The potential of daily nutrition as preventative health technology

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Disclosures

• Director Public Health & Scientific Relations, Danone Company
• Chair of INPHORM, a working group of Health Technology Assessment international (HTAi)
• Member of the ISPOR leadership group on Nutrition Economics
• Member of the Standing Committee Nutrition & Health, International Dairy Federation (IDF)
• Board member of the Mission Scientifique Syndifrais
• Guest lecturer at Université Diderot, Paris
Public Health

"Let medicine be thy food, and food be thy medicine."
Hippocrates, 460-377 BC

Public Health: The science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals

Science 51 (1306):23-33

PH ... aims to provide conditions in which people can be healthy and focus on entire populations, not on individual patients or diseases

WHO

Nutrition

A science which analyses the relation between food and health, investigating the metabolic and physiological responses of the body to diet

Different food/nutrition categories

Healthy consumers and at-risk populations
Conventional food
Survival, health, pleasure
Functional
Targets specific body functions/risk factors
Baby food
Age-specific needs

Diseased population (= patients)
FSMP
Special enteral medical nutrition for all ages
Parenteral nutrition
Special parenteral (IV) medical nutrition
All ages
Although nutrient deficiency diseases are still prevalent in some countries, and are an important cause of ill-health and premature death, nutrients-associated chronic diseases due to incorrect balance or excess of nutrients are now of significant importance in all countries, developing and developed alike.

Factors needed for successful nutrition and food policies:

Food and nutrition policies must have the credibility provided by scientific and epidemiological evidence, have political and technical support, and be regarded as necessary and convenient by the consumer.
Common conditions of ill health

Overweight
Insulin Resistance
Increased LDL-CHOL
Hypertension
Reduced Bone Mass
Age-related undernutrition

Obesity & Type 2 Diabetes
Cardiovascular Diseases & Stroke
Osteoporosis & Sarcopenia

Potential cost-savings in healthcare

Diet and exercise
Non-compliance
Compliance but lack of effect

1st line treatment
Treatment failure
Paradoxical effects

2nd line treatment
Treatment failure
Multiple progression modalities

Extension of nutritional strategies for managing many NCDs would considerably reduce healthcare expenditures

The world is not on track to meet the target set by the UN Sustainable Development Goals of a one-third reduction in premature NCD deaths by 2030.

Dr. Douglas Bettcher, WHO director for the prevention of NCDs.
Given the apparent lack of success of strategies based on behavioral modification, it is not surprising that there is increasing pressure to develop pharmacologic approaches for the management of obesity, with all the potential dangers of turning a lifestyle problem into a medical one (Clinical Pharmacology & Therapeutics - 2007).

There is virtually no information on the cost/effectiveness of functional food, i.e., it is unclear at what cost the expected health benefits come. Studies indicate that functional food may help prevent diseases that currently impose a heavy drain on health care budgets (European Commission's report – 2008).

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### Cost/effectiveness of nutrition

**Cost/effectiveness** information is obtained by analysing the costs and consequences of a health intervention (technology) to address a specific problem under general or routine conditions, rather than under controlled conditions.

**HTA:** The systematic evaluation of the properties and effects of a health technology, addressing the direct and intended effects of this technology, as well as its indirect and unintended consequences, and aimed mainly at informing decision making regarding health technologies.
The example of flu-like diseases and probiotics

Two meta-analyses reported the probiotics effects on RTI

Effectiveness of probiotics on the duration of illness in healthy children and adults who develop common acute respiratory infectious conditions: a systematic review and meta-analysis

Sarah King¹, Julie Glenville¹*, Mary Ellen Sanders² et al. British Journal of Nutrition
2014 - incl. 20 randomized placebo-controlled trials of probiotics

Probiotics for preventing acute upper respiratory tract infections (Review)
Hao Q, Dong BR, Wu T
2015 - incl. 12 randomized placebo-controlled trials of probiotics
King 2014 (YHEC): shows a reduced duration per RTI episode when consuming probiotics

Significantly shorter illness episodes with probiotics vs placebo:
Mean duration placebo 7.40 days
Mean duration probiotics 6.63 days
Weighted mean difference -0.77 days [-1.50; -0.04], p=0.04

Hao 2015 (Cochrane): preventive probiotics have a positive impact on RTI frequency & duration

Significantly shorter illness episodes with probiotics vs placebo:
Mean duration placebo 8.82 days
Mean duration probiotics 6.93 days
Weighted mean difference -1.89 days [-2.03; -1.75], p<0.001

Significantly reduced RTI incidence with probiotics vs placebo:
Odds Ratio (OR) 0.53 [0.37; 0.76], p<0.001
Additional effects of probiotics reported by the meta-analyses

- Significant reduction of RTI-related antibiotics use with probiotics vs placebo (Cochrane)

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of participants who used antibiotics</td>
<td>4</td>
<td>184</td>
<td>Risk Ratio (M-H, Random, 95% CI)</td>
<td>0.65 [0.45, 0.90]</td>
</tr>
</tbody>
</table>

- Significant reduction of RTI-related sick leaves with probiotics vs placebo (YHEC)

Model: MA results combined with existing RTI data

Healthy Individual
- age, sex
- smoking status
- living in a community setting
- influenza vaccination status

New RTI episode
- direct medical cost (visit, AB)
- indirect cost per work day lost

RTI cured
- back to healthy state at the end of the RTI episode

Ongoing RTI

RTI not cured
- (RTI days: +1)

Duration RTI episode function of...
- individual characteristics (risk factors, prophylaxis use)
- RTI episode duration:
  - 7-80 days (YHEC, placebo)
  - 4-83 days (Cochrane, placebo)
Study country: Canada

Age and sex from StatCan vs modeled population (N=35,540)
Error rate < 5% between expected and modeled population size

Key input: probability of RTI episodes

derived from FluWatch ‘ILI’ statistics and StatCan data
Data used in the model

- Combining Fluwatch and StatCan data allowed an estimate of the annual RTI incidence and the related numbers of GP consultations: 1.7-2.2%
- The prescription rate of antibiotics in case of RTI is 26.1% (Kwong et al, 2009)
- Absence from work caused by RTI is 42% of employees for an average of 1.7 missed working days (Palmer et al, 2011 - US)
- In case of child’s RTI, 18% of employees miss work for 0.5 days on average (Palmer et al, 2011 - US)

Adjustments for risk factors and vaccination status

- Children aged 0-9 years bear a higher burden of ILI
- People sharing life/work environment have a higher frequency of RTIs (Louhiala et al 1995, Jaakola 1995)
- Active and passive smokers have longer and/or more frequent RTIs (Bensenor et al, 2001)
- Individuals vaccinated against influenza have a lower risk of ILI (vaccination coverage StatCan 2014)
- An estimated 12% of the Canadian population is using probiotics (IPSOS 2012)
Taking into account the current probiotics use (= 12% of the Canadian population)

At-risk groups show a higher incremental benefit
Prevented RTI days and associated savings according to the 2 scenarios

Probiotic use saved between 573,000 RTI days (YHEC scenario) and 2.3 million RTI days (Cochrane) annually in Canada.

The averted RTI events generated up to:
- Can$ 9 million savings for the health care payer
- Can$ 100 million when adding productivity losses

Reduction of the number of RTI days based on the YHEC and Cochrane meta-analyses.
Acute RTIs in daily life

- Adults have an average of 2–4 common RTI episodes annually
- Primary schoolchildren have an average of 3–8
- In the USA, 20 million school days are lost per annum

Daily nutrition as preventative health technology
has great potential for sustained health
and sustainable health care systems

Implementation of successful, population-oriented strategies is hampered by
- the scarcity of methodological guidance in PH evaluations
- the failure to motivate/achieve effective and lasting changes in eating behaviour (lifestyle)

HTA offers (un[der]exploited) possibilities for
- developing robust alternative (to RCT) methods and broadening of translational research in complex settings
- generating positive outcomes to build policies that motivate the general population to adopt healthy food behaviour

In conclusion
Thank you