Approaches for valuing health impacts

Measuring the Impact of Voluntary Consensus Standards on Human Health and Safety

Chris Dockins*

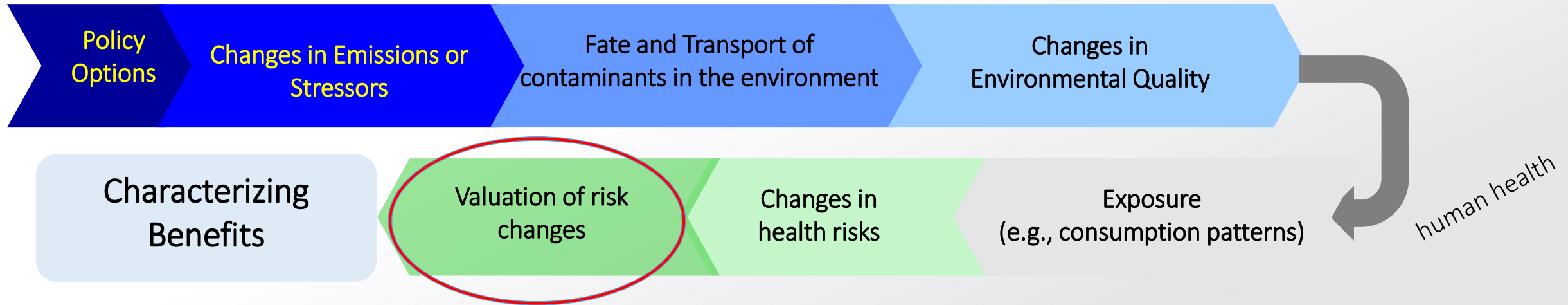National Center for Environmental Economics

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Valuing health effects for benefits analysis

Policy Options	Changes in Emissions or Stressors	Fate and Transport of contaminants in the environment	Changes in Environmental Quality

Characterizing Benefits	Valuation of risk changes	Changes in health risks	Exposure (e.g., consumption patterns)

human health

Economic analysis requires us
- quantify the changes in risk (or expected cases)
- estimate the economic value of those changes in risk

There are well-established valuation methods for providing two types of values
- willingness-to-pay
- cost-of-illness

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EPA health effects for benefits analysis

Human Health Improvements		Methods
Mortality risk reductions *Reduced risk of premature mortality from an array of causes*	• acute fatality • cancer fatality	• averting behaviors • hedonics • stated preference
Morbidity risk reductions *Reduced risk of other (non-fatal) health outcomes*	• non-fatal cancer • asthma • IQ changes • cardiovascular health • gastrointestinal illness • hospitalization • work loss days	• averting behaviors • cost of illness • hedonics • stated preference

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Valuing health risks with willingness to pay (WTP)

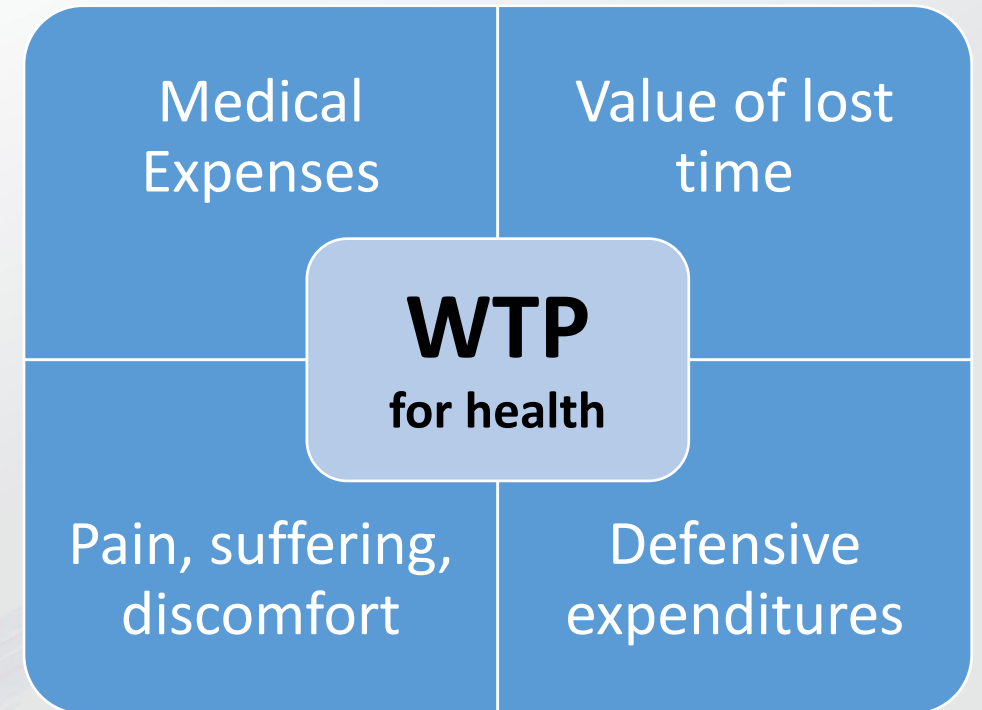WTP is the appropriate measure of value in benefit-cost analysis.

What are affected people willing to pay to reduce their risk of an adverse health outcome (mortality or morbidity)?
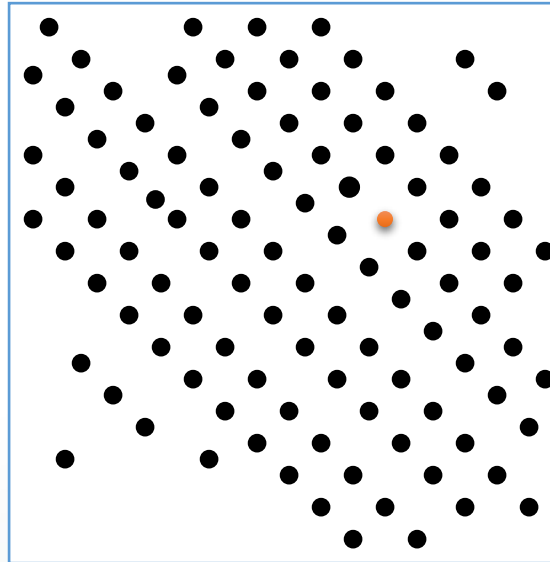
Premature mortality

- *WTP for (relatively small) reduced risk of premature mortality*
- *Usually expressed as Value of Statistical Life (VSL)*

Morbidity

- *WTP for (relatively small) reduced risk of non-fatal health outcome*
- *Usually expressed as value of a statistical case avoided*

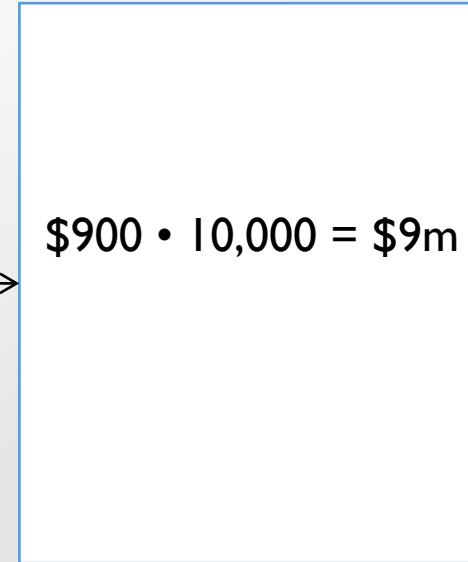|	
Medical Expenses	Value of lost time
Pain, suffering, discomfort	Defensive expenditures

WTP for health

The Value of Statistical Life (VSL)

In a population of 10,000, reducing pollution would avoid one premature death (i.e. reduce risk by 1/10,000)
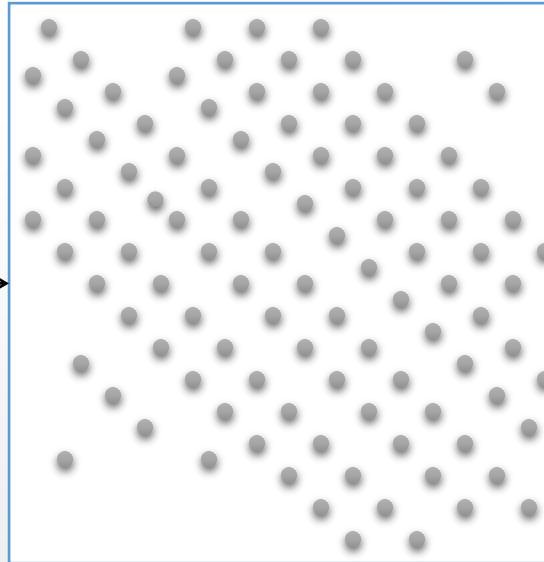
Each of 10,000 are willing to pay $900 to reduce risk of death by 1/10,000

WTP per unit of risk reduction is $900 per 1/10,000, or $9m per statistical life

$900 · 10,000 = $9m

This is the **Value of a Statistical Life (VSL)** Saved

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Where do WTP values come from?

Market prices?

But we don't observe prices directly for "health" or "health risks"

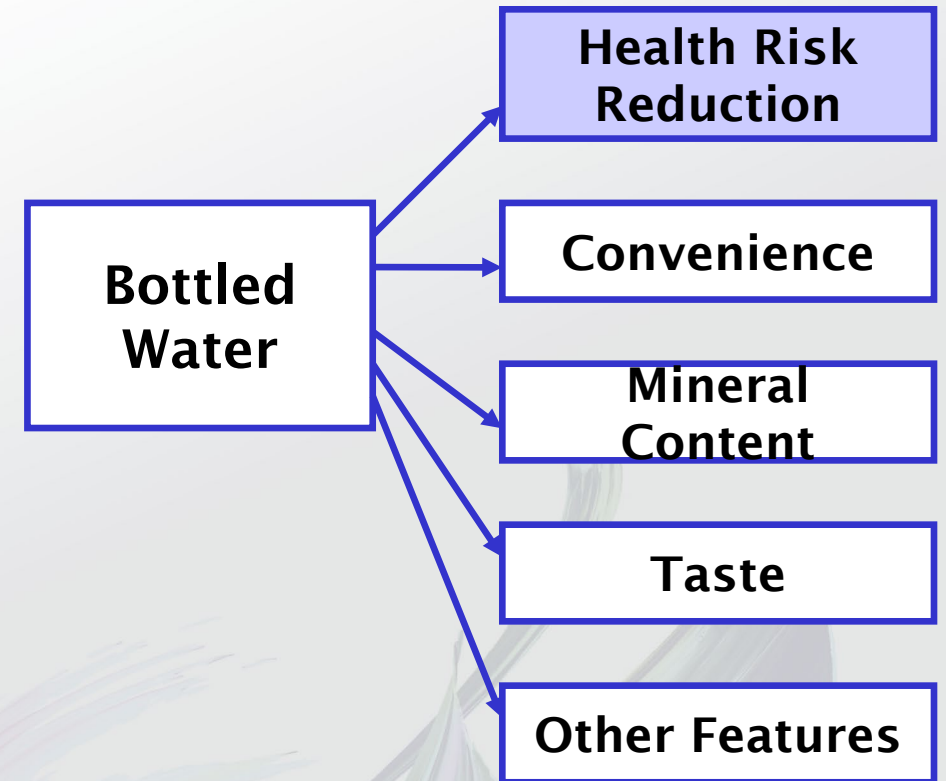*Must use other methods to infer willingness to pay for risk reductions.*

Where do WTP values come from?

~~Market prices~~

Related Markets (Revealed Preference)

- ***Averting (or defensive) behaviors*** *where consumers make risk-income tradeoffs through goods they buy*
  - *Safety equipment*
  - *Products that vary in actual/perceived safety (e.g., types of automobiles, bottled water)*

Bottled Water

- Health Risk Reduction
- Convenience
- Mineral Content
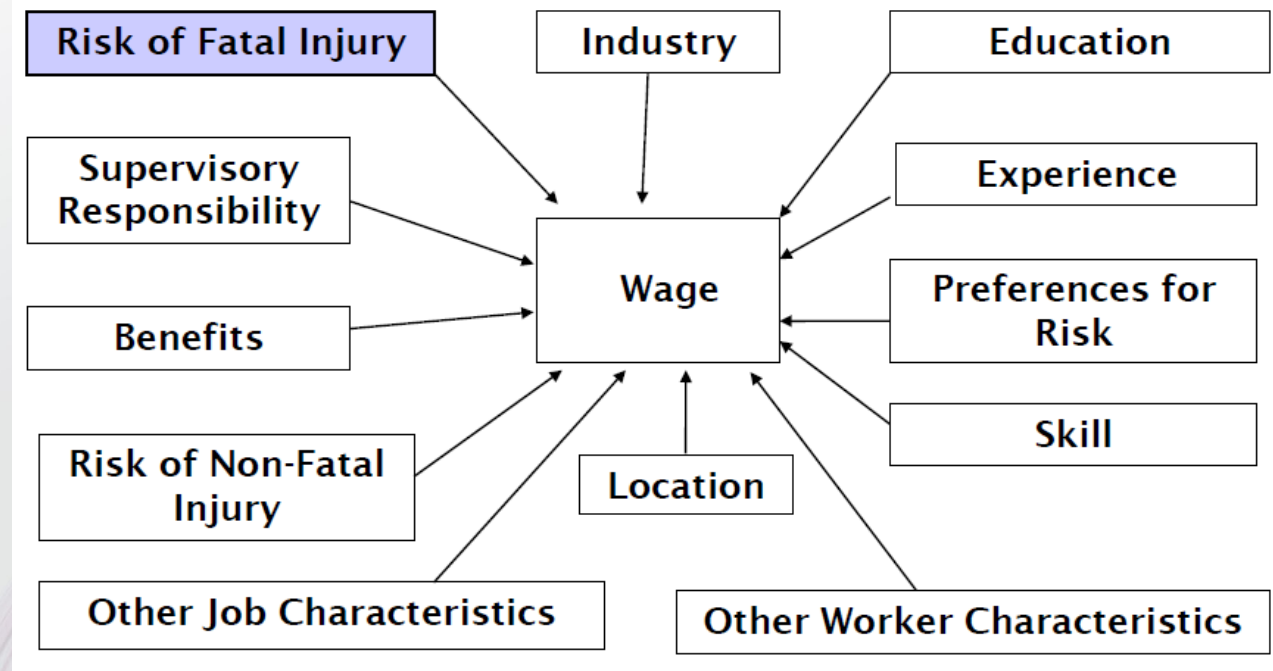- Taste
- Other Features

Where do WTP values come from?

Market prices

Related Markets (Revealed Preference)
- *Averting or defensive behaviors*

- ***Hedonic wage (or wage-risk) studies*** *where workers accept higher risks if they receive a higher wage*

Widely used for
value of statistical life (VSL)
estimates

Where do WTP values come from?

Market prices

Related Markets (Revealed Preference)
- *Defensive or averting behaviors*
- *Hedonic wage (or wage-risk) studies*

Hypothetical Markets (Stated Preference)
- *Survey method where people are asked about choices trading off risk for income*
- *Must be done carefully and rigorously*
- *The scenario can be tailored to the health effects and situation of interest*

Example from Ščasný and Alberini 2018

	The current situation	Option A (reduced risks)
Chance of getting cancer over 5 years	25 in 1 000	20 in 1 000
Chance of 5-year survival (if you get cancer)	60 %	70 %
Effects on everyday activities (if you get cancer)	Unable to work	Unable to work
Pain (if you get cancer)	Mild pain	Mild pain
Annual cost for each of the next 5 years (total in parentheses)	£ 0 (in total £ 0)	£ 210 (in total £ 1050)
Which would you choose?	The current situation	Option A (reduced risks)

Valuing health risks with Cost of Illness (COI)

COI a more limited measure than WTP but is often more readily available.
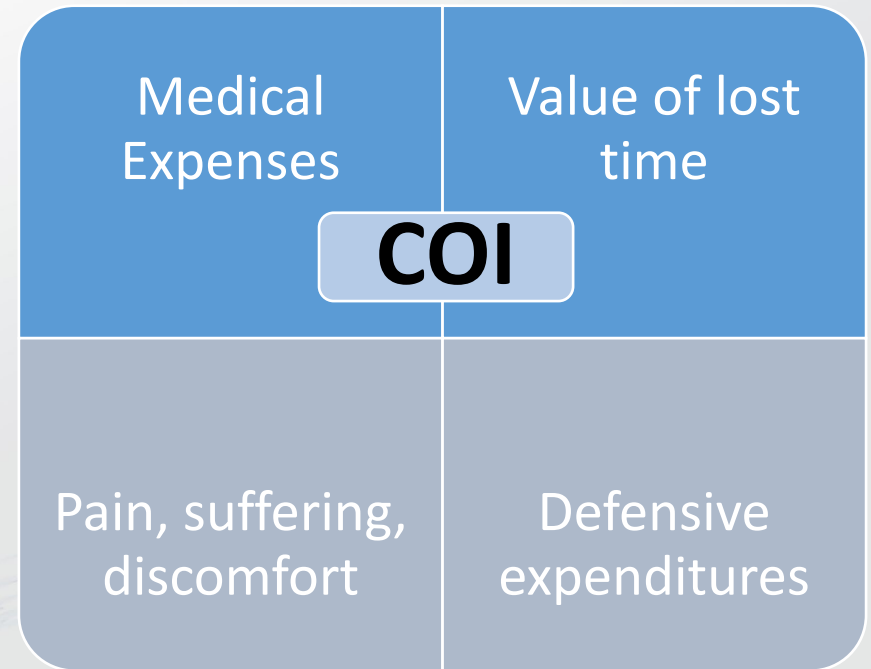
> "Second-best" – underestimate of WTP

Medical (or "direct") Costs

Expenditures on hospitalization, outpatient care, tests, etc.

Lost productivity (or "indirect") Costs

Lost value of paid work time from absence or reduced productivity

Lost leisure time (often not included)

Medical Expenses	Value of lost time
COI	
Pain, suffering, discomfort	Defensive expenditures

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Applying health valuation estimates in BCA

Valuation estimates often need to be adapted **(benefit transfer)**

• differing populations, severity, timing
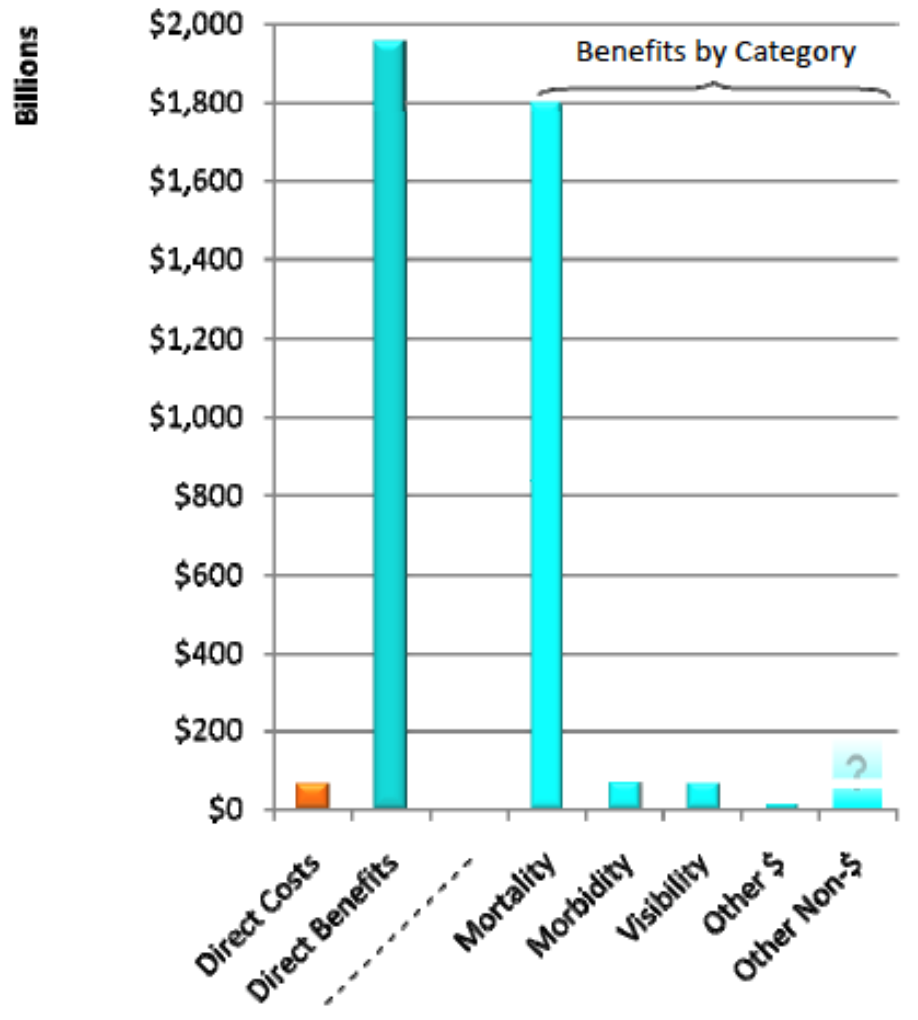
Premature mortality (*Value of Statistical Life*)

• Most agencies have clear guidance on what VSL to use (EPA ~$10m)

Morbidity

• Relatively few willingness to pay estimates

• Illnesses vary in duration, severity, frequency, and impact on health

WTP and COI may be additive under some conditions

Types of values used in benefit-cost analysis

Benefits by Category

Billions

Direct Costs | Direct Benefits | Mortality | Morbidity | Visibility | Other $ | Other Non-$

Valued using Willingness to Pay
- **Premature mortality (VSL)**
- Chronic Bronchitis
- Upper & Lower Respiratory Symptoms
- Asthma Exacerbation
- Minor Restricted Activity Days
- Acute Bronchitis
Valued using Cost of Illness
- Non-fatal myocardial infarction
- Hospital Admissions
- ER visits for asthma
- Work loss days & School loss days

*From Cost and Benefits of
the Clean Air Act, USEPA (2011)*

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Thank You!

Please feel free to contact me if you have with any questions

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References

Ščasný, Milan and A Alberini (2018) "The benefits of avoiding cancer (or dying from cancer): Evidence from a four-country study." Journal of Health Economics, 57:249-262

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