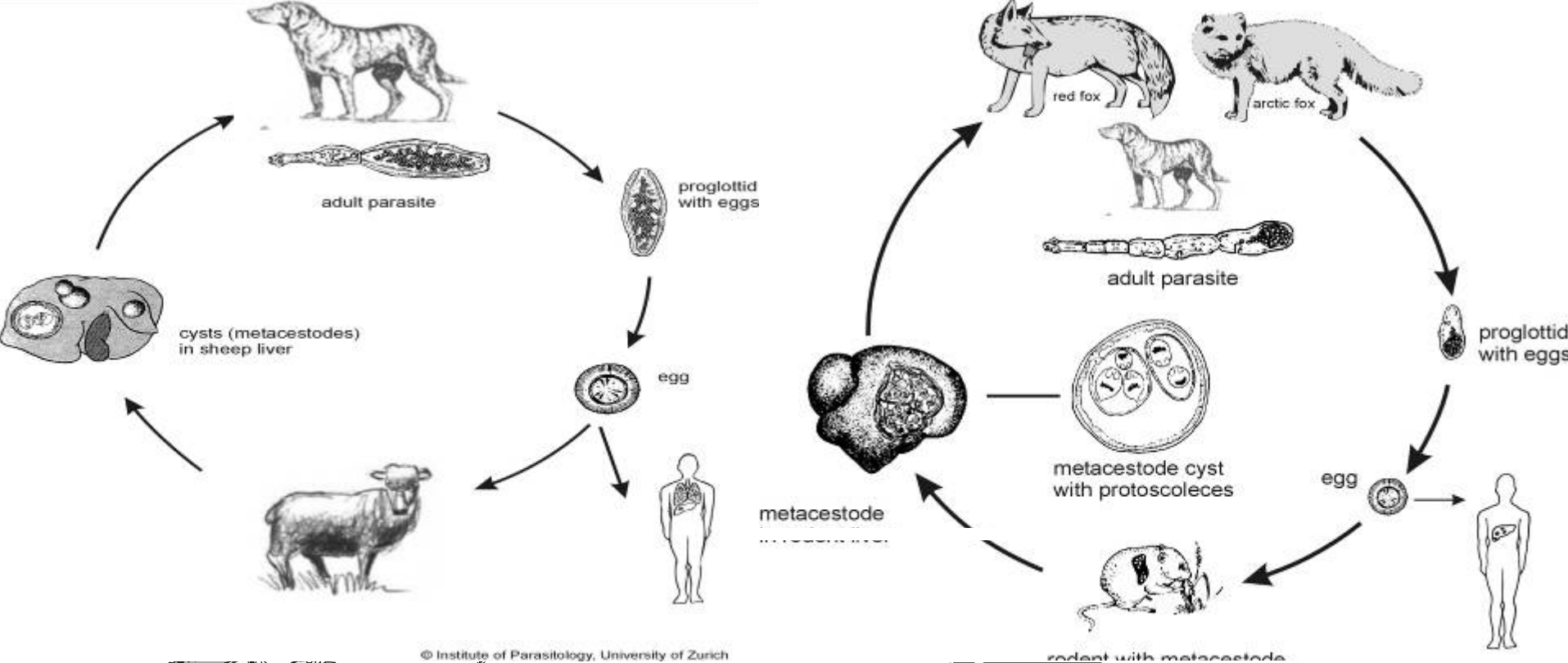


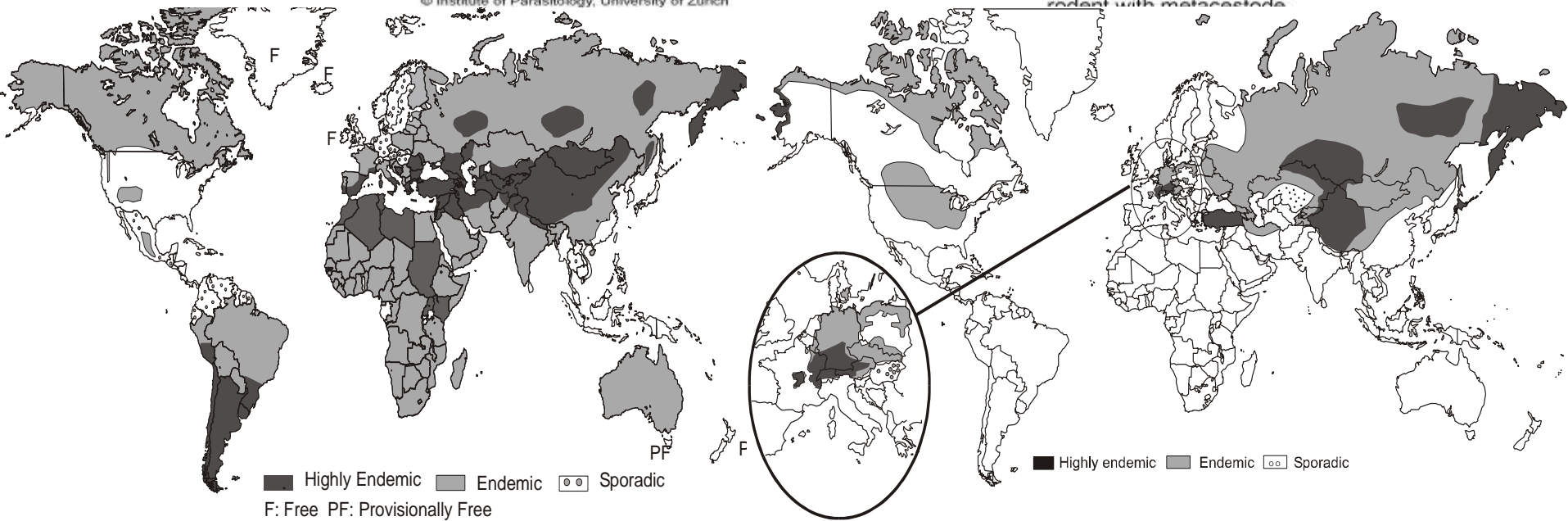
Methods for Burden Assessment: Echinococcosis



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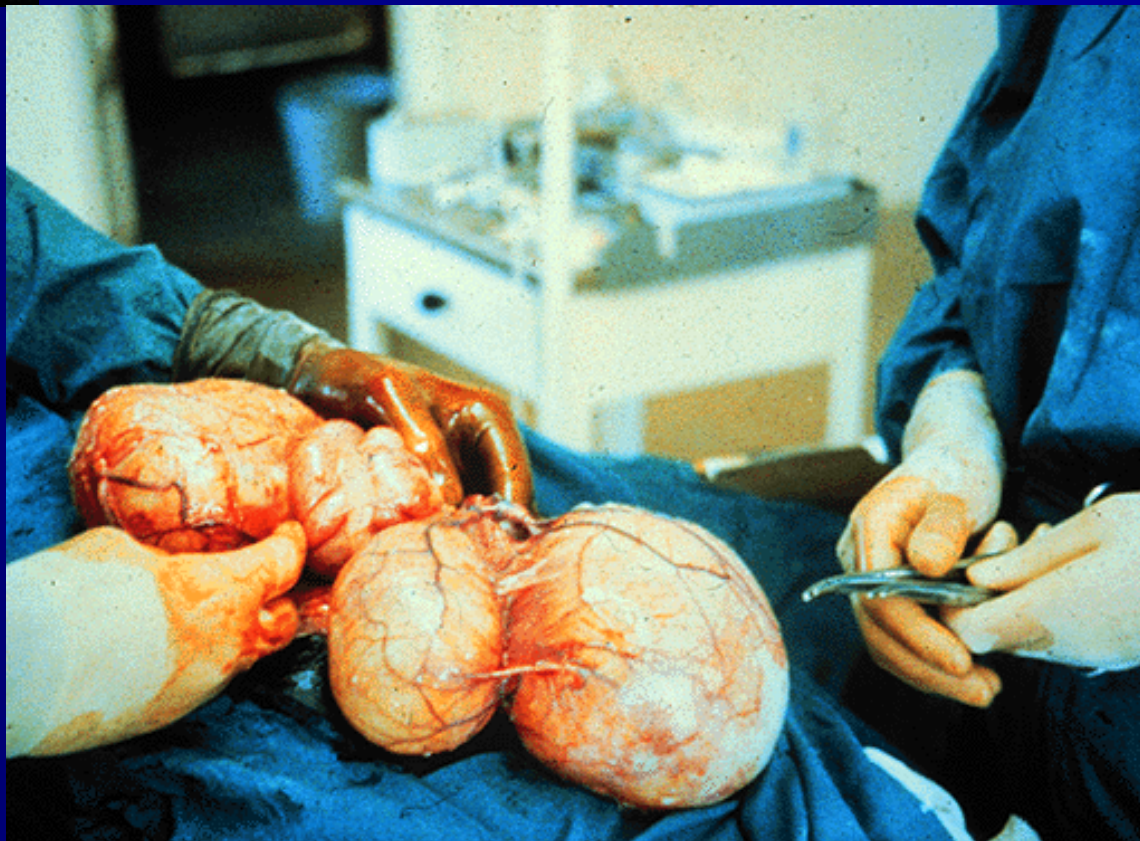
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F: Free PF: Provisionally Free



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Methods of burden assessment

- Economic modelling techniques
- Financial estimates
 - Zoonoses
 - Animal and human health costs
- Non financial estimates
 - Levels the playing field between chronic and acute disease
 - Human life has the same value in rich and poor countries
 - WHO preferred instrument is the DALY
- Used to compare different disease burdens and hence drive policy
- Developed stochastic techniques to model the uncertainty of source data

Economics

Costs-Livestock

- Animal production losses
- Decreased food conversion efficiency
- Mortality or morbidity
- Lower reproductive performance
- Lower milk yield



Economics

Costs-Human Disease

- Cost of Treatment
 - Surgery
 - Medical treatment
 - Convalescence
- Morbidity
 - Time off work
 - Less productive
- Mortality
 - Economic effects of death

Data Sources

- OIE reports
 - Gross underreporting
- Literature reports
 - Method of collection
 - Biased
- Representative surveys

OIE Data

	Country	2003	2002	2001	2000	1999	1998	1997	1996
	Albania					6			
	Belarus	8	11					55	
	Bolivia					5			
	Bosnia & Herzegovina	34	24	13					3
	Bulgaria	639	684	628	662	691		591	
	Italy								
	Jordan	2		14	21	8			
	Kenya								18
	Kyrgystan		470	477	566	573			
	Lithuania	2	4	4	4	1	4	4	8
	Palestinian Auth.	10							
	Peru								1,326
	Sudan						9		
	Syria	24							
	Tunisia	100	162	157	196	154	227	285	299
	Uzbekistan					1,428	1,321	1,130	976

Data from literature

Country	Years evaluated	Human incidence (annual incidence per 100,000 pop.)	Reference
Austria	1983-1992	0.21-0.67	Auer and Aspöck, 1993
Australia	1991-1994	0.23	Longbottom and Hargreaves, 1995
Corsica	1966-1970	10	Economides and Thrasou, 1999
Greece	1994	3.4	Economides and Thrasou, 1999
Italy (Entire)	1980-1984	1.92	Gabriele et al., 1997
Italy (regional)	Early 2000s	9.7-Sardinia 1.57- Emilia Romagna 2.30-Sicily 2.33-Apulia	Gabriele et al., 2004
Portugal	1998-2000	1.82	Seimenis, 2003
Spain	1996	0.9	Garcia, 1997
Switzerland	1984-1992	0.38 (0.09- Swiss nationals 1.39- foreigners)	Eckert et al., 1995
U.K. (Powys)	1984-1990	2.3	Lloyd et al., 1998

Sources of Data Uzbekistan

- OIE reports
 - 1999 - 1428 cases
 - 2002 - 1500
- Government figures
 - 2000 – 1435 cases
 - 2001 - 819
- Hospital records search and case finding¹
 - 2000 – 4636 cases
 - 2001 – 4089 cases

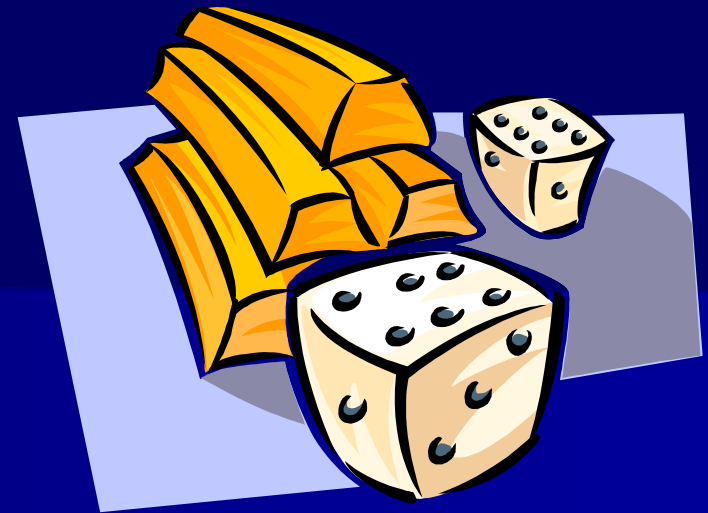
1. Nazirov et al. (2002) Echinococcosis in Uzbekistan: types of problems and methods to improve treatment Uzbek Medical Journal 2-3, pp 2-5 (in Russian)

Sources of Data Jordan

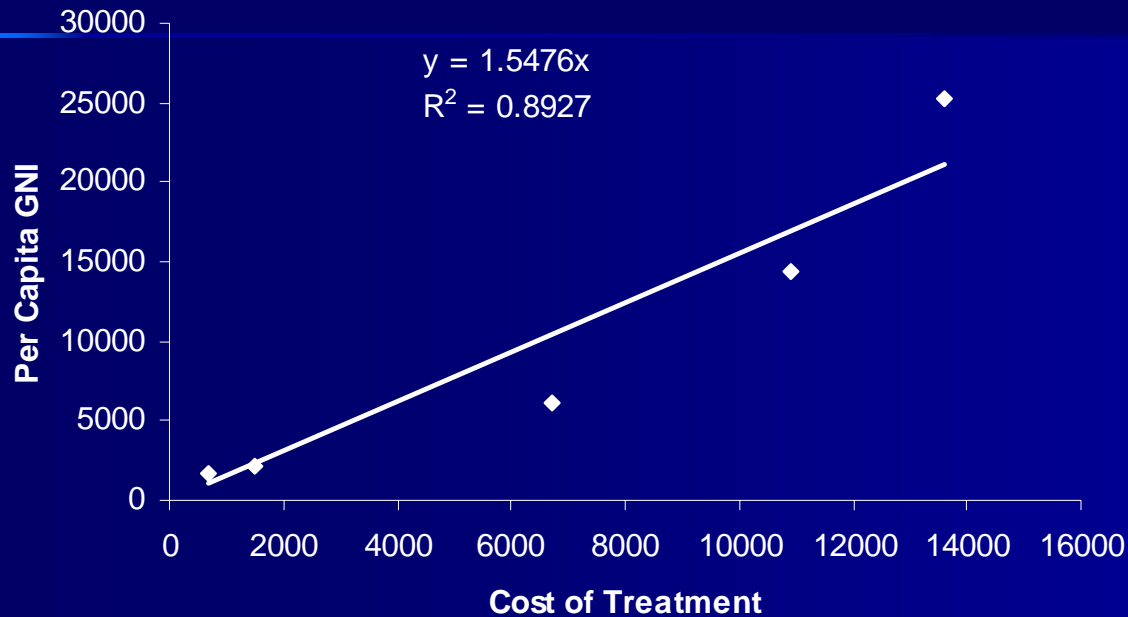
- OIE reports
 - 1996-2004
 - 0-21 cases per year
- Hospital records search and case finding
 - 1995 – c 128 cases per year

Uncertainty

- Some costs well defined
- Other costs ??
 - May represent the largest losses
- Poor or inadequate reporting
- Sample size
- Diagnostic test efficiency
- Attributable morbidity
- Monte-Carlo techniques
 - Randomly vary each “unknown”



Estimating unknown Data



For Global Burden Estimates :

Cost of treatment in each country varied as the linear predictor (mean \pm SEM)

Estimating unknown data

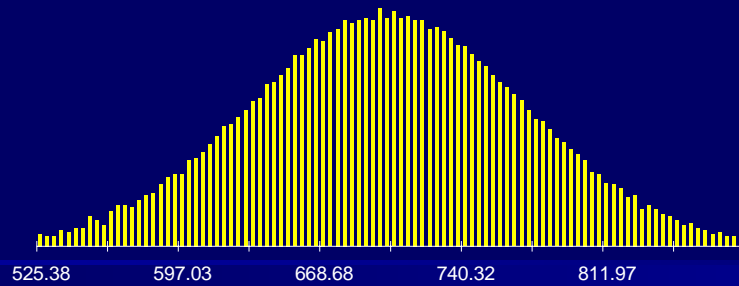
- Other modelling techniques
- From published prevalence in
 - Dogs c 10%
 - Sheep c 50%
- Estimate Incidence in humans
 - c10 cases/100,000/year
 - Over estimates some (eg Muslim)
 - Under estimates eg Chinese

Hospital Costs

- Cost of treatment and medication

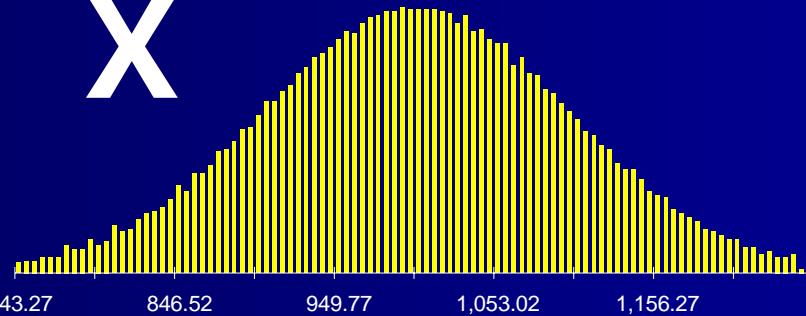
Annual number of cases \sim mean (±SEM)
X

Cost of representative sample \sim mean (±SEM)



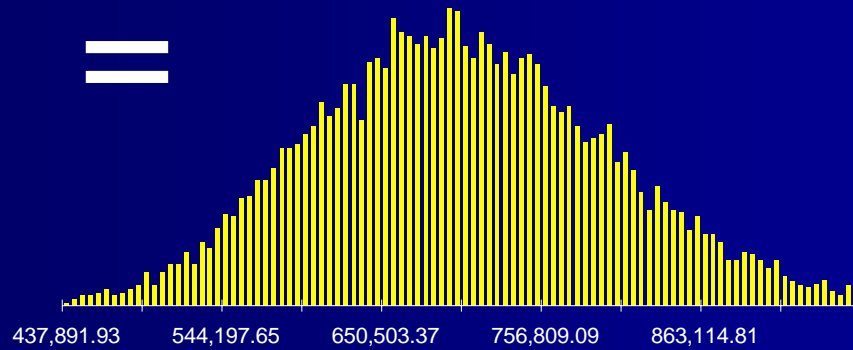
Cost of Treatment

X



Number of cases

=



Total Treatment Costs



95% CIs

Other Human Health Costs

- Long term ill health
- Do patients fully recover?
- Perhaps not?
- Permanent decrease in quality of life.
 - How much?
 - Needs good studies to accurately define
- Infected but not treated
 - Sub clinical disease
- Some patients die!
 - Capital Approach
 - Willingness to pay

Income levels for participants in the Shiqu County abdominal ultrasound study for echinococcosis (income in U.S. dollars)*

Annual income	Control group (%)	CE positive (%) [†]	AE positive (%) [†]
< \$120	47	50	52
\$121–\$241	30	35	40
\$242–\$362	9	12	5
> \$362	14	2	3

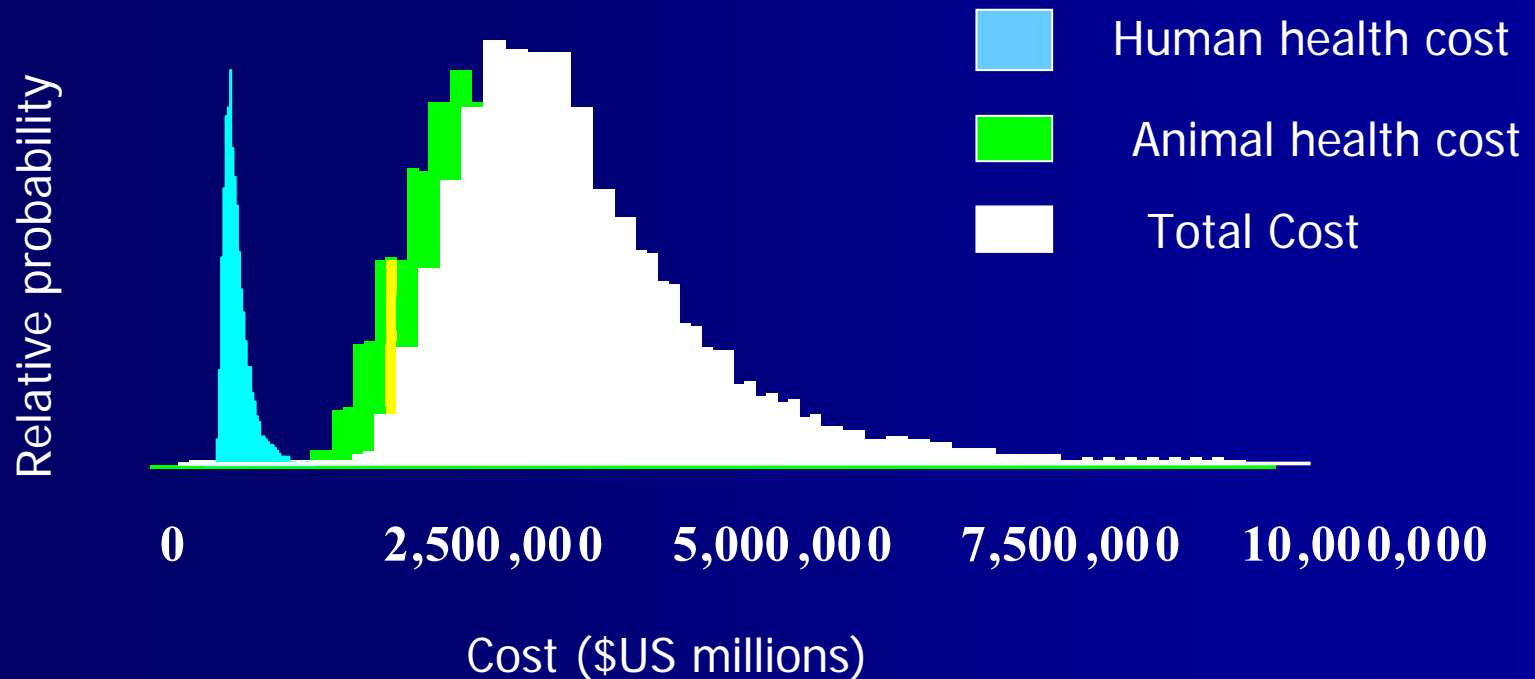
* CE = cystic echinococcosis; AE = alveolar echinococcosis.

[†] $P < 0.05$.

Infected people are poorer!

Echinococcosis in Jordan

Total Costs



All calculations should be discounted for future values

Non financial instruments

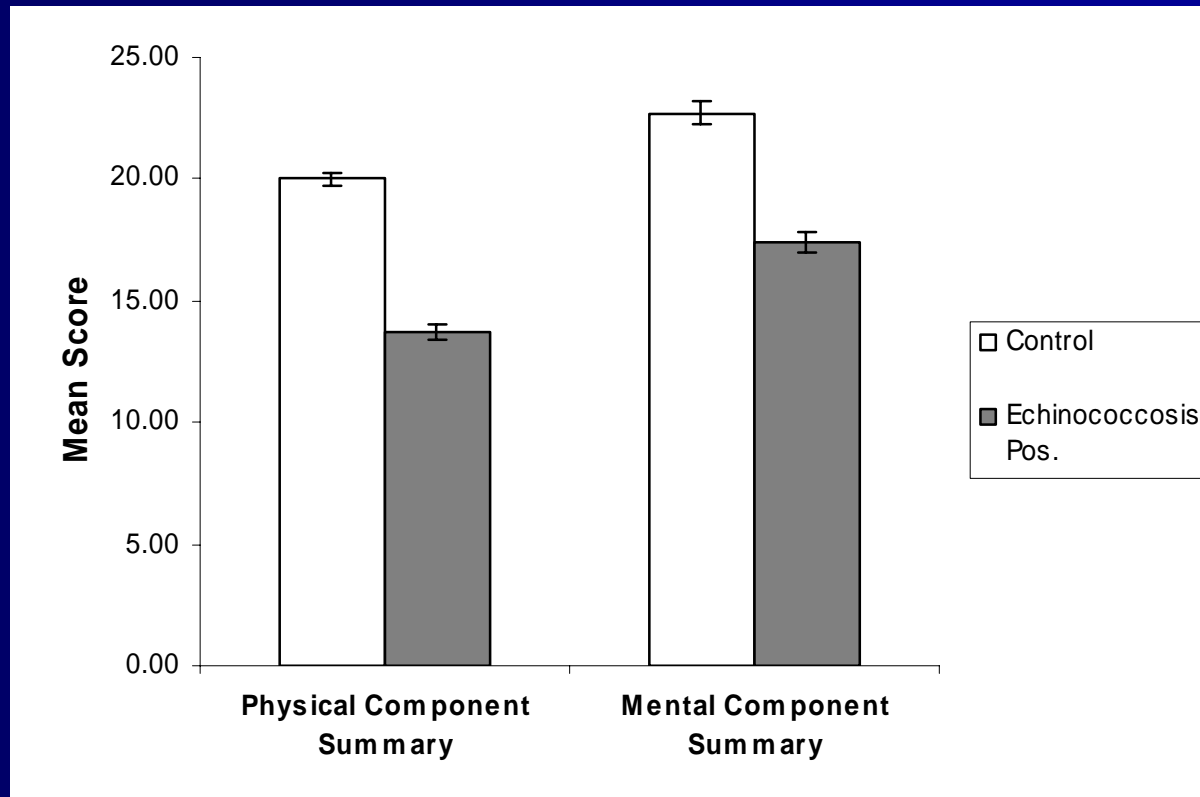
- HALYs, DALYs, QALYs
- All measures of loss of health
- WHO preferred measure is DALY
 - Disability Adjusted Life Year
 - Measures number of “years of full health” lost due to disease

DALY

- Length of time lived with morbidity
- Discounted for
 - Disability weight
 - Age of onset
 - Losses in future years at today's rates
- Numbers of healthy years lost

Morbidity costs

SF-12 results - China



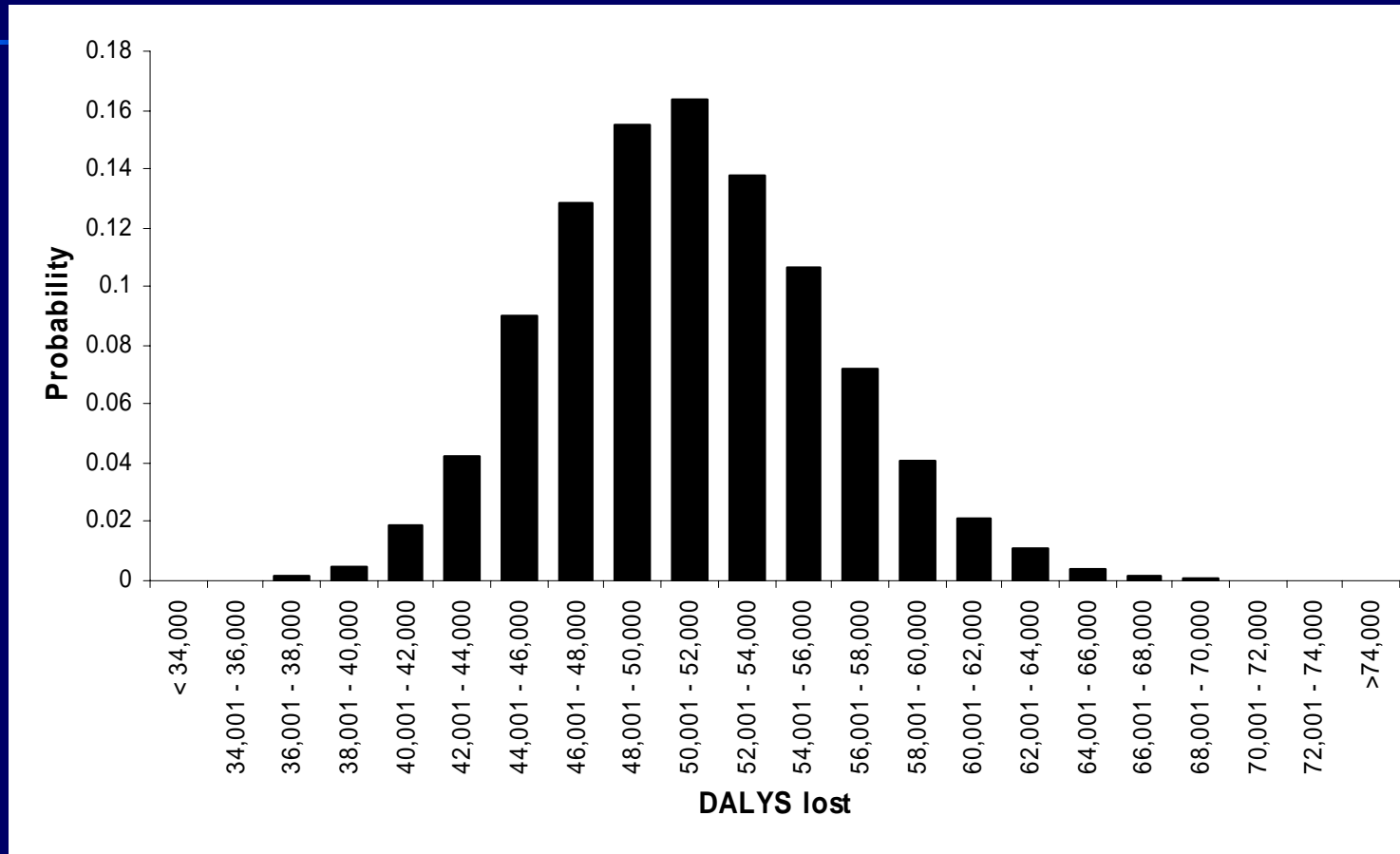
Country (Year)	Number of patients	Cure	Morbidity	Relapse	Death	Reference
Greece (1984-1990)	56	40 (72%)	13 (23%)	3 (5%)	0 (0%)	(14)
Italy (1950-1987)	298	244 (82%)	27 (9%)	15 (5%)	12 (4%)	(15)
Turkey (1992-1999)	95	32 (34%)	38 (40%)	24 (25%)	1 (1%)	(16)
Turkey (1990-1995)	108	88 (81%)	19 (18%)	0 (0%)	1 (1%)	(17)
Greece (1985-1990)	67	59 (86%)	4 (6%)	3 (6%)	1 (2%)	(18)
Italy (1982-1994)	89	70 (79%)	17 (19%)	1 (1%)	1 (1%)	(19)
Total	713	533 (75%)	118 (17%)	46 (6%)	16 (2%)	

Disability Weights

- Echinococcosis
- Disease free liver cancer (0.200) (improve after surgery)
- Preterminal liver cancer (0.239) (Post surgical conditions)
- Terminal liver cancer (0.809) (Recurrent disease, multiorgans etc)
- Death 1
- Weights and duration assigned using a multinomial distribution with relative proportions based on published surgical studies.

Country	Years	Average age of onset/detection	Reference
China	2001-2003	35	(3)
Jordan	1994-2000	31-45	(22)
Kenya (Turkana)	1980s	21-30	(23)
Morocco	2000-2001	32	(24)
Turkey	1992-1999	44	(16)
Uruguay	1991-1992	45	(25)
Kyrgystan	1991-2000	22	(26)

DALYs lost in Serchu, China county due to echinococcosis



c 0.81 DALYs lost per person

Economic losses

- Attributable losses only
- True losses are only those that are preventable
- Cystic echinococcosis and cysticercosis
 - Eliminated by veterinary public health programmes
 - Essentially entire burden is preventable

Global Burden of Echinococcosis

- US\$4.1 Billion (adjusted for underreporting, PPE estimate)
- 54% Human costs
 - >1.0 million DALYs
 - c 200,000 cases per year
- 46% Animal health costs

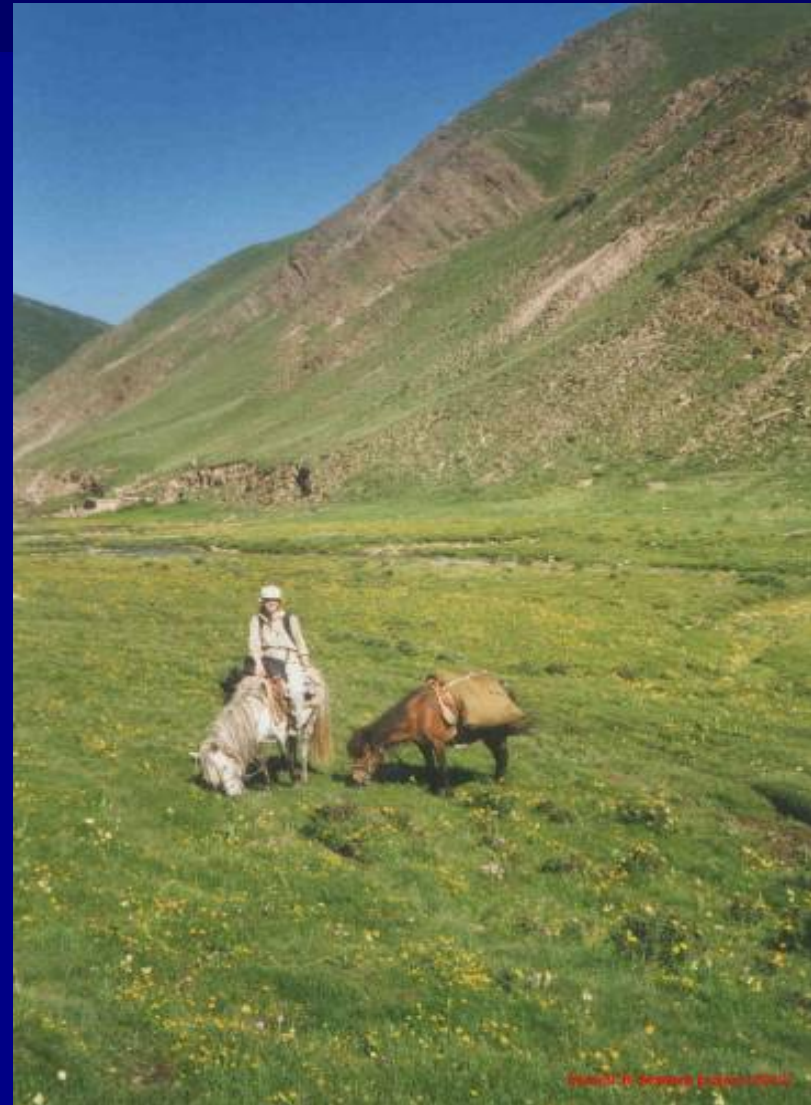
	DALYs
Leprosy	199,000
Onchocerciasis	484,000
Dengue	616,000
Chagas	667,000
Cystic echinococcosis	1,079,038
Trypanosomiasis	1,525,000
Schistosomiasis	1,702,000
Leishmaniasis	2,090,000
Lymphatic filariasis	5,777,000
TB	34,736,000
Malaria	46,486,000
Japanese encephalitis	709,000
Trachoma	2,329,000
Ascariasis	1,817,000
Trichuriasis	1,006,000
Hookworm	59,000

Conclusions

- Financial estimates estimate total burden of disease including animal health costs
- Purchasing power equivalents give a better idea of disease burden in poor countries
- Such results can be used to implement cost sharing between sectors
- DALYs for zoonoses can indicate priorities compared to other diseases
- Results of cost sharing can indicate the true cost benefit to health services
- Stochastic and risk analysis techniques are powerful tools to model uncertainty.

Thank You

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Numbers of surgical cases of cystic echinococcosis Kazakhstan 1984-2001

