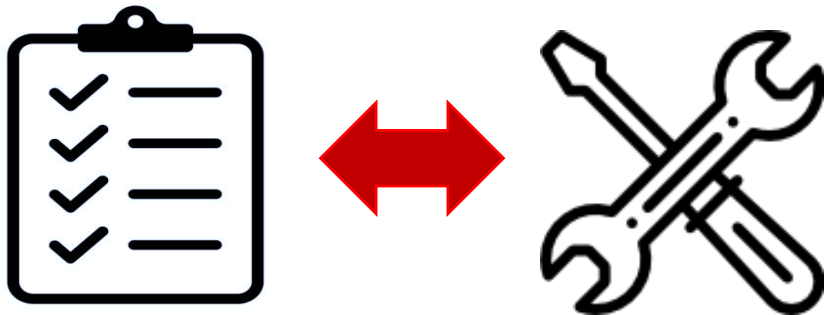
AI for Sustainable Food Systems and Nutrition

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Questions

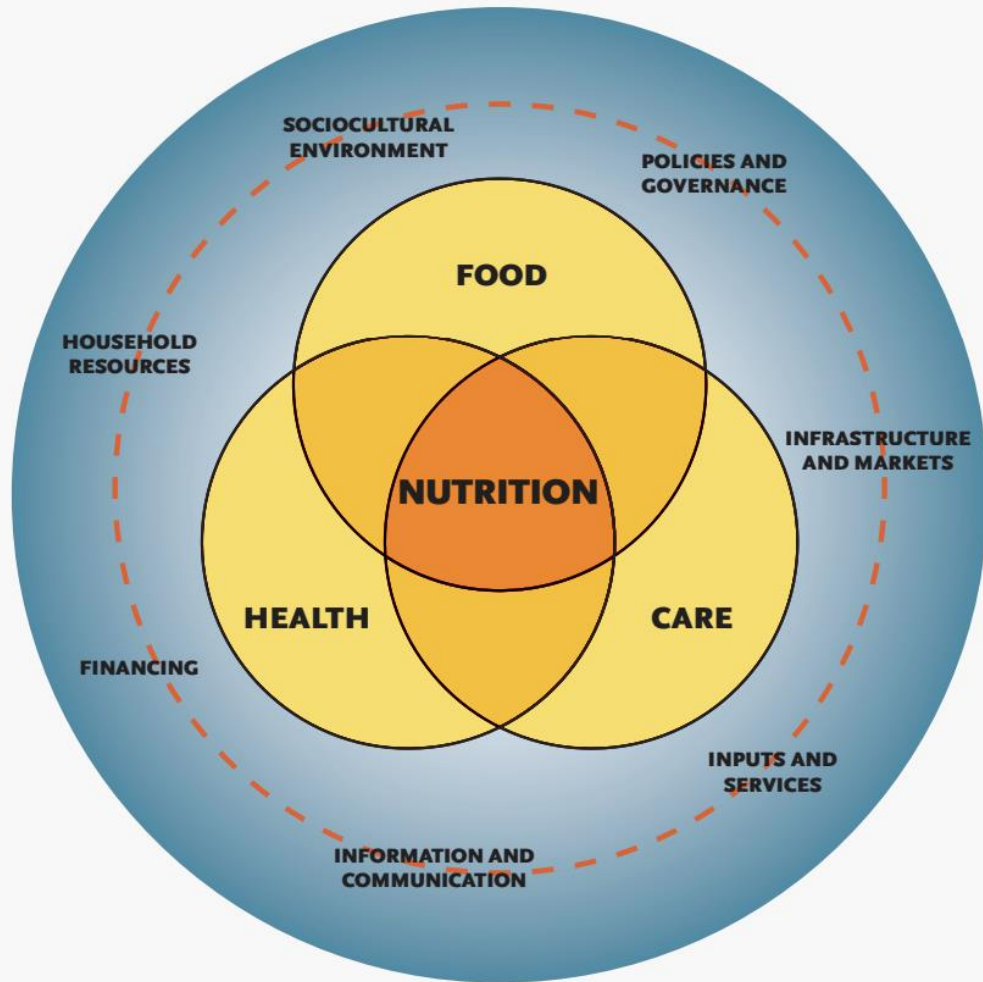
1. How is AI helping to build more sustainable and resilient food supply chains, from production to distribution to consumption?
2. Could you discuss a successful example where AI improved food system transparency or reduced food waste, and what impact did this have on nutrition and community health?



Sustainable Food Systems and Nutrition refers to a food system that provides food security and nutrition for all, while also preserving the economic, social, and environmental foundations for future generations.

Sustainable Food Systems and Nutrition should ensure access to safe and nutritious food, support sustainable diets, and minimize environmental impact.

Nutrition & Health & Food & Sustainability



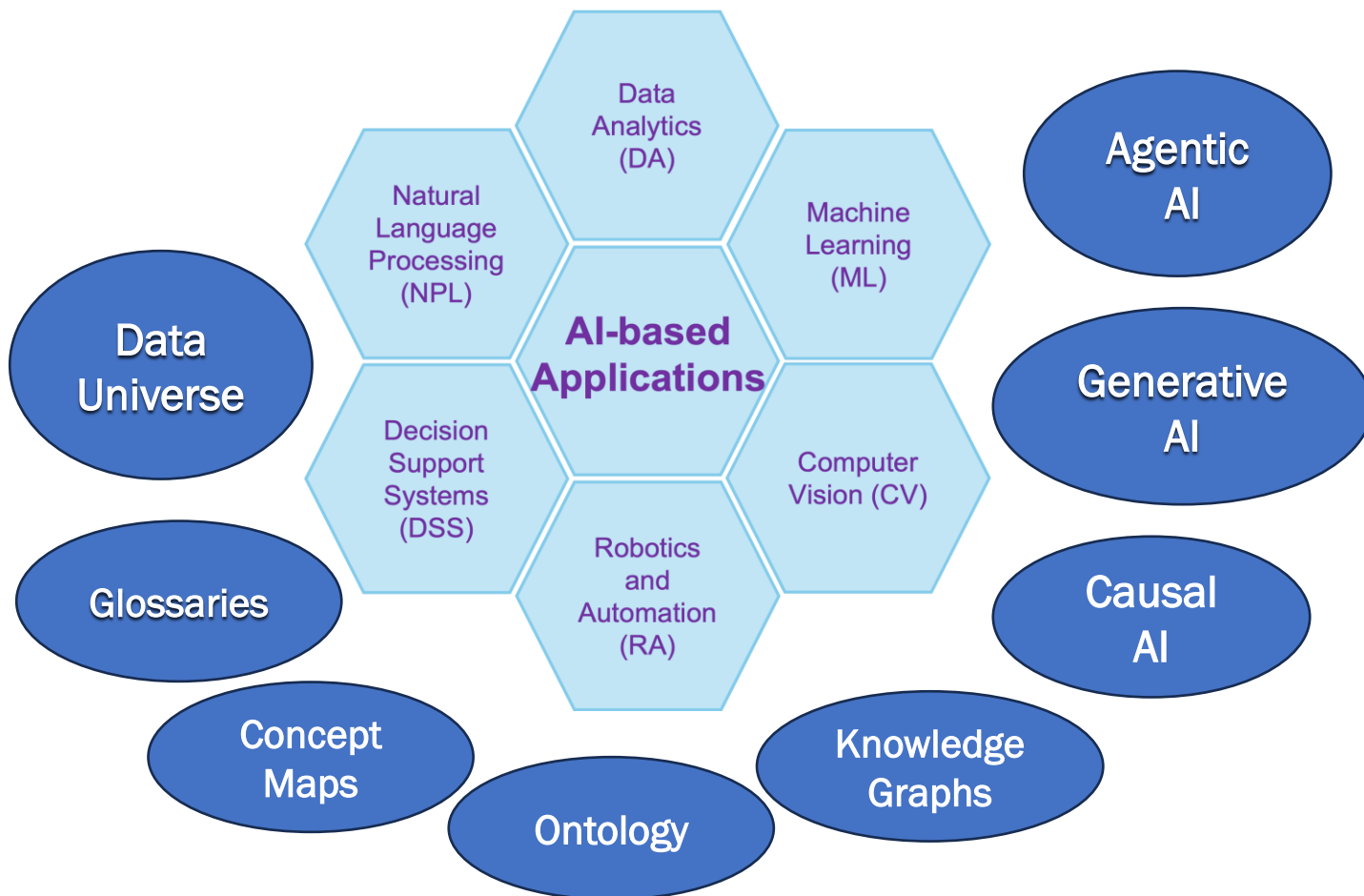
Systems Thinking for Nutrition:

- Define, monitor, and improve the **nutritional status** of the population
- Identify **population at risk** and intervene via education, public policies, investments, and technological advancements
- Optimize **food-based solutions** to improve nutrition outcomes
- Tailor **metrics of success** to ensure food systems and nutrition sustainability



Kuhl, E. AI for food: accelerating and democratizing discovery and innovation. *npj Sci Food* **9**, 82 (2025). <https://doi.org/10.1038/s41538-025-00441-8>

AI Universe



Artificial Intelligence is the study of computations that make it possible to perceive, reason, and act.

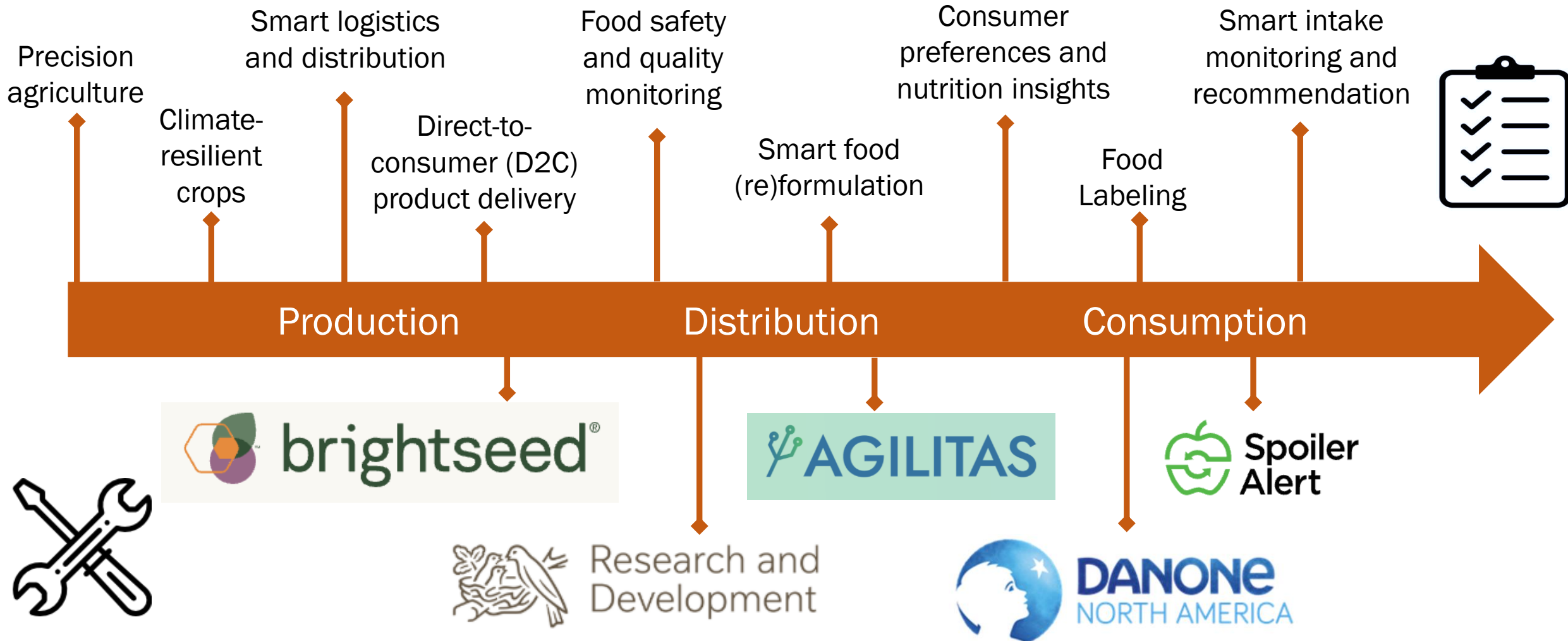
Artificial Intelligence is a computer-assisted approach to synthesize knowledge.

Naumova, E.N. Causal AI for public health research and policy: a journey back to the future. J Public Health Pol 46, 1–7 (2025).

<https://doi.org/10.1057/s41271-024-00541-x>

Naumova, E.N. Challenges of online surveys and synthetic data in achieving reproducibility in public health research: echoes of the “rise of the machines”. J Public Health Pol (2025). <https://doi.org/10.1057/s41271-025-00556-y>

Opportunities for AI



Key Features



Research and
Development

- ❖ "NesGPT," an internal generative AI tool inspired by ChatGPT, to support employees across functions such as sales, marketing, legal, and product development
- ❖ "Ruth," an AI-powered virtual assistant assists users with baking questions, providing recipes, ingredient substitutions, and troubleshooting tips for perfecting cookies
- ❖ Using AI to create products like Nescafé Dalgona coffee mixes.

1. AI in Product Innovation
2. Generative AI for Internal Productivity
3. **AI-Powered Food Waste Reduction Initiative**
4. Predictive Maintenance in Manufacturing
5. AI for Customer Engagement



Key Features



- ❖ Danone Microsoft AI Academy, aiming to upskill 100,000 employees in AI-related skills, such as predictive forecasting and real-time operational adjustments.
- ❖ Use Digital Twins to assist in data-driven decision-making across procurement, production, and distribution teams.
- ❖ Use AI to analyze consumer data and uncover trends, optimizing promotions and product offerings.

1. Strategic Collaboration with Microsoft
2. Operational Efficiency and Supply Chain Optimization
3. Customer Engagement through AI-Powered Assistants
4. Marketing and Consumer Insights



Key Features



- ❖ Forager® is built on one of the world's largest proprietary libraries of plant-derived bioactive compounds
- ❖ Mapped 7 million plant compounds and identified 40 thousand predicted bioactives

1. Robust verifiable data Infrastructure
2. Continuously updated knowledge hub
3. AI-Powered Discovery at Scale
4. Cross-Sector Collaboration
5. Sustainability through Nature-Inspired Innovations



Key Features



- ❖ Proprietary Database for 100+ F&B product categories
- ❖ Proprietary Formulation Database with starting formulas for 100k+ products
- ❖ Proprietary Ingredient Database from industry sources and suppliers

1. Building robust data infrastructure
2. Building consumer trust by ensuring compliance with regulatory standards
3. Building AI-guided assistance in innovate on product formulation



Key Features



❖ Scalable data infrastructure to manage excess and slow-moving inventory for consumer-packaged goods (CPG) companies

1. Seamless Integration with Existing Systems
2. Automated Data Processing
3. Real-Time Analytics and Reporting
4. Continuous Knowledge Updates
5. Scalable and Secure Infrastructure

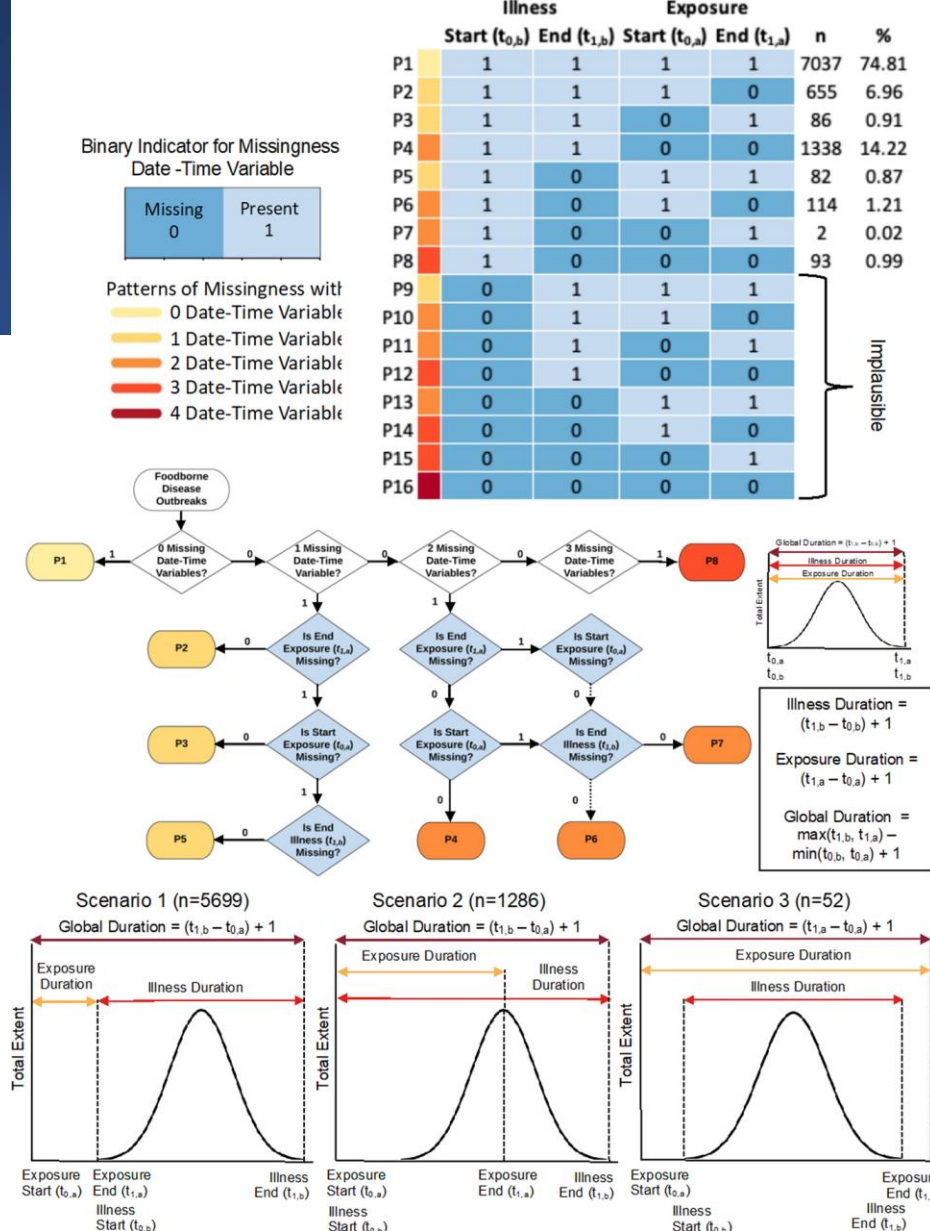


Assessing Food Recalls

- Food recalls are costly: ~ \$10M/recall
- Food recall surveillance is fragmented and frequently incomplete
- Babylonian Tower problem: data compilation and harmonization over the whole food supply chains, from production to distribution to consumption
- Clear metrics of success: avoided food/nutrition loss, avoided adverse health outcomes, long term impact

Sanchez, E., et al (2022). Exploring Risk Factors of Recall-Associated Foodborne Disease Outbreaks in the United States, 2009–2019. *IJERPH* 19(9), 4947. <https://doi.org/10.3390/ijerph19094947>

Diemer, E., Naumova, E.N. Missingness and algorithmic bias: an example from the United States National Outbreak Reporting System, 2009–2019. *J Public Health Pol* 45, 198–204 (2024). <https://doi.org/10.1057/s41271-024-00477-2>



An analytical workflow to identify and explore mutually exclusive patterns of missingness (P1–P16) among illness and exposure start and end dates of 9407 foodborne disease outbreaks (FBDO) reported by the CDC's National Outbreak Reporting System (NORS) in 2009–2019.

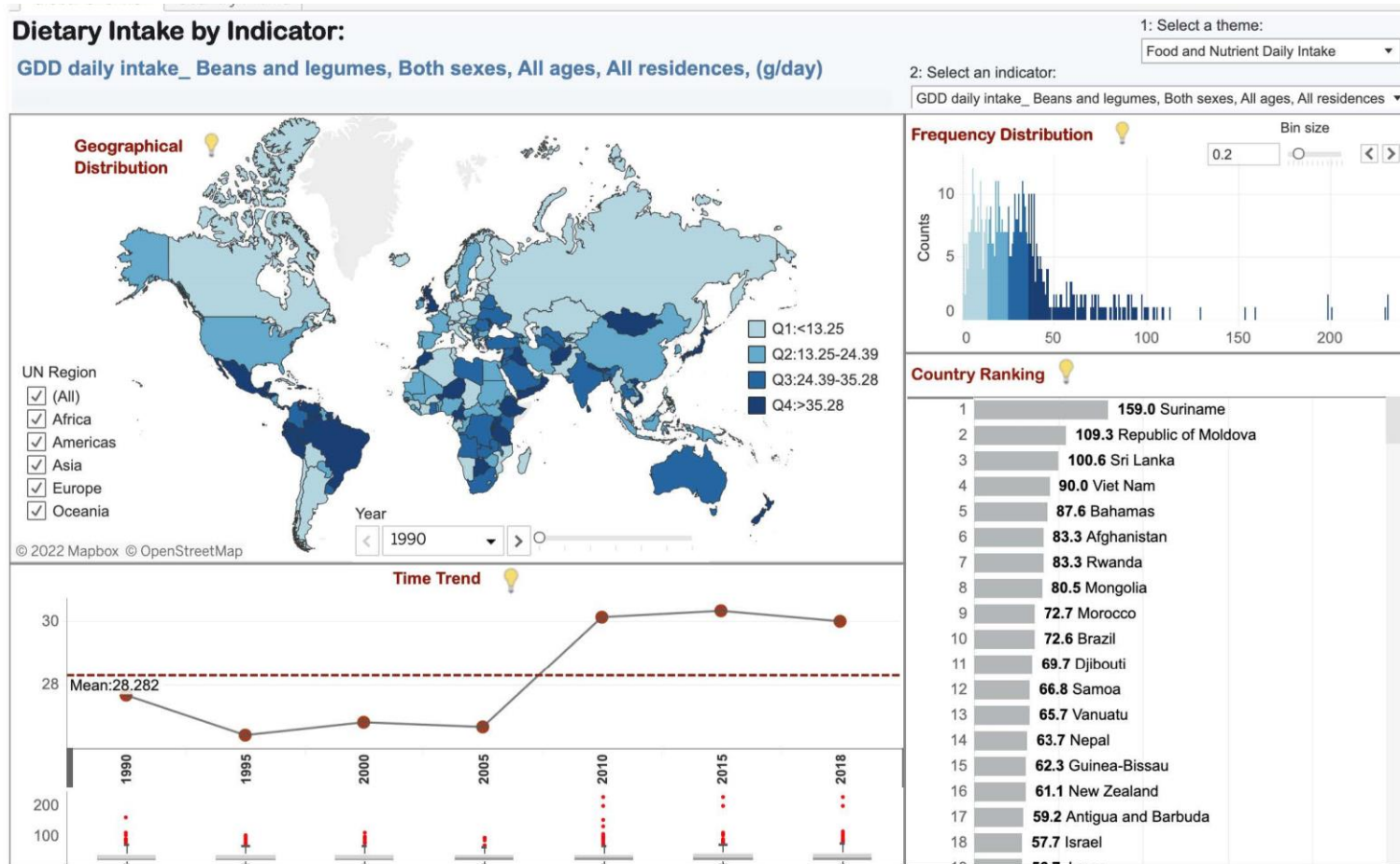
The Global Nutrition and Health Atlas (GNHA)



GLOBAL NUTRITION AND HEALTH ATLAS

- Interactive and open-access nature of the platform, designed to foster collaboration and innovation
- Contains 26 themes, 500+ indicators, 190+ countries, 30-year span
- Initiated with Nestle support
- Actively used by students and researchers

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Takeaways



Knowledge synthesis



Secondary data analysis



Synthetic datasets



Online surveys

Reproducibility and Replicability:

- Data integrity
- Analytical robustness
- Methodological soundness

Reproducibility uses the *same data*, and replicability relies on *different data*.

Reproducibility confirms the validity of the analysis, and replicability assesses the generalizability and robustness of the findings.

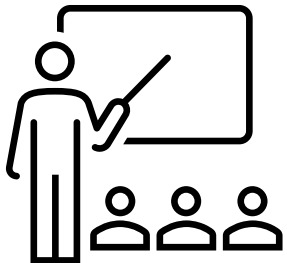
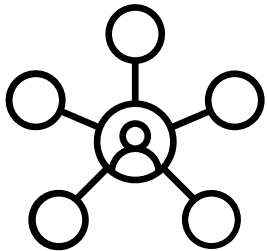
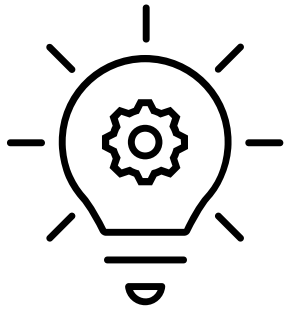
Reproducibility ensures technical accuracy, and replicability evaluates scientific reliability across contexts.



Questions?



Thank you!



Selected publications:

1. Naumova, E.N. Precision public health: is it all about the data?. J Public Health Pol 43, 481–486 (2022). <https://doi.org/10.1057/s41271-022-00367-5>
2. Naumova, E.N. Intellectual humility in public health training, research, and practice. J Public Health Pol 44, 1–5 (2023). <https://doi.org/10.1057/s41271-022-00389-z>
3. Naumova, E.N. Who is responsible for AI-generated public health policies?. J Public Health Pol (2023). <https://doi.org/10.1057/s41271-023-00438-1>
4. Naumova, E.N. A mistake-find exercise: a teacher's tool to engage with information innovations, ChatGPT, and their analogs. J Public Health Pol 44, 173–178 (2023). <https://doi.org/10.1057/s41271-023-00400-1>
5. Naumova, E.N. Causal AI for public health research and policy: a journey back to the future. J Public Health Pol 46, 1–7 (2025). <https://doi.org/10.1057/s41271-024-00541-x>
6. Naumova, E.N. Future-proofing global health surveillance through a workforce-driven path to success. J Public Health Pol 45, 605–609 (2024). <https://doi.org/10.1057/s41271-024-00526-w>
7. Naumova, E.N. Artificial intelligence and data analytics competencies for public health professionals. J Public Health Pol 45, 407–412 (2024). <https://doi.org/10.1057/s41271-024-00499-w>
8. Naumova, E.N. Telling truth with data visuals: a guide for public health professionals. J Public Health Pol 45, 191–197 (2024). <https://doi.org/10.1057/s41271-024-00479-0>