



Future of Malnutrition Seasonality

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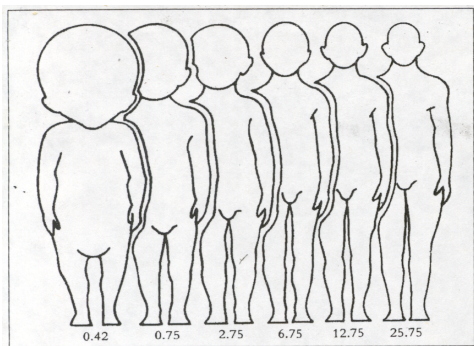
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**Gerald J. and Dorothy R. Friedman School
of Nutrition Science and Policy
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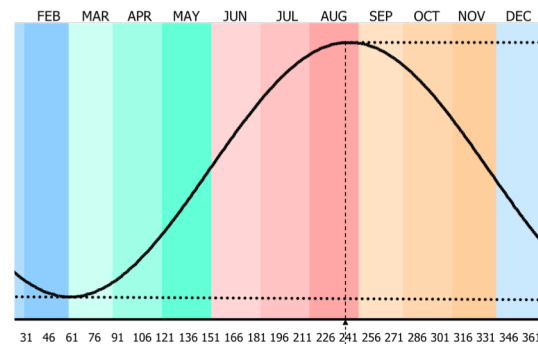


Advancing systems thinking and recognizing seasonality as a system feature

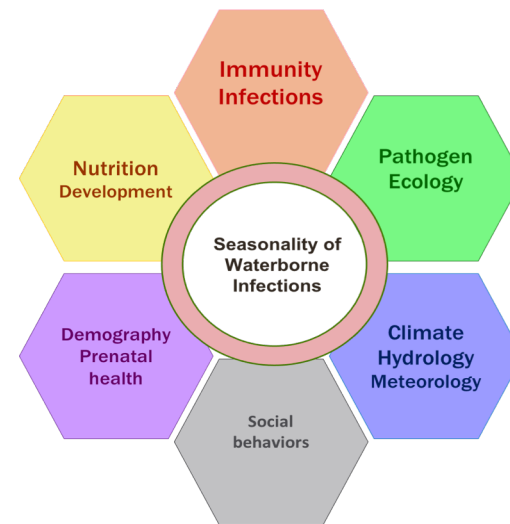
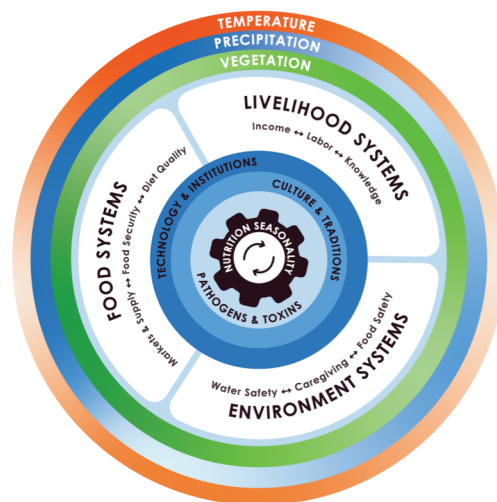


Allometric features of growth - aging is changing

Quantifying seasonality of malnutrition and infections



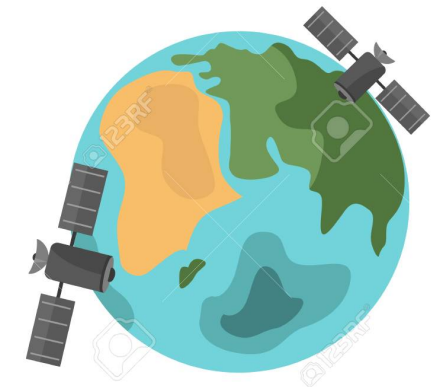
Interconnectedness of malnutrition seasonality



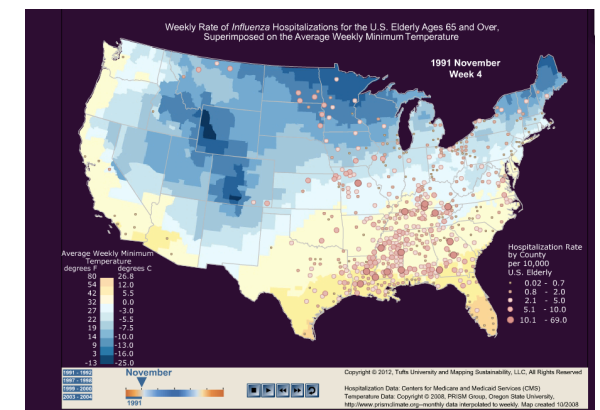
Understanding challenges of modeling seasonality in changing environmental and climatic conditions

Key Points

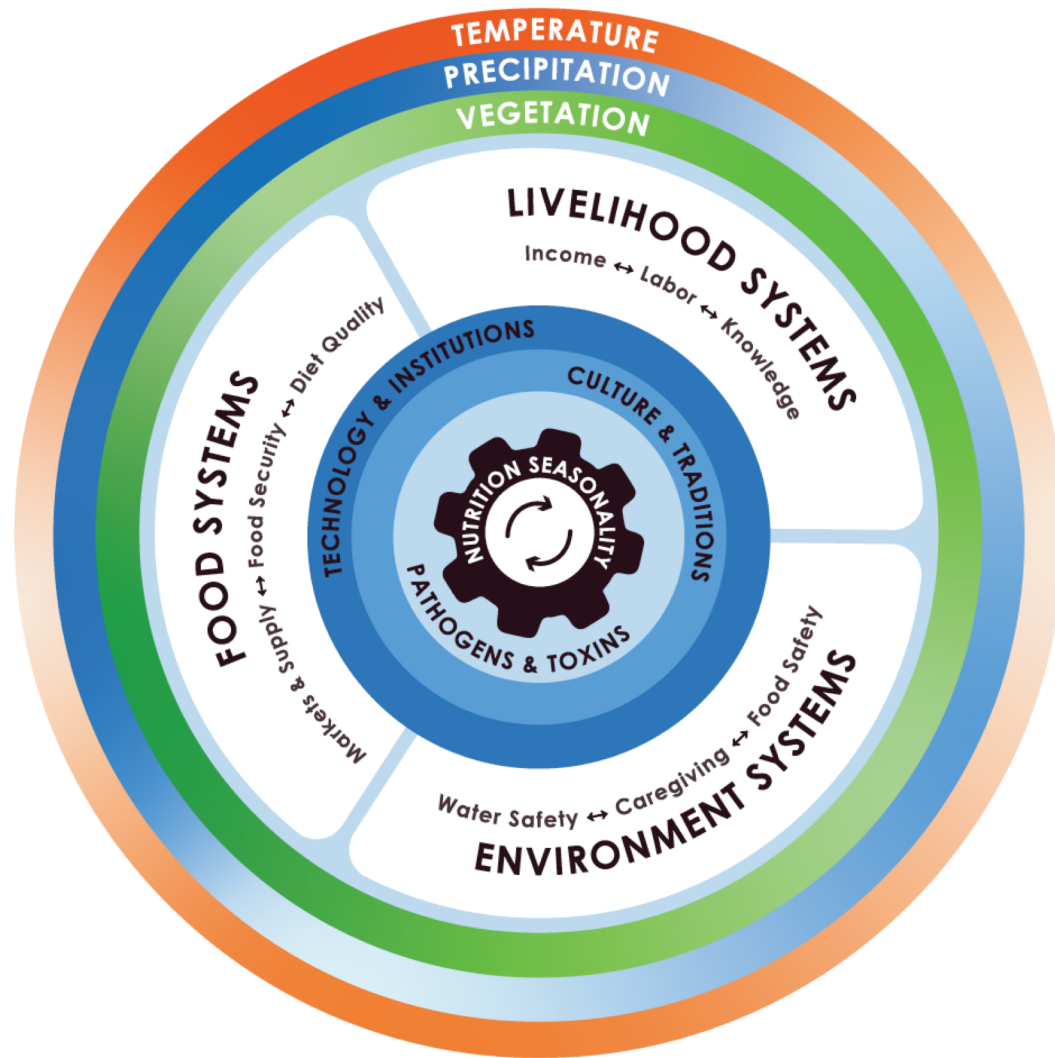
Understanding time distributed effects of interventions and policies



Advancing tools to capture trends and patterns



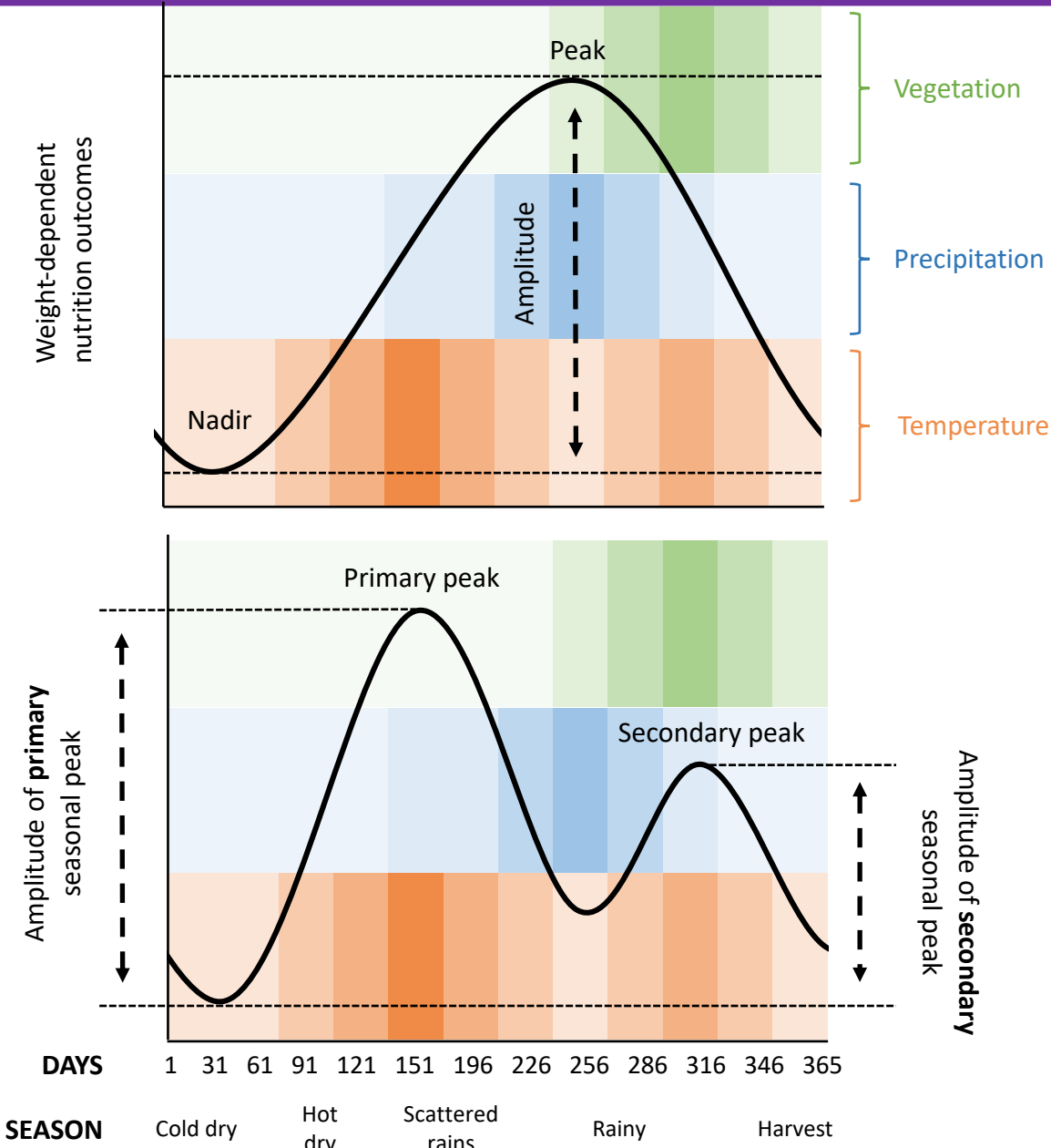
Interconnectedness of malnutrition seasonality



- ❑ Seasonal malnutrition – insufficient and inadequate nutrition – is a common indicator of a food crisis and a precursor of famine.
- ❑ Seasonality of malnutrition is affected by several systems.
- ❑ Seasonality can be quantified, modeled, and used to measure the response to global change.

MONTH Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Quantification of malnutrition seasonality

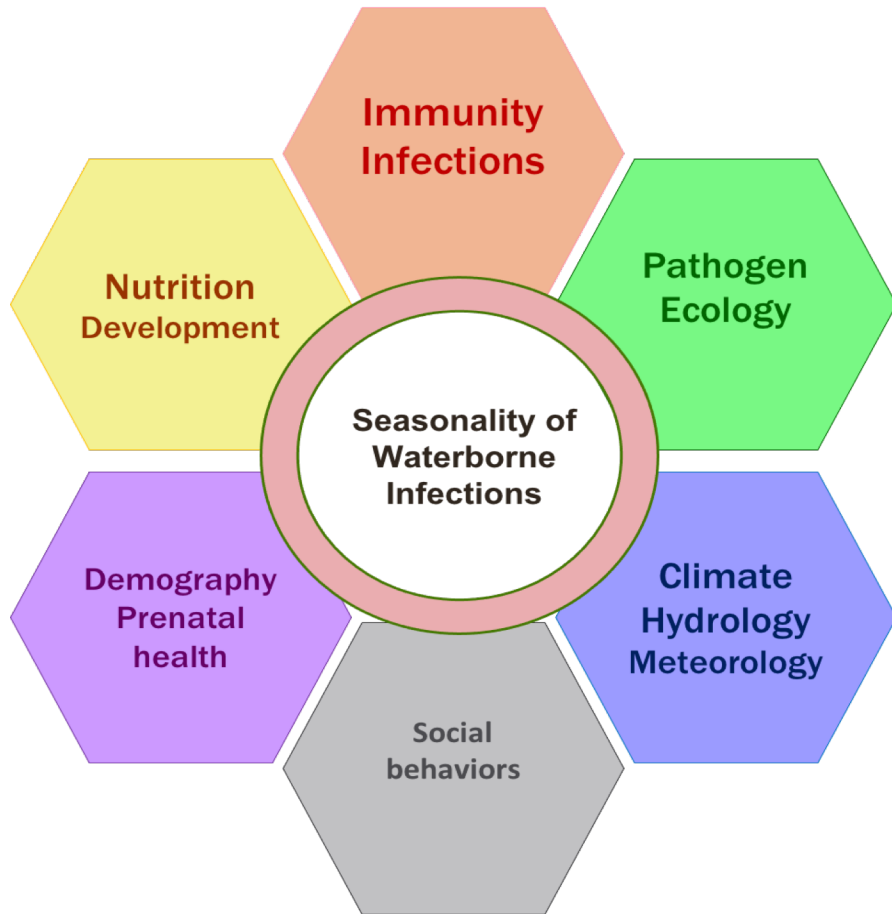


- ❑ Seasonal malnutrition and drivers are well recognized, yet it has been poorly quantified and even more poorly forecasted.
- ❑ Seasonality of malnutrition shares common features with seasonality of infections as a reinforcing cycle.
- ❑ In a resilient system, the seasonal swings are minimized by preemptive actions.

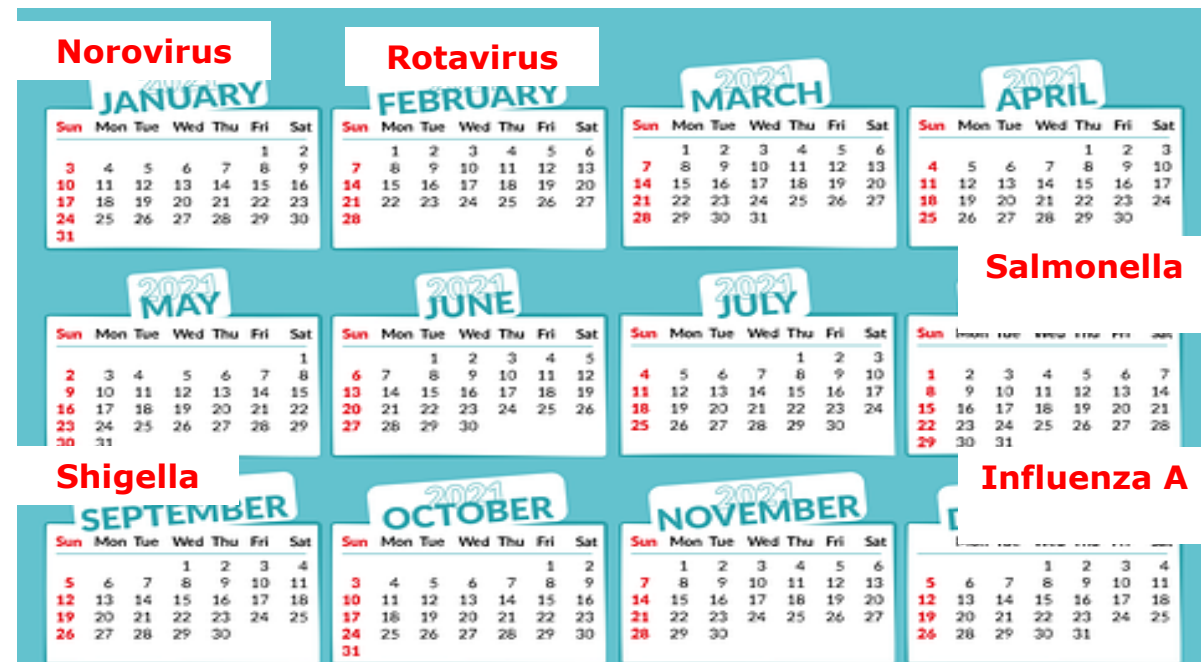
Note: Example based on a single peak dryland rainfall climate and would need to be adopted for different contexts.

Marshak A, Venkat A, Young H, Naumova EN. How seasonality in malnutrition is measured and analyzed. International Journal of Environmental Research and Public Health. 2021; 18(5), 1828 <https://www.mdpi.com/1660-4601/18/4/1828>.

Health-Nutrition-Environment Interface

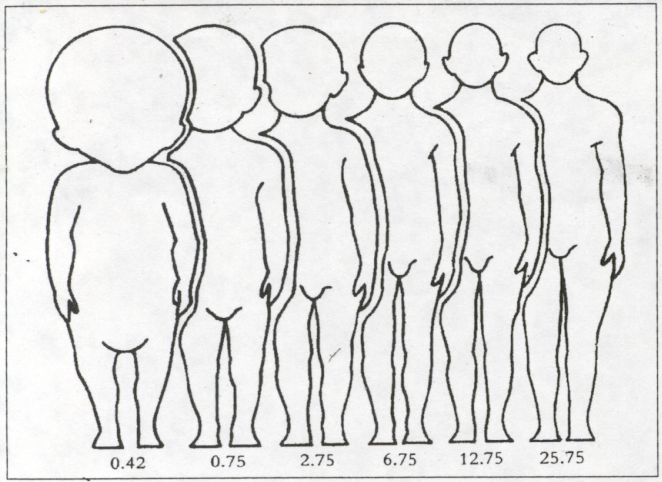


- Seasonality of infections can be mapped to globally-accepted calendars.
- Seasonal variations in infection affecting malnutrition account for 70-80% of variability.
- Widely accepted measures, like vaccination, can drastically reduced, or even eliminate seasonality.

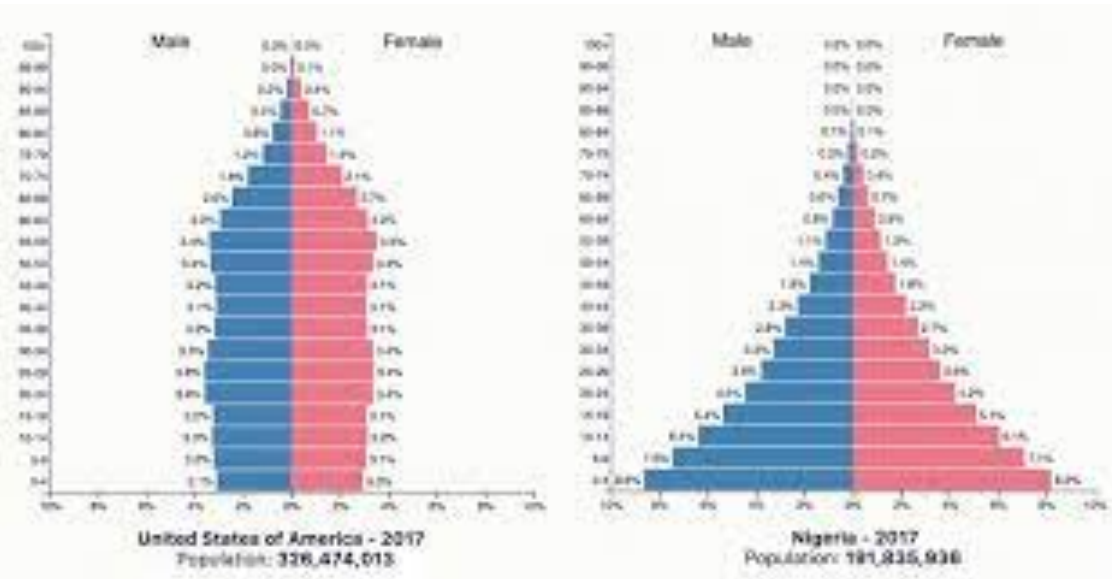


Understanding challenges of modeling seasonality in changing environmental and climatic conditions

Impact of global change on malnutrition



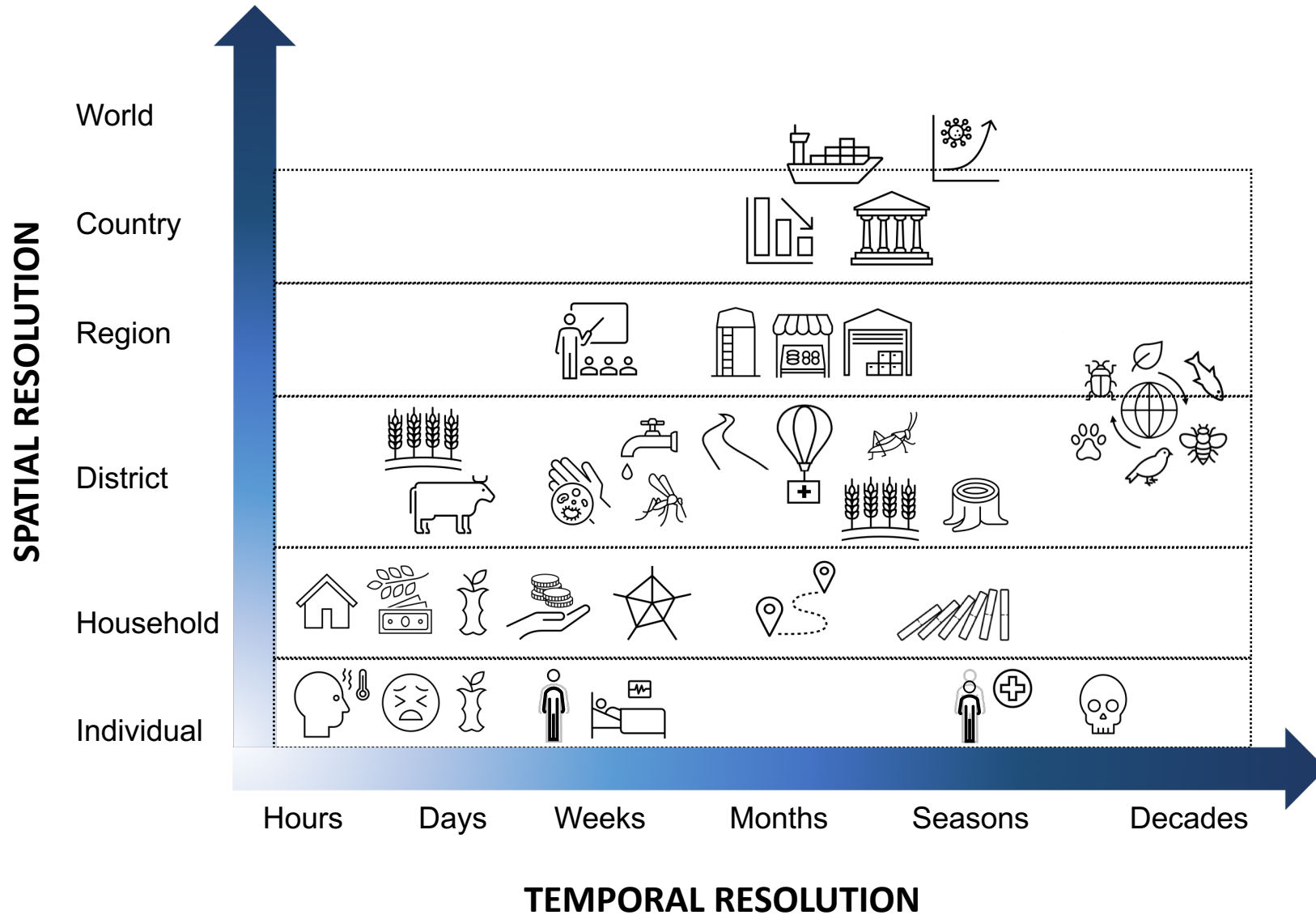
- Population structure, aging, migration.
- Malnutrition in children under 5 yet has lasting generational effects.
- Inadequate nutrition is not distributed equally or randomly across populations, time periods, and climatic zones.
- Seasonality of malnutrition mimics inequalities and inadequacies



Cliffer IR, Perumal N, Masters WA, Naumova EN, Ouedraogo LN, Garanet F, Rogers BL. Linear growth spurts are preceded by higher weight gain velocity and followed by weight slowdowns among rural children in Burkina Faso: a longitudinal study. *The Journal of Nutrition*. 2022; nxac071, <https://doi.org/10.1093/jn/nxac071>

Bai Y, Naumova EN, Masters WA. Seasonality in retail food prices, cost of nutrient and caloric adequacy in East Africa. *Science Advances*. 2020; 6(49) eabc2162 <https://advances.sciencemag.org/content/6/49/eabc2162>

Scale and resolution are critical

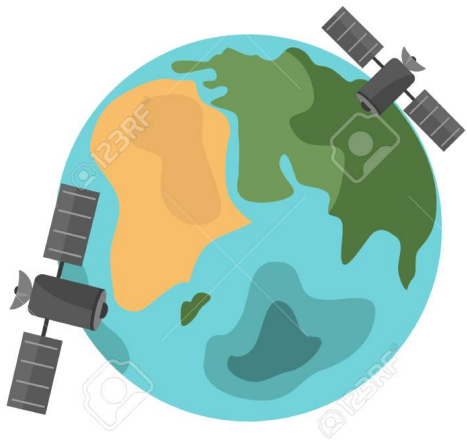


- With large seasonal fluctuations the annual totals lose their value.
- With localized malnutrition, broad geographic aggregates are losing their meaning.
- Precision humanitarian assistance: to help to right people with the right actions at the right time.

Distributed and compounded effects

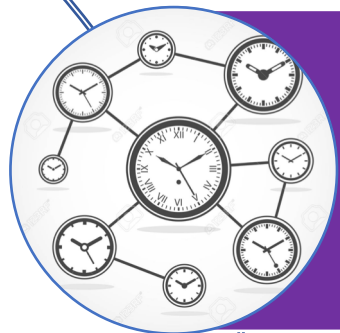
on malnutrition and seasonality are likely due to:

- ❑ Various forms and types of hazards,
- ❑ Health policies and interventions,
- ❑ Global transitions in food production, storage, and consumption,
- ❑ Nutrition transition – a shift in dietary consumption, caloric density, and energy expenditure from traditional diets high in cereal and fiber to more Western-like diets high in sugars, fat, and animal-source food.



HAZARDS





Tools for detecting malnutrition seasonality



Risks for seasonality amplification



Enablers of reducing malnutrition and its seasonal peaks

Malnutrition Seasonality
synchronization across:

- Populations
- Food-related practices
- Climatic zones
- Livelihoods
- Water and energy sources
- Natural resources
- Cultures and traditions
- Trade partners



Notable points



Every disease occurs at any season of the year but some of them more frequently occur and are of greater severity at certain times.

Hippocrates. *Aphorisms, III, 19*

Now let us consider the seasons and the way we can predict whether it is going to be a healthy or an unhealthy year.

Hippocrates. *Air, Waters, Places, 10*

When the weather is seasonable and the crops ripen at the regular times, diseases are regular in their appearance...

Hippocrates. *Aphorisms, III, 8*

You will find, as a general rule, that the constitutions and the habits of a people follow the nature of the land where they live.

Hippocrates. *Air, Waters, Places, 24*

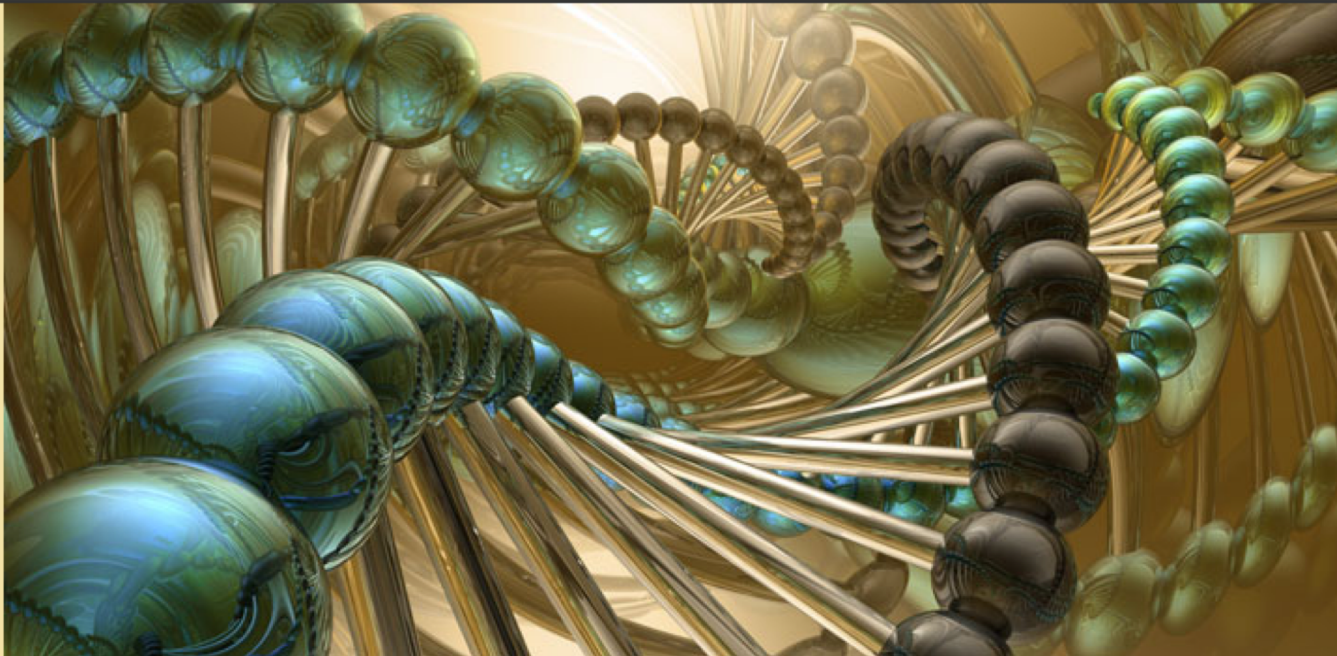
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Thank You!

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Selected Publications

- Naumova EN, Christodouleas J, Hunter PR, Sued Q. Temporal and spatial variability in cryptosporidiosis recorded by the surveillance system in North West England in 1990 - 1999. *Water and Health*. 2005; 3(2):185-96.
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- Chui KHH, Cohen SA, Naumova EN. Snowbirds and infection: New phenomena in pneumonia and influenza hospitalizations from winter migration of older adults. *BMC Publ Health*. 2011; 7;11(1):444.
- Jagai JS, Griffiths JK, Kirshen P, Webb PM, Naumova EN. Seasonal Patterns of Gastrointestinal Illness and Streamflow along the Ohio River. *Int. Journal of Environmental Research and Public Health*. 2012
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- Cruz M, Alarcon T, Hartwick M, Venkat A, Ward H, Balaji B, Naumova EN. From hospitalization records to surveillance: the use of a single-year age distribution to characterize patient profiles. *PLoS ONE*. 2017

