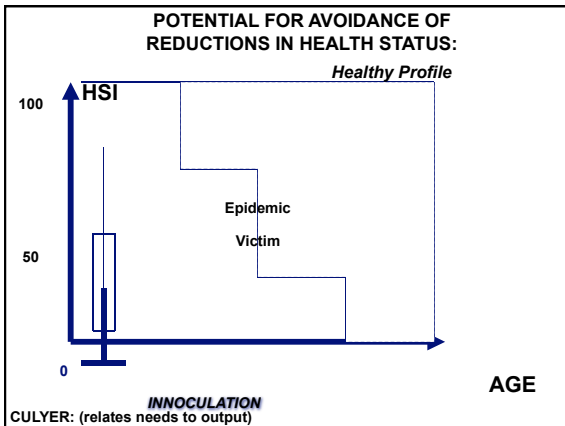
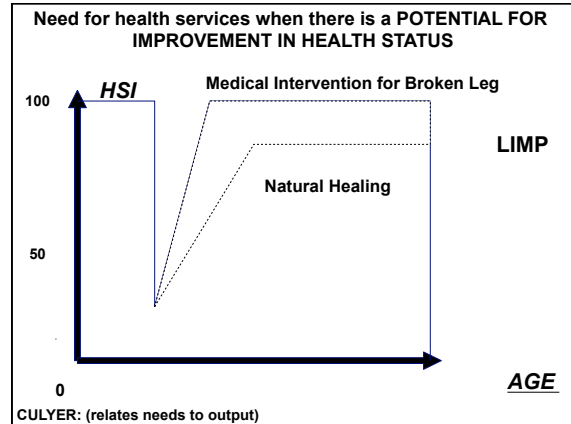


# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

Prioritising Mainstream and non-mainstream interventions

Using economic-epidemiological evaluations (cost-utility analysis)



**PLAYING DOCTORS (EQUIVALENCE).**

We are asked to play the role of a Doctor (G-d) who only has the resources to treat 1 of 2 groups. Both groups will die if one is not helped immediately. We are asked,

"How many people in state of health X" (eg.spina bifida) are equivalent to 100 persons of the same race, age and sex who are from a standard healthy population".

IF X was spina bifida & the reply was 140, then  
HSI of SB =  $100/140 = 0.70$

IF X was wheelchair bound people & reply was 110, then  
HSI of wheelchair bound people is  $100/110 = 0.91$

**TIME TRADE OFF.**

What length of time (X) in a totally healthy state (HH=1 with HD=0 representing death) would be equivalent to a longer length of time (T) in some dysfunctional state (e.g: HS wheelchair bound)???

$HS \cdot T = HH \cdot X$

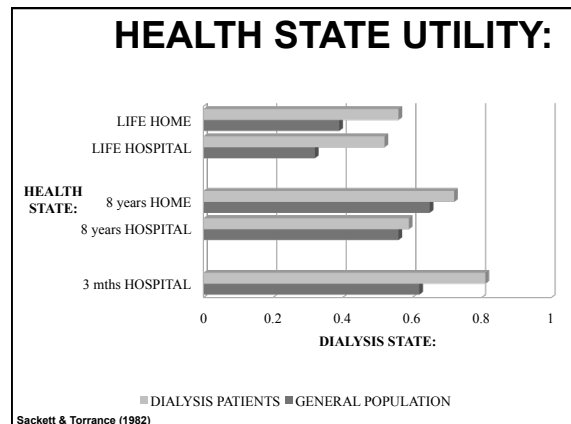
so  $HS = X/T$

Say, we regard 50 years of health life to be equivalent to 75 years in a wheelchair: then:::

$HS = 50/75 = 0.666$

\*high reliability,correlates with gold-standard lottery method BUT JUDGEMENTS ARE HYPOTHETICAL UNLESS PATIENTS HAVE EXPERIENCED THE DYSFUNCTIONAL STATES.

\* DURATION OF STATES AFFECTS UTILITY  
\* DISEASE LABEL MATTERS (CANCER PHOBICS)  
\* HAVING THE DISEASE MAKES A DIFFERENCE.  
Sackett & Torrance, Jnl Chronic Diseases,1978; 31; 697-704:



# Prioritizing Mainstream and Non-mainstream Interventions

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**STANDARD GAMBLE:**


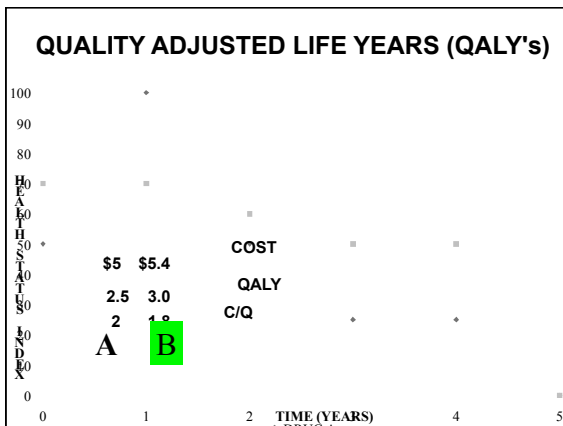
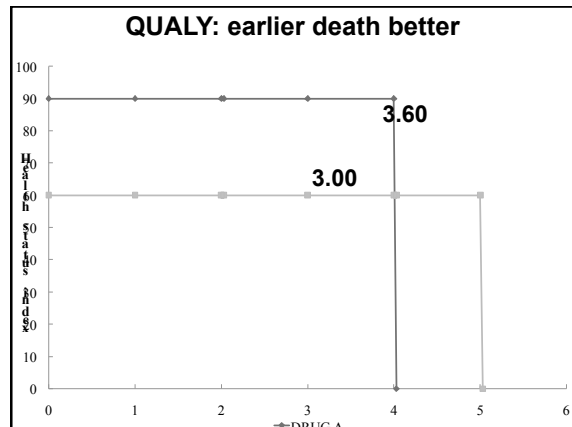
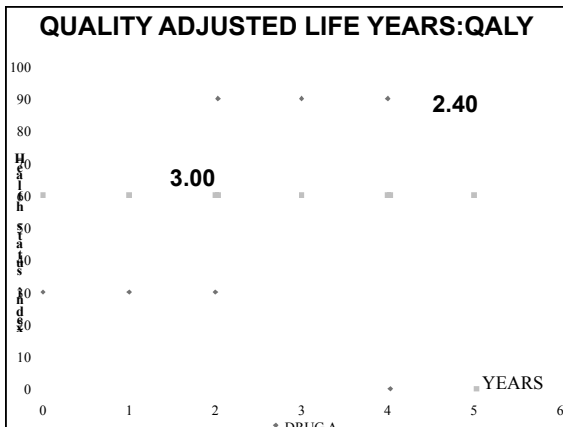
VON-NEUMAN MORGENSTERN LOTTERY:  
 \*\*\*\* THEORETICALLY CORRECT BUT HARD FOR PATIENTS TO UNDERSTAND & GIVE CONSISTENT ANSWERS TO.\*\*\*\*

INTERMEDIATE HEALTH OUTCOME H(B) vs p ---BETTER OUTCOME H(A) and 1-p --- WORSE OUTCOME H(C)


Choose p, so we are indifferent between being in state H(B= broken ANKLE) or choosing a lottery ticket with probability 'p' of H(A= broken finger) and '(1-p)' of worse state H(C=broken hip).

say H(A) = 1 and H(B) = 4  
 Then  $H(B) = p H(A) + (1-p) H(C)$   
 $4 = (.8 \times 1) + (.2 \times H(C))$   
 $H(C) = 16$

THIS DOES NOT NECESSARILY MEAN A BROKEN HIP IS 16/4 = 4 TIMES AS BAD AS A BROKEN ANKLE: BUT ORDINAL SCALE IS VALID.

**CAREGIVER QALYS**



- Chronic illness of a family member impacts on the quality of life of care-givers (eg: Alzheimers, ALS patients)
- 0.87, 0.87, 0.86, 0.90, 0.93 for Alzheimers reflecting transfer of care to institutions in later stages (Neumann 1998).

# Prioritizing Mainstream and Non-mainstream Interventions

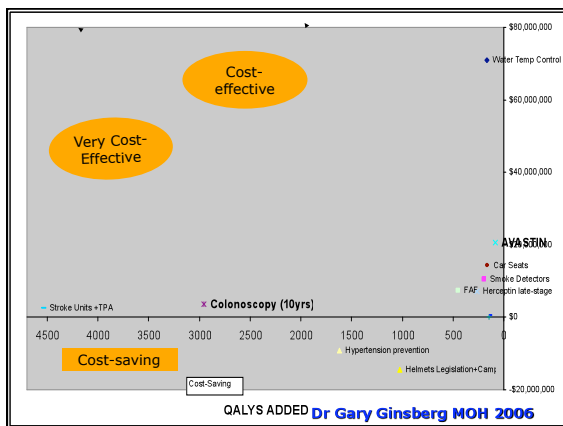
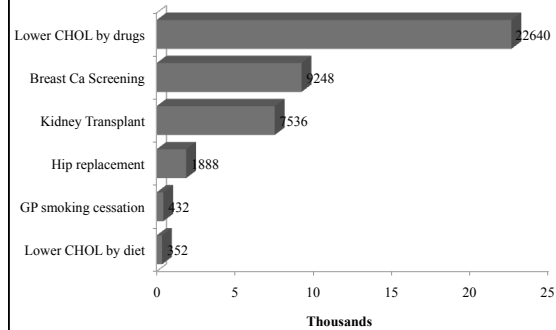
Gary Ginsberg, DrPH

## Aim of CUA

- To rank all potential interventions in terms of their Cost per QALY (Quality Adjusted Life Year)

## COST per QALY (\$)

Neurosurgery for Brain Tumor \$173,000



## Cost-Utility Analysis of HIB vaccinations in Albania

Gary Ginsberg WHO/VAM  
Sylvia Bino PHI, Tirana, Albania

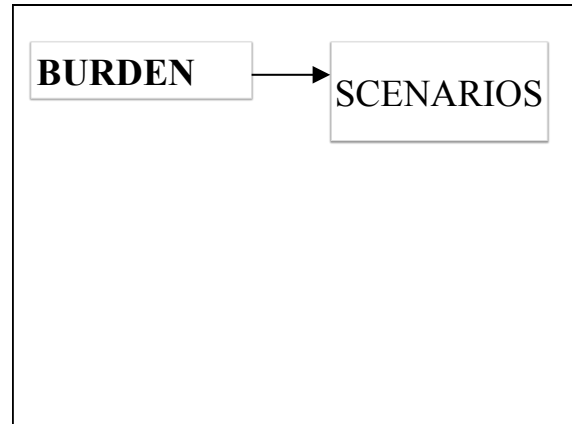
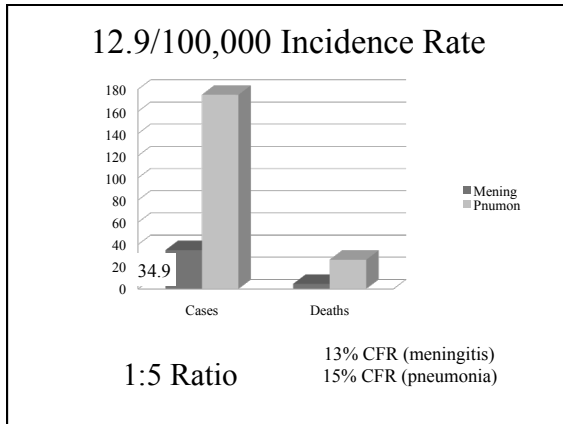
## BURDEN

## HIB RAT: From CSF specimens

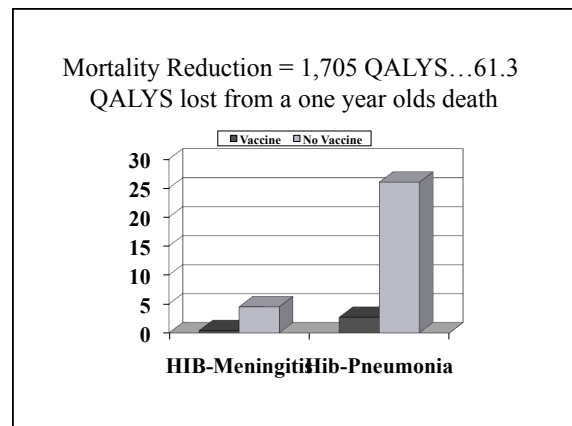
- Hib-Meningitis Incidence of 18.8/100,000 based on Wenger's (2001) 7.9 cases in 42,000 under 5's in Tirana & Fier.
- Extended RAT to Duras regional hospital and identified a further 4 specimens that had not been referred to Tirana....also had new census: **12.9/100,000** (9.4 cases/73,000 under 5's)

# Prioritizing Mainstream and Non-mainstream Interventions

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- Background Parameters**
- 26%, 92% and 95% Vaccine Efficacy from immunisation at 6,14,26 weeks
  - 98% Coverage Rate (DTP)
  - Life Expectancy of 74.0 years
  - Healthy Adjusted Life Expectancy (HALE) of 62.3 years
  - Assumed no Herd Immunity....conservative



**DALY LOSSES (MORBIDITY) GBD/WHO**

| <u>Hib-Meningitis</u>                 | <u>Hib-Pneumonia</u>                  |
|---------------------------------------|---------------------------------------|
| • Health Status valuation (QALY) 0.38 | • Health status valuation (QALY) 0.72 |
| • QALY loss = DW=0.62                 | • QALY loss = DW=0.28                 |
| • 19.9 days                           | • 11.3 days                           |
| • 0.0335 QALY loss per case           | • 0.0086 QALY loss per case           |
| • 1.1 QALYS gained                    | • 1.2 QALYS gained                    |

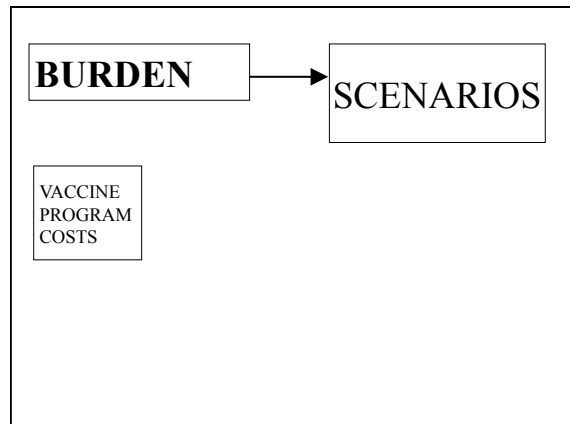
- QALYs SAVED FROM REDUCTION IN HIB-MENINGITIS SEQUELLAE**
- Applied age-specific QALY weights to each sequela for the rest of persons life:-
    - Neurological (5%\*) 0.53-0.61 QALY
    - Physical (5%\*) 0.666 QALY
    - Deafness (5%\*) 0.82-0.83 QALY
- 54,41 & 32 QALYS saved respectively

# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

### 1835 QALY GAINS FROM VACCINATION

|                            |      |
|----------------------------|------|
| • HIB-Pneumonia mortality  | 1452 |
| • HIB-Meningitis mortality | 253  |
| • Neurological sequelae    | 54   |
| • Physical sequelae        | 41   |
| • Deafness                 | 32   |
| • HIB-Pneumonia morbidity  | 1.2  |
| • HIB-Meningitis morbidity | 1.1  |

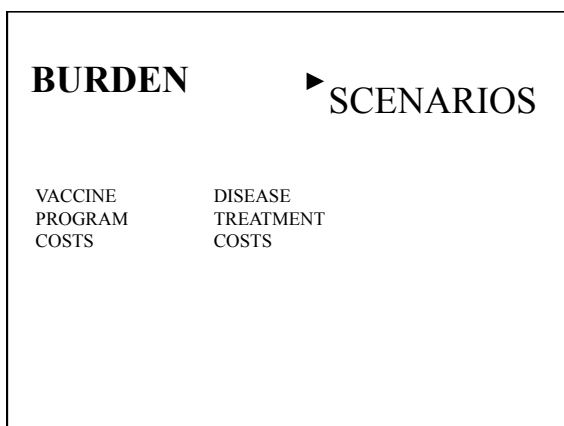


### Vaccine Costs

- Largest component is vaccine price for 3 doses at \$2.82 per dose (UNICEF 10 dose vial) USED IN ANALYSIS
- Possibility to purchase DTP-HIB 10 dose vials for \$2.35 per dose.

### \$845,000 Costs (\$16.35/child)

|                                |          |
|--------------------------------|----------|
| • Vaccine                      | \$8.46   |
| • Labour                       | \$5.84   |
| • Wastage (10%)                | \$0.85   |
| • Clinic overheads             | \$0.58   |
| • Surveillance                 | \$0.29   |
| • Transport                    | \$0.02   |
| • Minor adverse affects        | \$0.004  |
| • Cold-Chain (excess capacity) | \$0.0024 |
| • Injection safety boxes       | \$0.001  |



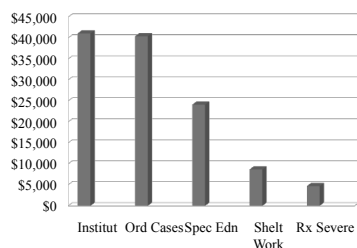
### Treatment Costs per hospitalised case

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# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

Sequelae Costs exceed those for regular treatment of cases



## Net Programme Cost

Programme Cost (\$844,000) --  
 Case treatment costs (\$40,000) --  
 Sequelae costs (\$54,000\*) --  
 Mothers work losses (\$2,000) --  
 Sequelae productivity losses (\$112,000\*)

= **\$637,000**

## BURDEN

## SCENARIOS

VACCINE  
PROGRAM  
COSTS

DISEASE  
TREATMENT  
COSTS

## COST-UTILITY ANALYSIS

## Cost Per Daly

- Net programme cost of \$637,000
- Saves 27.6 lives
- Adds 1835 QALYS
- Cost per QALY of \$409 from health services perspective
- Cost per QALY of \$347 from societal perspective (\$430 if Vaccine efficacy is just 80%).

ALBANIA has \$1,120 GNP per Head

- WHO report, says project is cost-effective if **CPQALY < 3 x GNP per head**
- VERY cost-effective if **CPQALY < GNP per head**

## Operational Conclusion

There is sufficient epidemiological (burden) and economic (low costs per QALY) evidence to morally and practically justify taking GAVI funds AS WELL AS giving evidence to persuade the Albanian government to commit to take over the financing of HIB vaccinations after five years.

# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

## Uneven Playing Field I

- Preventive interventions such as smoking cessation, weight reduction and physical activity promotion potentially can cause huge gains in mortality & morbidity (decreases in burden of disease)

## Uneven Playing Field I

- Bias towards Curative Interventions as opposed to Preventive.
- Often fueled by pharmaceutical industry.
- Usually Power is in hospitals.
- People actually demonstrate for curative (eg: cancer drugs) but not for preventive (e.g: colonoscopies)

## Uneven Playing Field II

- Bias towards Mainstream as opposed to Alternative medicine.
- Bias towards mainstream as opposed to Orthomolecular medicine.

## Breaking the Bias

- Evaluate potential interventions, whether preventive, curative, mainstream, alternative or orthomolecular using a standardised methodology.
- Eg: current gold-standard of Cost-Utility Analysis (CUA).

## Breaking the Bias

- Interventions should all be based on the highest possible level of evidence regarding efficacy.

## Donabedian: Highest Levels

- Ia Randomized controlled clinical trials comparing drug to comparator
- Ib Two sets of randomized trials involving a common comparator (eg placebo or other active therapy).
- II-1a Controlled trial with pseudo-randomisation
- II-1b Controlled trial without randomization

# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

## Donabedian: Medium

- II-2a Prospective cohort study with parallel control
- II-2b Prospective cohort study with historical control
- II-2c Retrospective cohort studies with parallel control
- II-3a Case-control studies.
- 

## Donabedian: Lowest

- III Studies of the “before and after” type.
- IV Expert Opinion.
- Studies lower in the hierarchy are more prone to publication, retrieval, selection, performance, measurement and attrition biases.

## Orthomolecular Medicine

- Very few studies are at the highest level (Smith GF et al. Effect of megadoses of vitamins with minerals in Down syndrome. J Pediatr 1984;105;2;228-34.....Haslam RH et al. Effects of megavitamin therapy on children with ADD, Pediatrics 1984;74;1;103-111).

## Orthomolecular Medicine

- Advice: If possible, make your research a double-blind randomised placebo controlled trial.
- Mainstream medicine will then find it a lot harder to reject your evidence.

## Theoretical Orthomolecular CUA Example

- Assume a RCT has shown that megadoses of vitamin X (costing \$465 annually including tests) results in a 32.2% decrease in LDL-C levels.
- Use of intermediate points (eg: LDL, blood markers) are understandable due to time it takes to generate hard end-points (eg: death).

## 2.5% 10 year AMI risk Savings in Treatment Costs = \$23

- Decreases in LDL-C levels result in decreases in 10 year risks of
- UAP (Rx costs of \$7,785: fatal \$2,354)
- UAP (Rx costs of \$9,106: fatal \$2,705)
- CVA (Rx and Rehab costs \$27,671)
- PVD (Rx costs \$9,281)
- Net Costs = \$465 - \$23 = \$443



# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

## 0.008 QALYS gained per person

- UAP (0.00086) = probability x QALY loss
- AMI (0.00081)
- CVA (0.00087)
- PVD (0.00007)
- Other Causes of Mortality (0.0054)

## Depends on 10 year AMI risk

- For person with 2.5% ten year AMI risk, Cost per QALY =  $(\$465-\$23)/0.0008 = \$55,000$
- For person with 22.5% ten year risk  
Cost per QALY =  $(\$465-\$210)/0.0172 = \$14,900$
- For person with 63% ten year risk  
Cost per QALY =  $(\$465-\$465)/0.027 = \$0$

## Actually cost-saving

- For persons with ten year risk greater than 63%, the savings in treatment costs as a result of the fall in morbidity, actually exceed the cost of the intervention.
- WIN - WIN SITUATION

## Very Cost-effective

- Cost per QALY < GNP per head (\$23,500)

63% > For ten year risks > 16%

If based on RCT, this provides strong epidemiological and economic evidence to pressure health services to fund such interventions

## Just Cost-effective

- GNP per head < Cost per QALY < 3x GNP per head

0% > For ten year risks > 16%

If based on RCT, this provides epidemiological and economic evidence to pressure health services to fund such interventions

## Not Cost-effective

- Cost per QALY < 3x GNP per head
- If costs doubled to \$930 per year, then its not cost-effective for persons with 10 year risks > 5.5%

Epidemiological and economic evidence shows that the health benefits of the intervention do not justify the costs involved.

# Prioritizing Mainstream and Non-mainstream Interventions

Gary Ginsberg, DrPH

