# Frameworks for Evidence-Based Decision Making

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July 12, 2011

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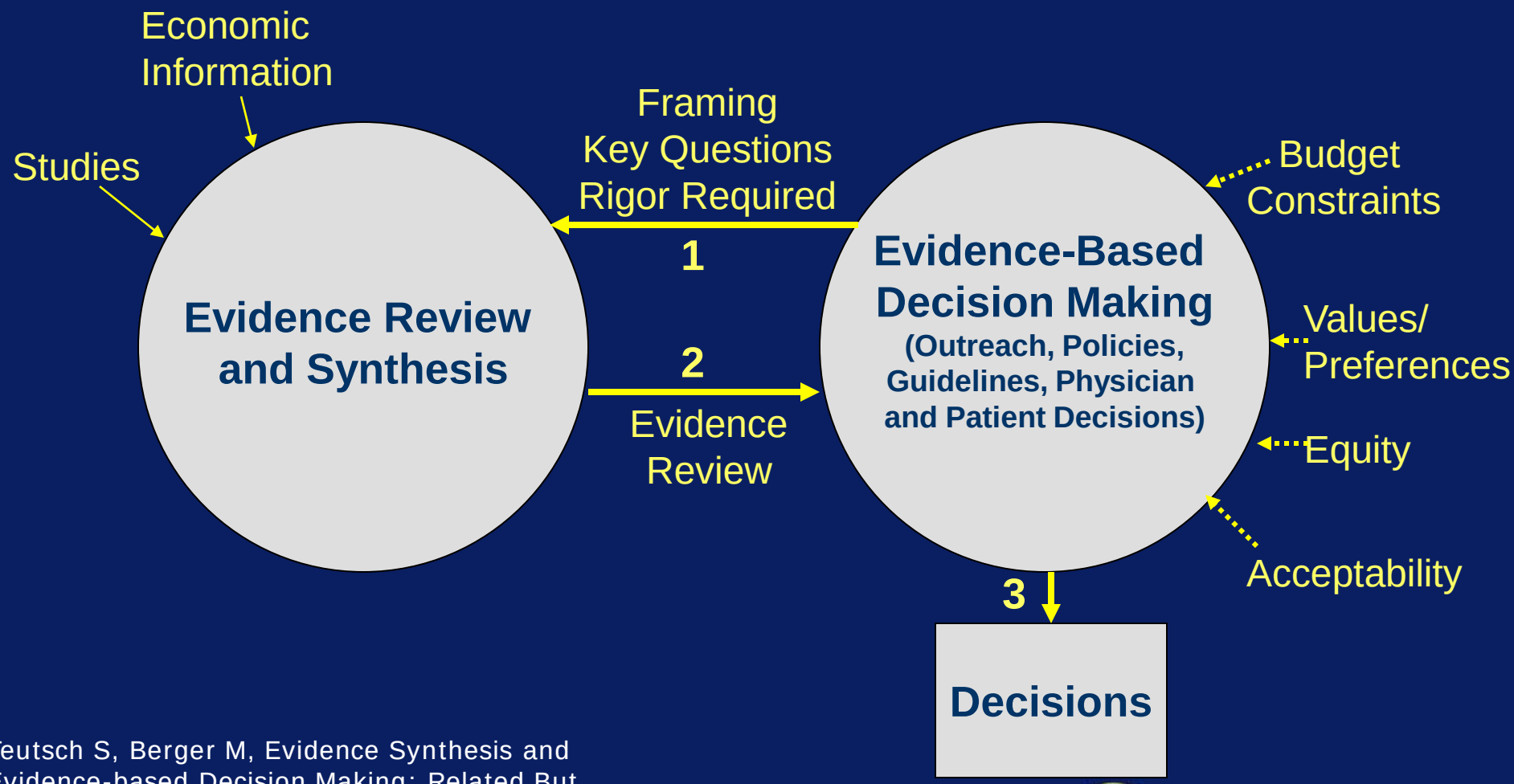
# Evidence-based Decision Making

- What is the decision to be made?
- How does it affect the evidentiary standards?
- What are the relevant contextual factors?
- How does the information get integrated and applied?
- What processes are necessary to legitimize the decision?

# Dynamic Relationship Between Evidence Review & Synthesis and Evidence-based Decision Making




Teutsch S, Berger M, Evidence Synthesis and Evidence-based Decision Making: Related But Distinct Processes.

Medical Decision Making Sep-Oct 2005, pp. 487-489.

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# Evidence for Decision Making

- Scientific Evidence
  - Knowable, context independent
- Social Science Evidence
  - Knowable, context dependent
- Colloquial

- Deliberative Processes



Lomas J, Culyer T, McCutcheon C, McAuley L, Law S. Conceptualizing and Combining Evidence for Health System Guidance. Canadian Health Services Research Foundation. May 2005

# SCIENTIFIC INFORMATION

# Example: How do you prioritize the recommended clinical preventive services?

Assess:

- Preventable Burden (How much can be accomplished?)
- Cost Effectiveness (What is the value?)
- Delivery Rates for Priority Services (How well are we doing?)

# Rankings of Preventive Services for the US Population

| Clinical Preventive Services | CPB | CE | Total |
|---|---|---|---|
| *Discuss daily aspirin use—men 40+, women 50+* | 5 | 5 | 10 |
| *Childhood immunizations* | 5 | 5 | |
| *Smoking cessation advice and help to quit—adults* | 5 | 5 | |
| *Alcohol screening and brief counseling—adults* | 4 | 5 | 9 |
| *Colorectal cancer screening—adults 50+* | 4 | 4 | 8 |
| *Hypertension screening and treatment—adults 18+* | 5 | 3 | |
| *Influenza immunization—adults 50+* | 4 | 4 | |
| *Vision screening—adults 65+* | 3 | 5 | |
| *Cervical cancer screening—women* | 4 | 3 | 7 |
| *Cholesterol screening and treatment—men 35+, women 45+* | 5 | 2 | |
| *Pneumococcal immunizations—adults 65+* | 3 | 4 | |
| *Breast cancer screening—women 40+* | 4 | 2 | 6 |
| *Chlamydia screening—sexually active women under 25* | 2 | 4 | |
| *Discuss calcium supplementation—women* | 3 | 3 | |
| *Vision screening—preschool children* | 2 | 4 | |
| *Discuss folic acid use—women of childbearing age* | 2 | 3 | 5 |
| *Obesity screening—adults* | 3 | 2 | |
| *Depression screening—adults* | 3 | 1 | 4 |
| *Hearing screening—adults 65+* | 2 | 2 | |
| *Injury prevention counseling—parents of children ages 0-4* | 1 | 3 | |
| *Osteoporosis screening—women 65+* | 2 | 2 | |
| *Cholesterol screening—men < 35, women < 45 at high risk* | 1 | 1 | 2 |
| *Diabetes screening—adults at risk* | 1 | 1 | |
| *Diet counseling—adults at risk* | 1 | 1 | |
| *Tetanus-diphtheria booster—adults* | 1 | 1 | |

**Table 3.** Additional QALYs saved if current percent receiving services increased

| Services (short name)[a] | Current % receiving services nationally | Additional QALYs saved if current % receiving services increased to 90%[b] |
|---|---|---|
| Tobacco-use screening and brief intervention | 35%[c] | 1,300,000 |
| Colorectal cancer screening | 35%[d] | 310,000 |
| Influenza vaccine—adults | 36%[f] among adults aged 50 to 64 years<br>65%[e] among adults aged ≥65 years | 110,000 |
| Breast cancer screening | 68%[f] | 91,000 |
| Cervical cancer screening | 79%[f] | 29,000 |
| Chlamydia screening | 40%[g] | 19,000 |
| Pneumococcal vaccine—adults | 56%[e] | 16,000 |
| Cholesterol screening | 87%[f] | 12,000 |
| Hypertension screening | 90%[f] | 0 |
| **Based on limited available data, utilization rates of 50% were assigned to the following services:** | | |
| Aspirin chemoprophylaxis | 50% | 590,000 |
| Problem drinking screening and brief counseling | 50% | 71,000 |
| Vision screening—adults | 50% | 31,000 |

# How Well Do Interventions Work?

# Evolution of Evidentiary Standards

- First US Preventive Services Task Force
  - A hierarchy of strength of evidence based largely on the rigor of the study design
  - Challenges:
    - More a measure of efficacy than effectiveness
    - Tyranny of the randomized clinical trial
- Recognition that evidence-based guidelines should be based on
  - Certainty of the evidence
  - Magnitude of effect

# Recognition that Evidentiary Approaches in Clinical Models are Only Partially Relevant for Population-Based Interventions

- Community Preventive Services
  - Interventions= Policies and programs
  - Developed a more robust evidentiary framework considering a variety of study designs and their execution

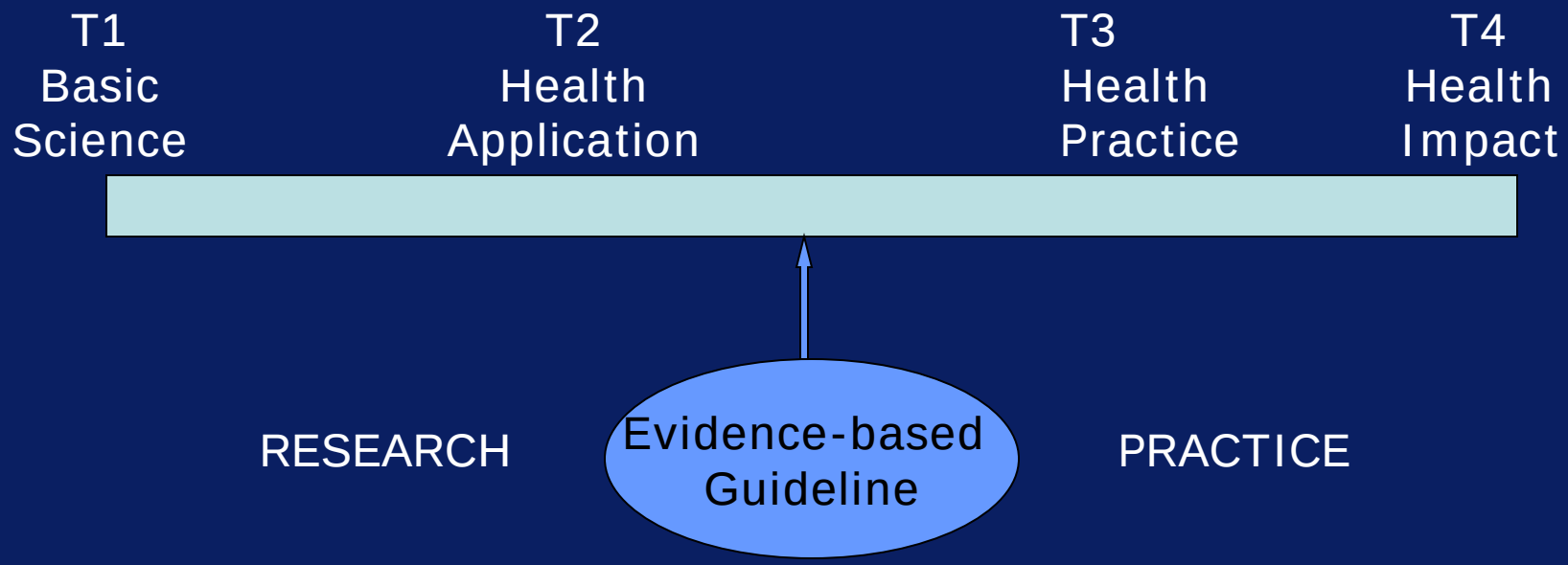
# Challenges of Population-Based Interventions

- Interventions are often synergistic and require often only “multicomponent interventions” are effective
- Issues of fidelity of implementation and applicability in different communities

# Use of Models

- Simulation models can provide insights into impacts including:
  - Synergies of different components
  - Applicability in different populations
  - Distributive impacts
  - Forecasting
  - Level of certainty
- Are often informative where empirical studies can’t be done

# The Translational Process



# Quantitative Information for Decision Making

- Effectiveness
  - Certainty
  - Magnitude of effect (Net benefit)
- Cost / Cost Effectiveness
- Comparison to alternatives

**Typology for Classifying Interventions by Level of Scientific Evidence**

| Category | How Established | Considerations for Level of Scientific Evidence | Data Source Examples |
|---|---|---|---|
| **Proven** | Peer review via systematic or narrative review | Based on study design and execution<br>External validity<br>Potential side benefits or harms<br>Costs and cost-effectiveness | Community Guide<br>Cochrane reviews<br>Narrative reviews based on published literature |
| **Likely Effective** | Peer review | Based on study design and execution<br>External validity<br>Potential side benefits or harms<br>Costs and cost-effectiveness | Articles in the scientific literature<br>Research-tested intervention programs (123)<br>Technical reports with peer review |
| **Promising** | Written program evaluation without formal peer review | Summative evidence of effectiveness<br>Formative evaluation data<br>Theory-consistent, plausible, potentially high-reach, low-cost, replicable | State or federal government reports (without peer review)<br>Conference presentations |
| **Emerging** | Ongoing work, practice-based summaries, or evaluation works in progress | Formative evaluation data<br>Theory-consistent, plausible, potentially high-reaching, low-cost, replicable<br>Face validity | Evaluability assessments*<br>Pilot studies<br>NIH CRISP database<br>Projects funded by health foundations |

# General Principles

- Use effective interventions before those with weaker evidence
- Strongly consider using evidence-based interventions in other areas before interventions with weaker evidence in unproven areas
- There MAY be compelling reasons to intervene on very important areas with a paucity of evidence-based interventions, but these should only be entertained if need is high and harms are negligible
- If undertaken, they should be subjected to rigorous evaluation

# Key Effectiveness Questions

- Efficacy: Can it work in controlled conditions?
- Safety: What are the possible harms?
- Effectiveness: Does it work in practice?
- Comparative effectiveness: Does it work better than alternatives?
- Community: Are there specific groups for whom it works better?
- Trade-offs: What is the balance of harms and benefits?

# Contextual Information for Decision Making (1)

- Clinical
  - Severity of the condition
  - Subgroup differences/generalizability
  - Availability of alternative treatments
  - Severity and frequency of harms
  - Risks of overuse or inappropriate use
- Economic
  - Budget impact
  - Budget constraints
  - Value (cost effectiveness, cost benefit, incremental value)

# Contextual Information for Decision Making (2)

- Legal and Ethical considerations
  - Precedent
  - Federal, state, and local regulatory constraints and mandates
  - Regret
- Feasibility
  - Current use (Level of underuse)
  - Infrastructure requirements (capability)
  - Acceptability:  Political, Partner and Stakeholder Interests and expectations
  - Time frame to see effects
  - Measurability / mutability

# Contextual Information for Decision Making (3)

- Administrative/ Management
  - Leverage with other stakeholders
  - “Competitive advantage)
  - Options for targeting or limiting use to those who would benefit most
  - Links to further evidence development

- Preferences / values

# Decision Factor Matrix

| | Regulation | Coverage | Guidelines | QI | Individual Decisions |
|---|---|---|---|---|---|
| Efficacy | | | | | |
| Safety | | | | | |
| Effectiveness | | | | | |
| Comp. Effect. | | | | | |
| Cost/ CE | | | | | |
| Clinical Sit | | | | | |
| Legal/ Ethical | | | | | |
| Values/ Prefs | | | | | |
| Admin. | | | | | |
| Feasibility | | | | | |
| Stakeholders | | | | | |

# Decision Factor Matrix
## (Straw Man for Discussion Only)

| | Regulation | Coverage | Guidelines | QI | Individual Decisions |
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| Feasibility | | | | | |
| Stakeholders | | | | | |

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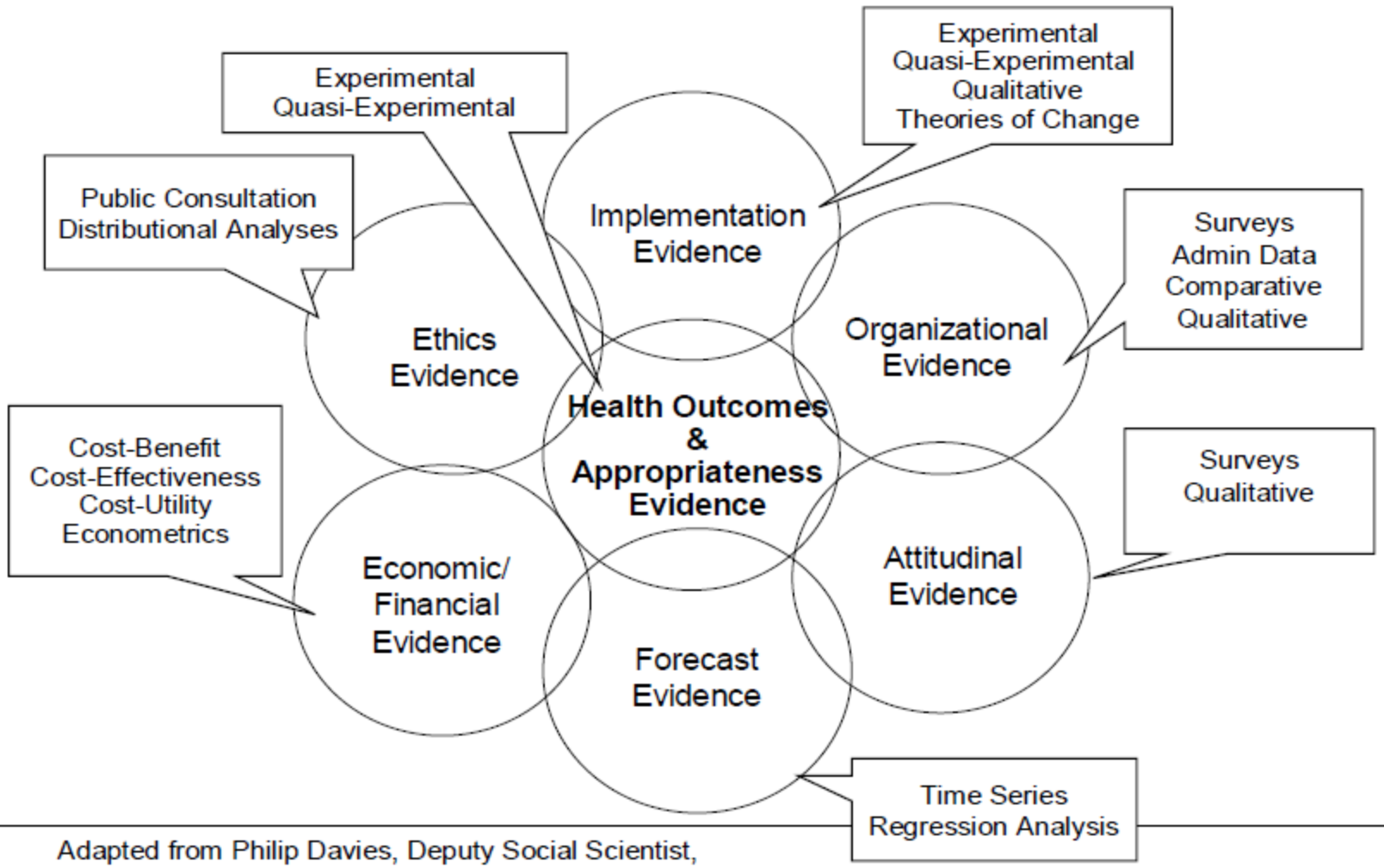
# EXTRAS

**Figure 1: Types of scientific evidence (and their methods) for context-sensitive health system guidance**




Adapted from Philip Davies, Deputy Social Scientist, UK Cabinet Office, 2005

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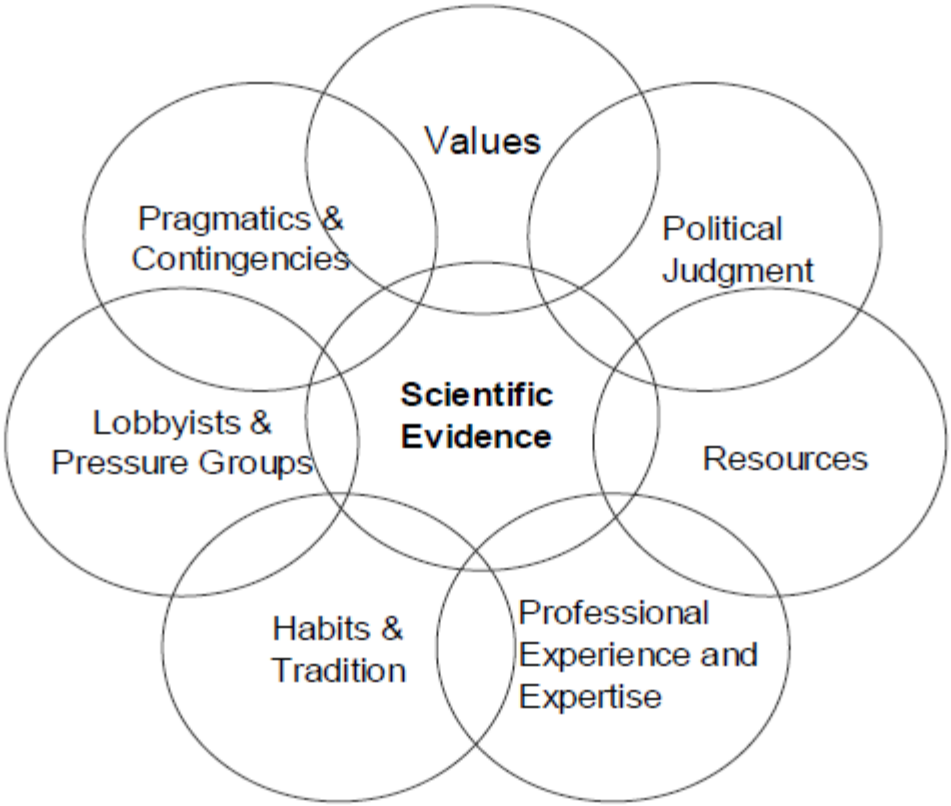
**Figure 2: Types of colloquial evidence available for context-sensitive health system guidance**




Adapted from Davies, 2005

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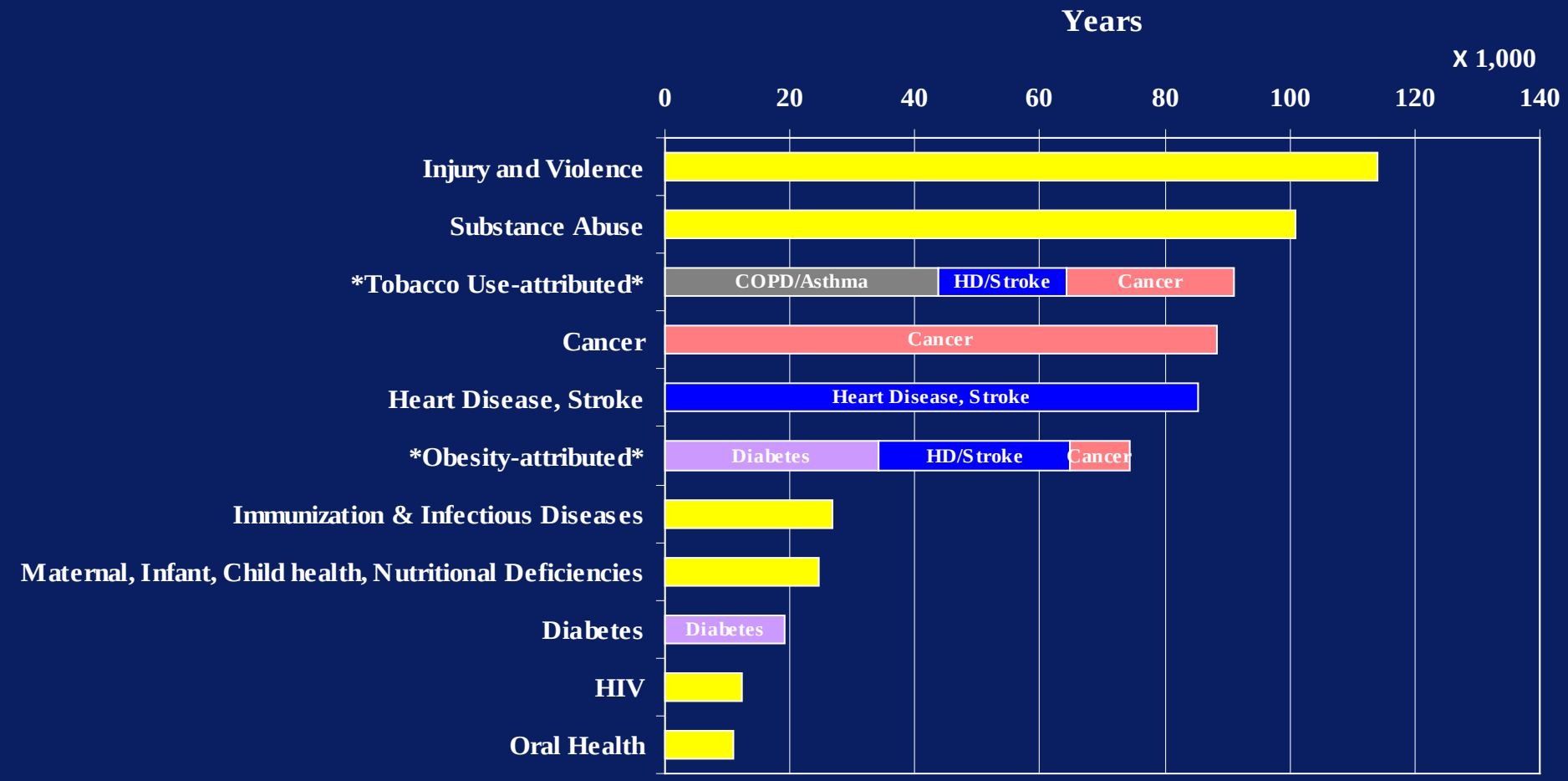
# How Big is the Problem?
# Burden of Disease

# QALYs

Composite unit to measure population-level disease burden based on mortality and morbidity

# Los Angeles Count 2005 Category-specific Burden of Disease



# Preventable Burden and Preventable Fraction

Preventable burden is the total (fraction) disability-adjusted years of life that could be gained if the preventive intervention were delivered as recommended

# Preventable Burden

Preventable Burden =

Burden x Effectiveness=

DALYs x Effectiveness of Intervention

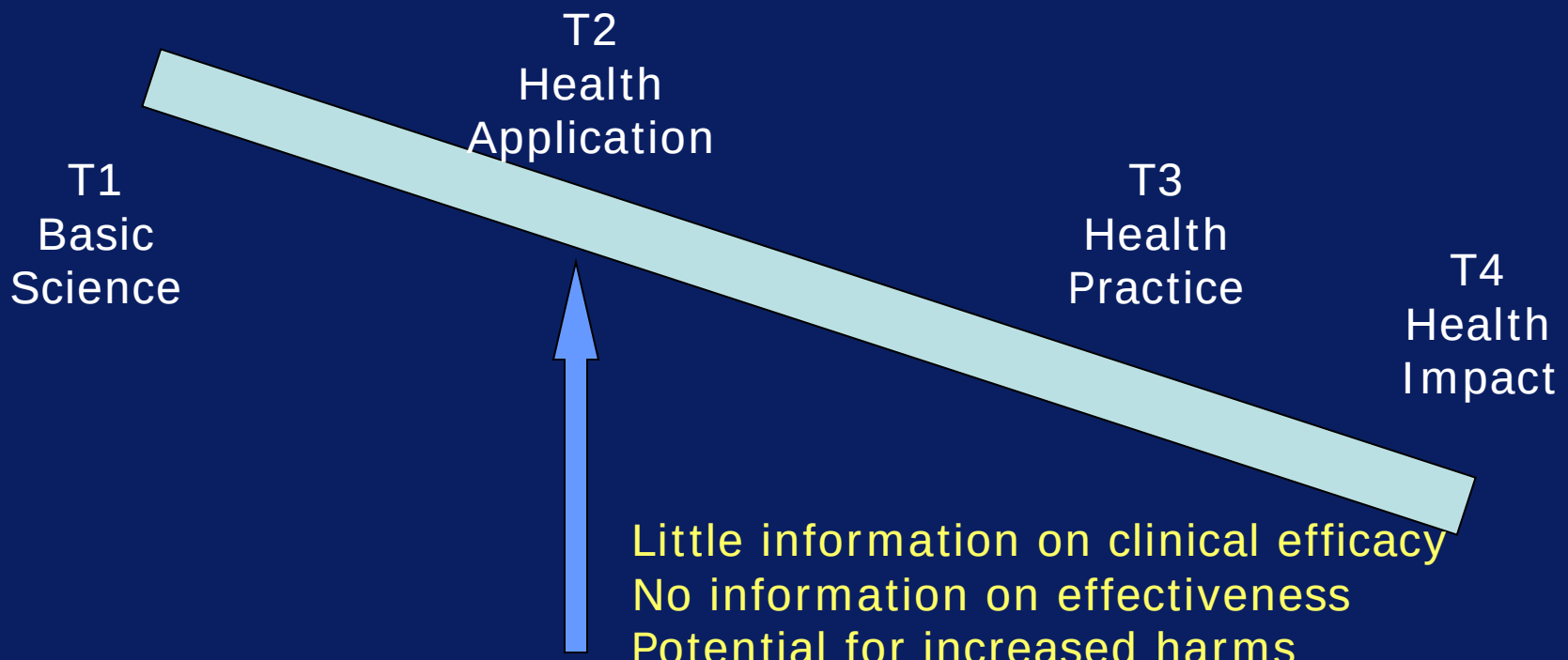
# Motor Vehicle Accident Fatalities and Burden of Disease Reduction by Safety Belts

- Burden of Motor Vehicle Fatalities (LAC 2005) = 935 cases, 21,086 YLLs, 9,605 YLDs
- Drivers of passenger cars & light trucks in fatal crashes, California 2005[2]
  - Restraint not-used/use-unknown = 24.6%
- Estimated safety belt effectiveness[1]
  - Fatality reduction for 3-point belts = 45.0%
- Had all Los Angeles County drivers worn safety belts:
  Number of fatalities avoided = 104 (2335 YLLs, 1064 YLDs)
  Preventable Burden due to Safety Belt use = 3,399 DALYs


1. *Fatality Reduction by Safety Belts for Front-Seat Occupants of Cars and Light Trucks Updated and Expanded Estimates Based on 1986-99 FARS (Fatality Analysis Reporting System) Data*
   US Dept. of Transportation National Highway, Traffic Safety Administration (NHTSA) Technical Report DOT HS 809 199 December 2000
2. *Drivers of Passenger Cars and Light Trucks in Fatal Crashes by Restraint Use,1994-2005 - California, 2005*
   http://www-fars.nhtsa.dot.gov/Trends/TrendsRestraints.aspx

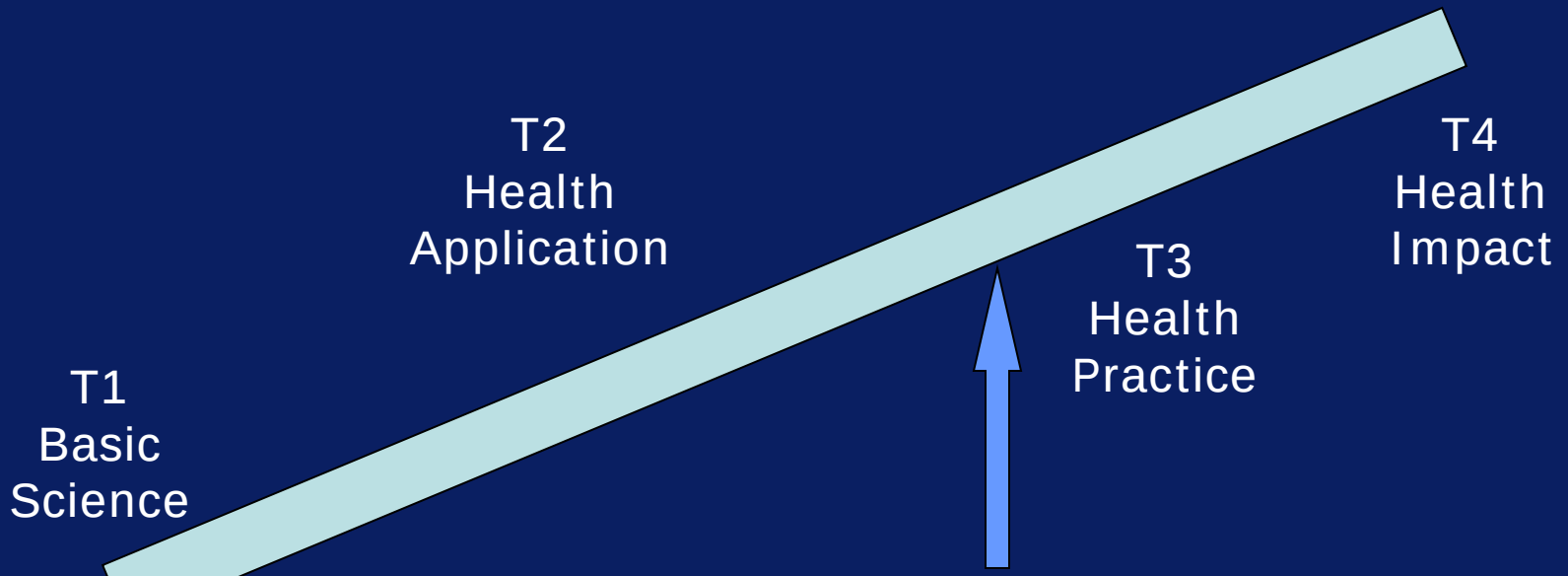
# How High Should the Evidence Bar Be?

# Lowering the Threshold for Translation into Practice




Little information on clinical efficacy
No information on effectiveness
Potential for increased harms
Potential for increased benefits
Use based on expert opinion
Stimulates innovation

# Raising the Evidentiary Threshold for Translation into Practice

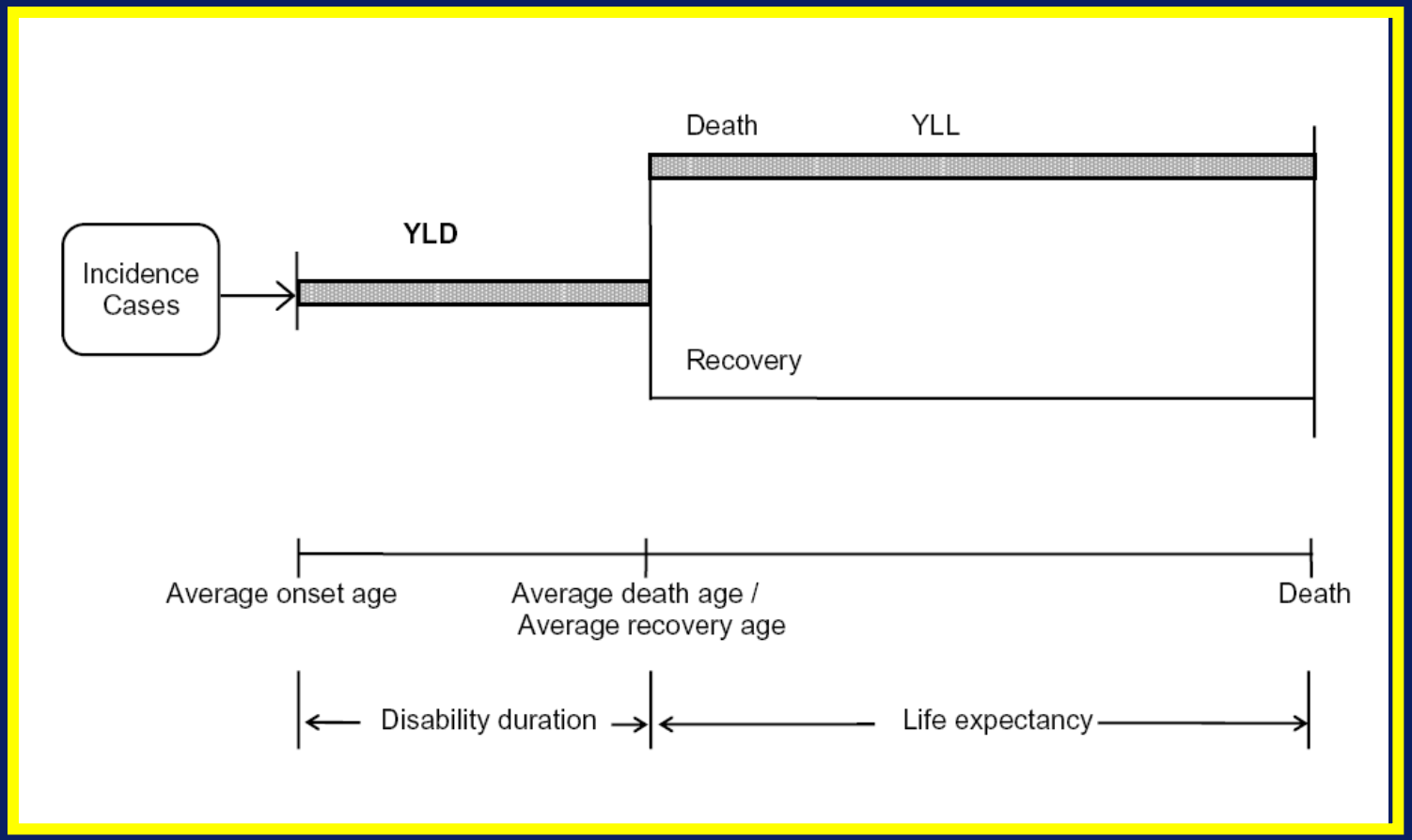



Greater evidence of efficacy and effectiveness
Lower incentive for innovation
Diminished potential for harms
Potential for diminished benefits
Stronger evidence of necessary components and applicability

| STRATEGIC PLANNING TOPICS from HP 2020 | | | |
|---|---|---|---|
| Health Improvement | | Health Protection | Preparedness |
| Adolescent Health | Educational and Community-Based Programs | Physical Environment | PH Infrastructure |
| Early and Middle Childhood | Family Planning | Food Safety | Health IT and Communication |
| Maternal, infant, and child health | | Global Health | Environmental Health |
| Older Adults | Public Health Infrastructure | Medical Product Safety | Social Determinants |
| | Genomics | Public Health Infrastructure | |
| Arthritis, Osteoporosis, and Chronic Back Conditions | Health Communication and IT | Health Communication and IT | |
| Blood Disorders and Blood Safety | Environmental Health | Environmental Health | |
| Cancer | Social Determinants | | |
| Chronic Kidney Diseases | | | |
| Diabetes | Nutrition and Weight status | | |
| Disability and Secondary Conditions | Occupational Injury and Health | | |
| Healthcare Associated Infections | Oral Health | | |
| Hearing and Other Sensory or Communication Disorders | Physical Activity and Fitness | | |
| Heart Disease and Stroke | Quality of Life and Well Being | | |
| HIV | Respiratory Diseases | | |
| Immunization and infectious diseases | Sexually Transmitted Diseases | | |
| Injury and violence | Substance Abuse | | |
| Mental health | Tobacco Use | | |
| | Vision | | |

| STRATEGIC PLANNING TOPICS | | | |
|---|---|---|---|
| Health Improvement | | Health Protection | Preparedness |
| Maternal, infant, and child health | Social Determinants | Environmental Health | Preparedness |
| Cancer | Obesity | Immunization and infectious diseases | |
| Diabetes | Oral Health | | |
| Heart Disease and Stroke | Substance Abuse | | |
| HIV | Tobacco Use | | |
| Injury and violence | | | |

# DALY & Disease Timeline



# DALY Calculation (1)

- DALY = YLD + YLL
- YLD (Years Lived with Disability)
  = Incidence x disability weight x disease duration
- YLL (Years of Life Lost from premature death)
  = Incidence x life expectancy at death

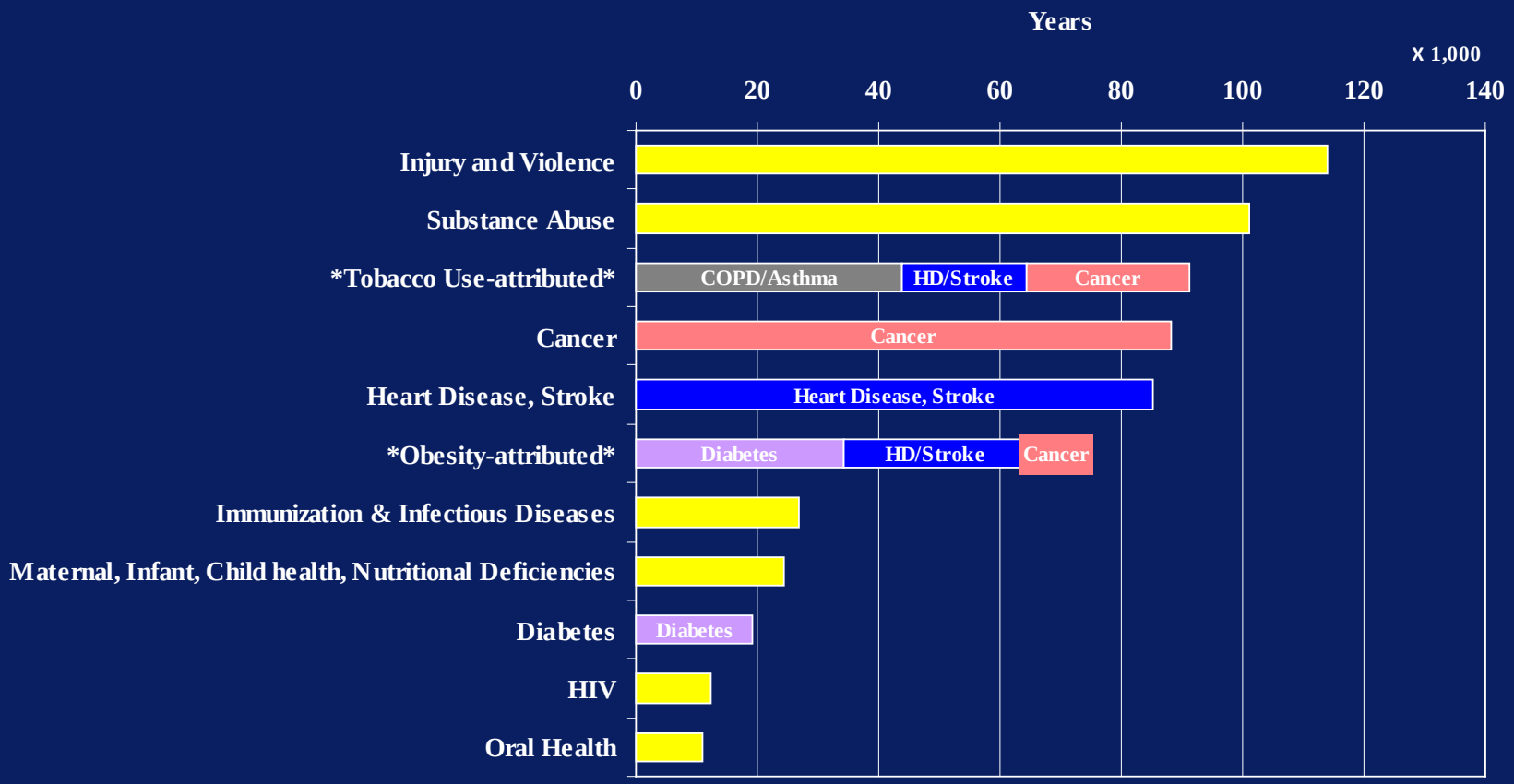
# DALY Calculation (2)

- YLD (Years Lived with Disability)
  = Incidence x disability weight x disease duration
- Simplified by using YLD-YLL ratios from 1996 Global Burden of Disease
- YLD = YLL x (YLD/YLL ratio) disease-gender-age-specific

# Process

1. Develop a matrix of topics from HP2020 organized by our Strategic Planning Goals
2. Quantify the burden of illness (morbidity, mortality, disparities) where possible
3. For those topics where burden exceeds a certain threshold, identify major evidence-based prevention strategies within each topic
4. Quantify the preventable burden over short, medium, and long term
5. For interventions with preventable burden exceeding a certain threshold, assess each priority-setting criterion.
6. Identify interventions that rank highest on these criteria

# Select Topics
# Burden of Disease



# For Each Topic Selected

- Identify the interventions (programs and policies) that can reduce the greatest burden
- For each intervention identified calculate the annual preventable burden when fully effective
- Indicate what proportion of the preventable burden is achievable over the short term (0-2 years), medium term (2-5 years), or long term (over 5 years) from

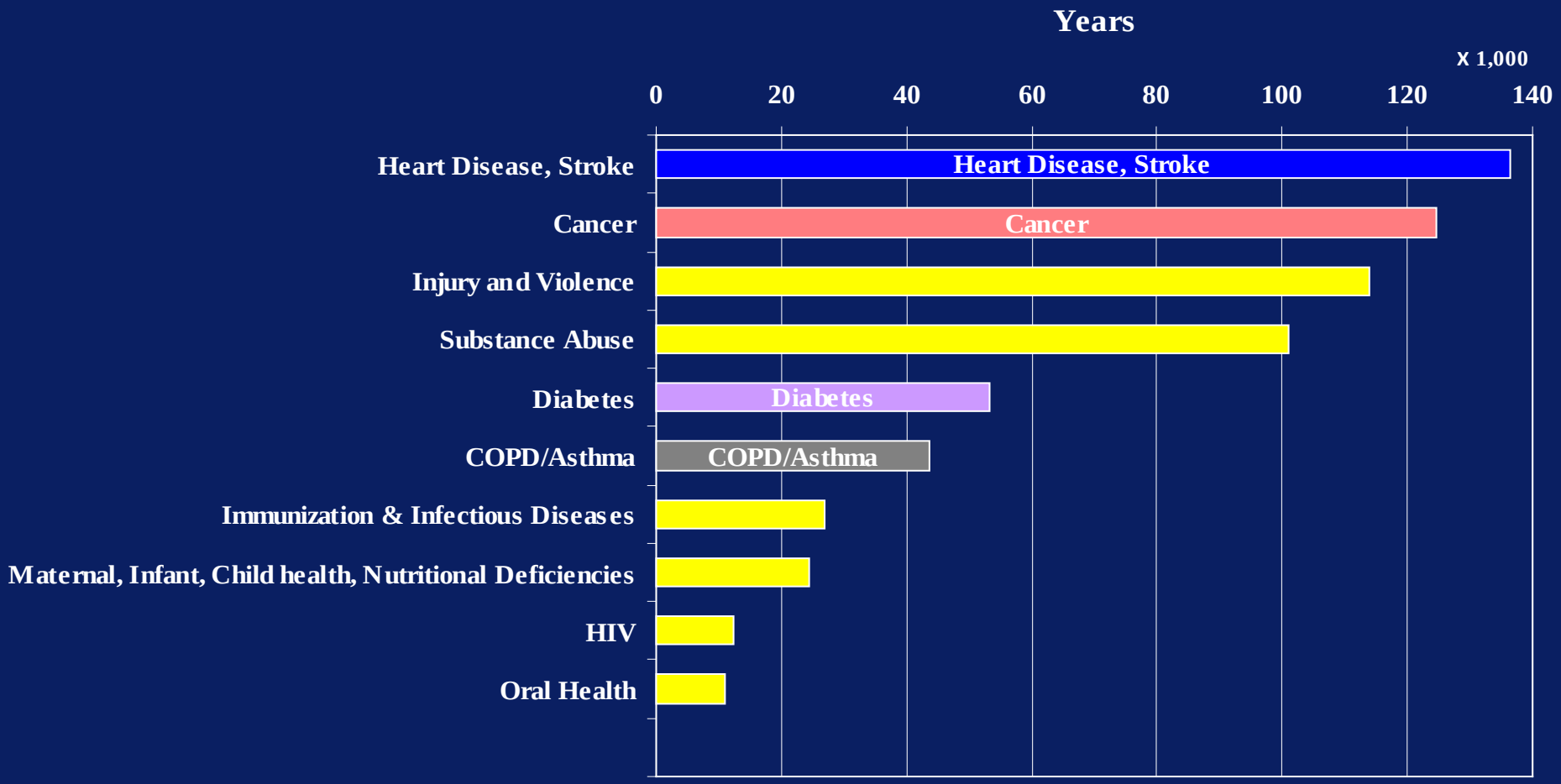
# We Know There are Challenges

- Difficult to identify interventions
- Interventions may be synergistic
- Data to do calculations may not be readily available
- Questions about methodology

# Considerations

- Don’t let the perfect be the enemy of the good.
- Go through the exercise.  Make reasonable judgments where necessary
- Technical assistance

# Los Angeles Count 2005
# Category-specific Burden of Disease (DALYs)



# Tobacco & Obesity Attributions

| | Prevalence | Diabetes | Cancer | HD/Stroke | COPD/Asthma |
|---|---|---|---|---|---|
| Obesity | 21.7% | 36.0% | 33.0% | 25.0% CHD<br>35.0% Stroke | - |
| | 22.6% | 26.0% | 55.0% | 25.0% CHD<br>35.0% Stroke | - |
| Tobacco Use | - | - | All Lung | 20.5% CHD<br>12.8% Stroke<br>17.9% Other | All |
| | - | - | All Lung | 12.2 CHD<br>8.2 % Stroke<br>8.5% Other | All |


1. *The public health impact of obesity.*
   Visscher TL, Seidell JC, Annual Review of Public Health. 2001; 22: 355-75.
2. *Smoking-Attributable Mortality, Years of Potential Life Lost, & Productivity Losses -United States, 2000–2004*
   Morbidity & Mortality Weekly Report, November 14, 2008 V57: 45

# Important to Consider Contextual Factors

# Information for Decision Making

- Quantitative
- Contextual

# Estimated Cost Impacts

| | Topic | Inpatient Hosp | Outpatient | LTC/ Rehab | Productivity | Overall |
|---|---|---|---|---|---|---|
| 1 | Heart Disease and Stroke | ++++ | +++ | ++ | ++ | +++ |
| 2 | Diabetes | +++ | +++ | + | +++ | +++ |
| 3 | Substance Abuse | ++ | ++ | +++ | +++ | +++ |
| 4 | Obesity | ++ | ++ | ++ | ++ | +++ |
| 5 | Injury and Violence | +++ | ++ | ++ | ++ | ++ |
| 6 | Cancer | +++ | ++ | + | ++ | ++ |
| 7 | Tobacco Use | +++ | + | + | ++ | ++ |
| 8 | Immunization and ID | ++ | + | - | ++ | ++ |
| 9 | HIV | + | ++ | + | + | + |
| 10 | Maternal/infant/child health/nutr | ++ | + | - | + | + |
| 11 | Oral Health | - | ++ | - | + | + |

Approach used: Expert consensus
Not included: Social Determinants, Environmental Health, Preparedness

# Process

Done

1. Develop a matrix of topics from HP2020 organized by our Strategic Planning Goals

Done

2. Quantify the burden of illness (morbidity, mortality, disparities) where possible
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6. Identify interventions that rank highest on these criteria

| INTERVENTIONS | Preventable Burden and Preventable Fraction | | | Other Priority-Setting Criteria |
|---|---|---|---|---|
| | Short Term | Medium Term | Long Term | Feasibility, Acceptability, Capability, etc. |
| Topic 1 | | | | |
| Intervention 1.1 | | | | |
| Intervention 1.2 | | | | |
| Topic 2 | | | | |
| Intervention 2.1 | | | | |
| Intervention 2.2 | | | | |

| INTERVENTIONS | Preventable Burden (PB) | Time Frame to see the effects (% of PB) | | | Other Priority-Setting Criteria |
|---|---|---|---|---|---|
| | | Short Term (0-2 yr) | Medium Term (3-5 yr) | Long Term (>5 yr) | Feasibility, Acceptability, Capability, etc. |
| HIV | | | | | |
| Intervention 1 | | | | | |
| Intervention 2 | | | | | |
| Intervention 3 | | | | | |
| Intervention 4 | | | | | |
| Intervention 5 | | | | | |