# Health Economics of Nutrition Adding Policy Relevance to Clinical Knowledge

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# Decision context

Govt. Health Agencies increasingly seek economic evaluation to inform investment decisions in health

in ▪ medical devises / screening / clinical services?

　　▪ pharmaceuticals /vaccines

　　　▪ Other??

Australia: PBAC (pharmaceuticals), MSAC (medical)

UK: NICE - broader

**Where is nutrition?**

< 1% health budget?

where are funding & decision mechanisms

# Nutrition and health

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Nutrition has wide-ranging & powerful effects on health ('good' vs 'poor' diet) established from:

- biological pathways
- observational studies /cohort/cross sectional
- high quality intervention trials

Affect on health is pervasive

- Mental health – cognition, depression, behaviour
- Metabolic risk – blood pressure, cholesterol, weight ,diabetes
- Clinical end points  - stroke, heart attack, cancers, death
- Recovery - surgery
- Nutrition deficient states (total, micro-nutrients)

# Nutrition and health

The quality of the diet in most countries is poor

In rich market-driven economies like Australia?

- high salt intake - almost all exceed guidelines
- low vegetable (fruit) intake <20% meet guidelines
- Excessive calories especially sugar → obesity epidemic
- low dairy intake – most don't meet guidelines

<20% Australian teenage girls consume enough dairy

→considerable impact on Health

on disease, quality of life & death. And health system costs

In Australia, low dairy → health system cost approx = the public health budget *(Doidge et al J Nutrition, in press).*

Generation of high quality policy relevant evidence of the effect of nutrition on health and the value of interventions

## What is the intervention

- Whole foods & whole diets
  Not simply micronutrients, vitamins/supplements etc.

- Combination
  - o eg diet plus physical activity (eg diabetes prevention)
  - o diet + counselling (child behaviours/depression),
  - o diet +++ early childhood

## Target population: consider high risk not just popn.

- impacts greater so capture impact on final end points
- benefits accrue sooner
- greater likelihood of compliance

# Select the appropriate outcomes

**Process outcomes** to establish fidelity of implementation

**Intermediate outcomes** eg change in diet and bio-markers, inform whether changes were as expected & help establish the causal pathway & relationship with final outcomes.

**Final outcomes**  major health events (eg AMI, stroke, disease free, death) quality of life. **Directly** important to the population and policy makers.

- Far more powerful if measured directly rather  than modeled from intermediate outcomes

**Ideal:** Establish the entire story - Process thru to final

**Yes Health endpoints** – events Eg deaths, stroke, AMI, cases of depression, cases of ADHD, Q of life utility score

**Not only Clinical risk markers**

**Health endpoints better as**

- Meaningful – contribute directly to health
- Capture range of pathways/mechanisms
- Not rely on risk equation that are highly uncertain
- Small clinical change (or large but insign. change) in risk marker can be associated with major change in health  +ve (eg diabetes prevention), or negative (eg high fibre)
- Direct input  to economic evaluation

**Mediterranean Diet** (n=303) Advice from cardiologist & dietician

- **more** vegetables, fruit, fish, good oils - rapeseed margarine
- **less** processed meats, cream, butter .

Control (n=302): American Heart Association Low fat diet

## Tells Entire story

- up to 5 year follow-up
- targeted high risk group who accumulate events quickly

## Observe differences in

- Diet, clinical biomarkers (small improvements) large difference in health endpoints

de Lorgeril et al 1999, *Circulation*    ▪ Dalziel. Segal, de Lorgeril, 2006  'Cost-utility analysis of Mediterranean diet in patients with previous MI'  *J. Nutrition*, (136): 1879-1885    ▪ Dalziel & Segal Ch. 22  in *Nutrients, Dietary Supplements  & Neutricals: Cost analysis versus clinical benefits*. Eds Watson et al. Humana Press 2011
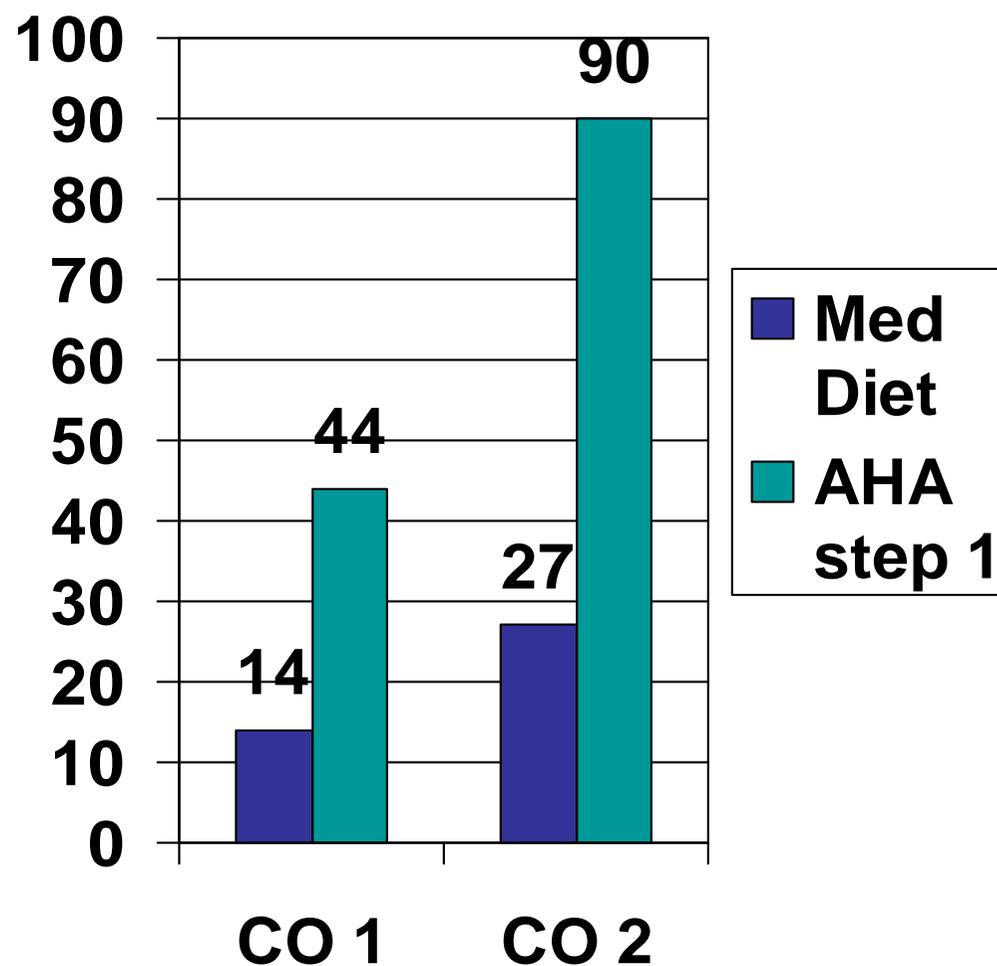
# Dietary change & Health outcomes
## (Co1 = death + AMI) co2 = major + 2ndry events)

| | AHA | Med diet |
|---|---|---|
| bread | 145.0 | 167.0 |
| cereals | 99.4 | 94.0 |
| legumes | 9.9 | 19.9 |
| vegetables | 288.0 | 316.0 |
| fruits | 203.0 | 251.0 |
| proc. meat | 13.4 | 6.4 |
| fresh meat | 60.4 | 40.8 |
| poultry | 52.8 | 57.8 |
| cheese | 35.0 | 32.2 |
| butter/cream | 16.6 | 2.8 |
| margarine | 5.1 | 19.0 |
| Oil | 16.5 | 15.7 |
| fish | 39.5 | 46.5 |



Bar chart legend: Med Diet, AHA step 1

- CO 1: Med Diet = 14, AHA step 1 = 44
- CO 2: Med Diet = 27, AHA step 1 = 90

**RCT gold standard but role for other study designs**

for

- LT follow-up (to establish maintenance of behaviours, side effect profile, final outcomes)

- Adverse events/Side effect profile (especially relevant to comparators) – issue of sample size

- Final health outcomes (eg death)

- Health service costs

**Other designs**

- Post marketing surveillance - using data linked (Eg Veterans mates project, *Roughead et al, UniSA),* using registries

**Are study findings likely to be realised effectiveness and harms**

**Key issues**

Does enrolled  Population match clinic popn./community?

Consider

- Inclusion/exclusion criteria: comorbidites, age, non native language speakers

- Self selection bias: higher income / better educated / less stressed

Other contextual factors

- eg are providers typical ? implications for fidelity

# How do nutrition interventions compare with other modalities?

Based on an Australian study* of 245 health interventions

• life-style, including nutrition, more cost-effective on average

But very mixed (as for all modalities)

• Often wide range of plausible estimates due to poor quality of evidence generation studies

• QALY gain per person can be v low

Dalziel, Segal, Mortimer 2008 'Review of Australian Health Economic Evaluation - 245 interventions: What can we say about cost-effectiveness?' *Cost effectiveness & Resource Allocation*, 6:9

Average ICERS for published Australian C-E studies of 249 health interventions
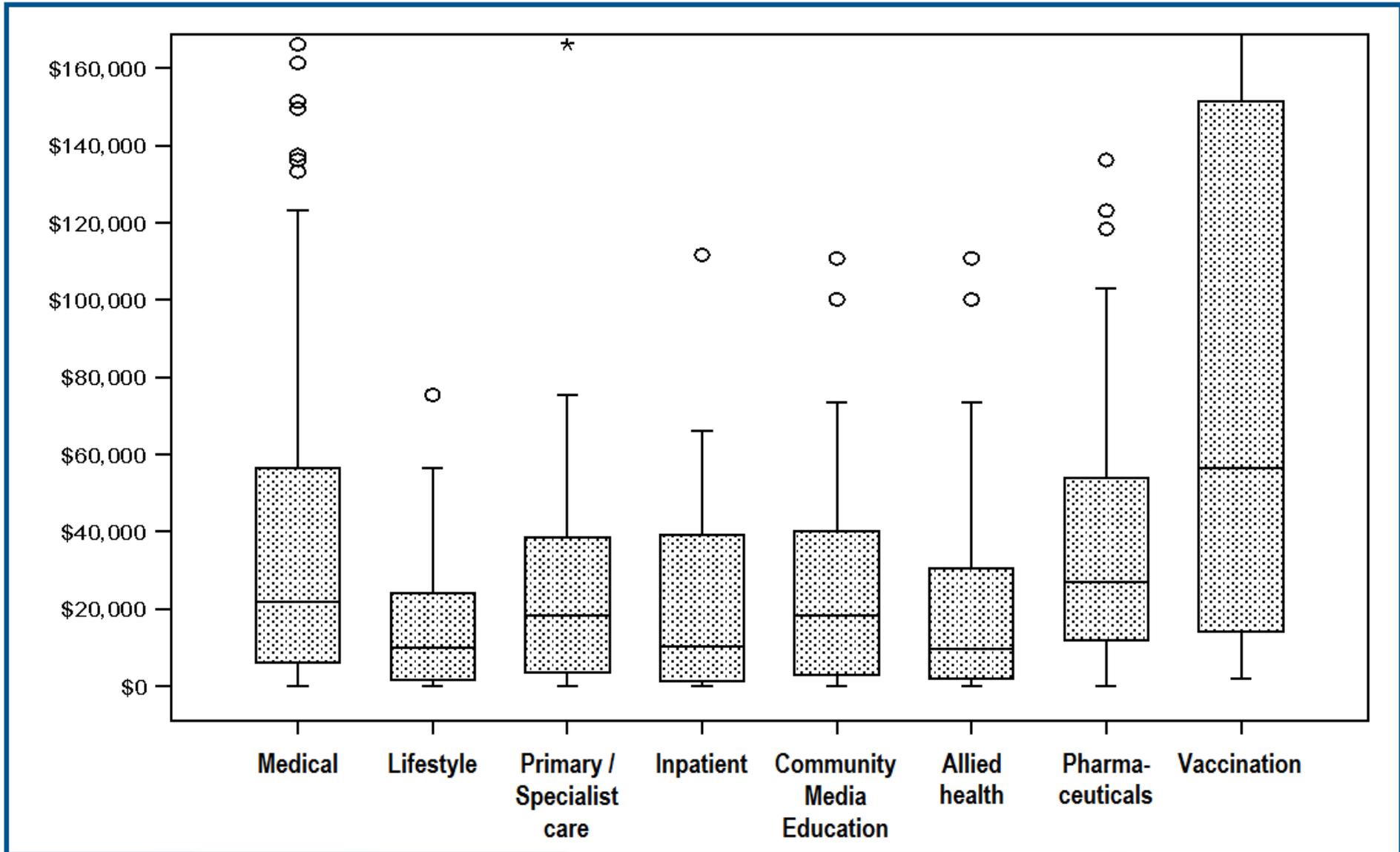
# $/QALY 8 Nutrition Interventions
## (Dalziel & Segal, Health Promotion International 2007)

University of

| Intervention | QALY gain per person | Incremental cost/person $ (~€) | Cost utility AUD $ (€) | Range from sensitivity analysis AUD$ (€) |
|---|---|---|---|---|
| **Reduce further cardiac events** | | | | |
| **Mediterranean diet** | **0.4** | **405** (€300) | **1,013** (€731) | Intervention dominates to 3,400 (€2452) |
| **Prevent type 2 diabetes** | | | | |
| **Reduced Fat Diet for IGT** | **0.024** | **241** (€175) | **10,000** (€7213) | Intervention dominates to 10,000 (€7213) |
| **Intensive Lifestyle to Prevent Diabetes in persons with IGT** | **0.41** | **769** (€555) | **1,880** (€1356) | Intervention dominates to $10,000 (€7213) |

**Dalziel K**, Segal L, 'Time to give nutrition interventions a higher profile: Cost-utility analysis of 10 nutrition interventions', *Health Promotion International*, vol 22(4):271-283, December 2007

# $/QALY 8 Nutrition Interventions

| Intervention | QALY gain / person | Incremental cost/person AU$ | Cost utility AU$ (Exchange Sept 2011) | Range from sensitivity analysis AU$ |
|---|---|---|---|---|
| **General Practice/Primary care based** | | | | |
| **Nutrition Counselling** | 0.087 | 917 (€661) | **10,600 (€7646)** | 6,500 (€4688) to 39,000 (€28,131) |
| **Oxcheck Nurse Check (UK,1995)** | 0.0045 | 57 (€41) | **12,600 (€9088)** | 6,800 (€4905) to 65,200 (€47,029) |
| **Media campaign** | | | | |
| **Multi Media 2 fruit 5 veg** | 0.0048 | 0.20 (€0.14) | **46 (€33)** | 24 (€17) to intervention dominated |
| **FFFF Media Campaign** | 0.0546 | 308 (€222) | **5,600 (€4039)** | 10 (€7) to intervention dominated |
| **Work force** | | | | |
| **Gutbusters Workplace** | 0.02 | 356 (€257) | **19,800 (€14,282)** | Intervention dominates to $19,800 (US$14800, £7900) |

# Key aspect of Performance : PBAC/MSAC & NICE

1. **Independence**
   - NICE: govt./community set agenda – can address community concerns
   - PBAC/MSAC driven primarily by industry submissions

2. **Internal validity** ▪ NICE & PBAC strong ▪ MSAC improving

3. **External validity**: ▪ MSAC/PBAC little attention to

4. **Comparators**
   - PBAC only pharmaceuticals ▪ MSAC mostly narrow
   - NICE broadest – often several modalities compared

5. **Scope: Complex interventions/range of modalities**
   - only NICE has a mechanism and does consider

# Implication of system failure

Pharmaceuticals & medical services may crowd out other more effective & more cost- effective ways of enhancing health

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**Considerable loss of health & wellbeing**

# Reflect Principle of Opportunity Cost

**As a matter of logic societal health** is maximised (given resources); if redirect resources

- **from** services / products that buy less health/$
- **to** services buy more health/$

**Example**: **If redistribute $1 million**

**From** service costs $100,000 / LY gain - lose 10 LYs

**To** a service costing $10,000 / LY gain - gain 100 LYs

**Net gain 90 LYs**

**Maximise breadth of comparison**

**Single priority setting system**

- **x-modalities within health** incl. pharmaceuticals, medical, other

- **x - jurisdiction Commonwealth / State / Local**

- **x – portfolio?**

**If separate systems**

- Ensure cut-off for invest decisions equal & consistent with budget

**Guiding Principle**

All services/programs have an equal chance of  funding

**All services treated equally regardless of**

- **modality**  - **portfolio**  - **complexity**

- **who funds**  - **who benefits**

**And Policy relevant evidence is generated**

**And Resources can shift in response to evidence**

**Result: Better Health**

<span style="color:red">**Requires a redesign of system structure**</span>

**Lessons from UK NICE**

# Encourage critical debate re priority setting system

Breadth/source of Topics

Scope of interventions: public health / allied heath complex multi-component / therapeutic

Cover all jurisdictions also state / local

More flexible Choice of comparator

Expand outcomes beyond individual

Consider cross portfolio options

Able to translate into funding & resource shifts

Incorporate Post marketing surveillance

# Conclusion

Health economics can provide clear guidance in the **design of nutrition trials**, re desirable characteristics to maximise policy relevance.

**Also** need to change the policy/decision context to create a level playing field where better nutrition can be supported and where 'competing' modalities are required to demonstrate superiority

**Need to encourage critical debate – in context of health system reform agendas**

Thank You