



# Determinants of Health: Effects of Funding on Quality of Care for Patients with severe TBI

- Facts about traumatic brain injury
- Definitions & Outcomes
- Methods
- Results
- Conclusions



# Facts about TBI

- ➔ **TBI (traumatic brain injury) is the leading cause of death for Europeans aged 1 – 45 years**
- ➔ **Total (= fatal plus hospitalized) incidence rate is 235 cases/10<sup>5</sup>/year**
- ➔ **average mortality is 15/10<sup>5</sup>/year (case fatality rate 2.7%)**
- ➔ **ratio of mild to moderate to severe TBI is 22 : 1.5 : 1 (6,8% of all ICU pts in Austria)**
- ➔ **10 cases of severe TBI/10<sup>5</sup>/year**



# Definitions & Outcomes

- ➔ **Severe TBI: Glasgow Coma Scale Score (GCS) <9 within the first 48 hours after trauma**
- ➔ **Moderate TBI: GCS 9 – 11**
- ➔ **Mild TBI: GCS 12 – 15**
- ➔ **Outcomes:**
  - ➔ **Severe TBI: 35 – 50% death, 25 – 35% GR**
  - ➔ **Moderate TBI: 3 – 5 % death, 50 – 75% GR**
  - ➔ **Mild TBI: 0 – 1% death, >90% GR**

*INRO database; 1200 patients with severe TBI*



# Methods

- **Collection of data**
  - **Patient data**
  - **Treatment data**
  - **System data**
- **Quality of care scoring**
  - **Prehospital care**
  - **Hospital care**
- **Collection of data on funding**
  - **WHO data**



# Data Collection

- ➔ **Collection period: 01/2001 and 12/2005**
- ➔ **Internet-based database (ITCP – international traumatic coma project)**
- ➔ **13 centres from 3 European regions with different economies:**
  - ➔ **“high income” (Austria, 5 centres)**
  - ➔ **“upper middle income” (Croatia, Slovakia, 6 centres)**
  - ➔ **“lower middle income” (Bosnia, Macedonia, 2 centres)**



# ITCP – available information

- personal data
- prehospital status and treatment
- mechanism and severity of trauma
- results of CT scans and lab testing
- data on surgical procedures
- details of ICU treatment (first 10 days)
- summary of ICU treatment at discharge
- outcomes: GCS at ICU discharge, GOS at 90, 180 and 360 days after injury.



# Quality of Care Score

## *Prehospital treatment*

### ➔ Airway management (guideline):

➔ not indicated = 0

➔ endotracheal intubation = +5

➔ other airway management = +3

➔ no airway management = -5

### ➔ Direct transfer to study center (guideline):

➔ yes = +3

➔ no = -3



# Quality of Care Score

## *Hospital treatment (first 48 hours)*

➤ Interval admission – CT scan:

➤ <60 min = +3; >60 min = -3

➤ Intracranial pressure monitoring (guideline):

➤ used = +3; not used = -3

➤ Normoventilation: arterial pCO<sub>2</sub> between 32 and 40 mmHg (guideline):

➤ yes = +3; no = -3

➤ Body temperature below 38.5 °C:

➤ yes = +3; no = -3

➤ Steroids used (guideline):

➤ yes = -5; no = +5





# Quality of Care Score

## *System factors*

### ➔ Number of nurses per ICU bed:

➔  $<2 = +1$

➔  $2-3 = +2$

➔  $>3 = +3$

### ➔ ICU patients with MRSA infections:

➔  $<2\% = +3$

➔  $2-5\% = +2$

➔  $5.1-10\% = +1$

➔  $>10\% = 0$



# Health Care Funding (HCF)

Variables	A	SK	CRO	FYROM	BIH
<b>Economy</b>	HI	UMI	UMI	LMI	LMI
<b>LE (m, yrs)</b>	77.3	70.3	72.6	71.1	69.5
<b>LE (f, yrs)</b>	82.9	78.2	79.4	76.1	76.0
<b>GDP (US\$/c)</b>	37.213	8.803	7.724	2.637	2.183
<b>HCF (% GDP)</b>	10.3	7.2	7.7	8.0	8.3
<b>HCF (US\$/c)</b>	7.213	634	595	211	181

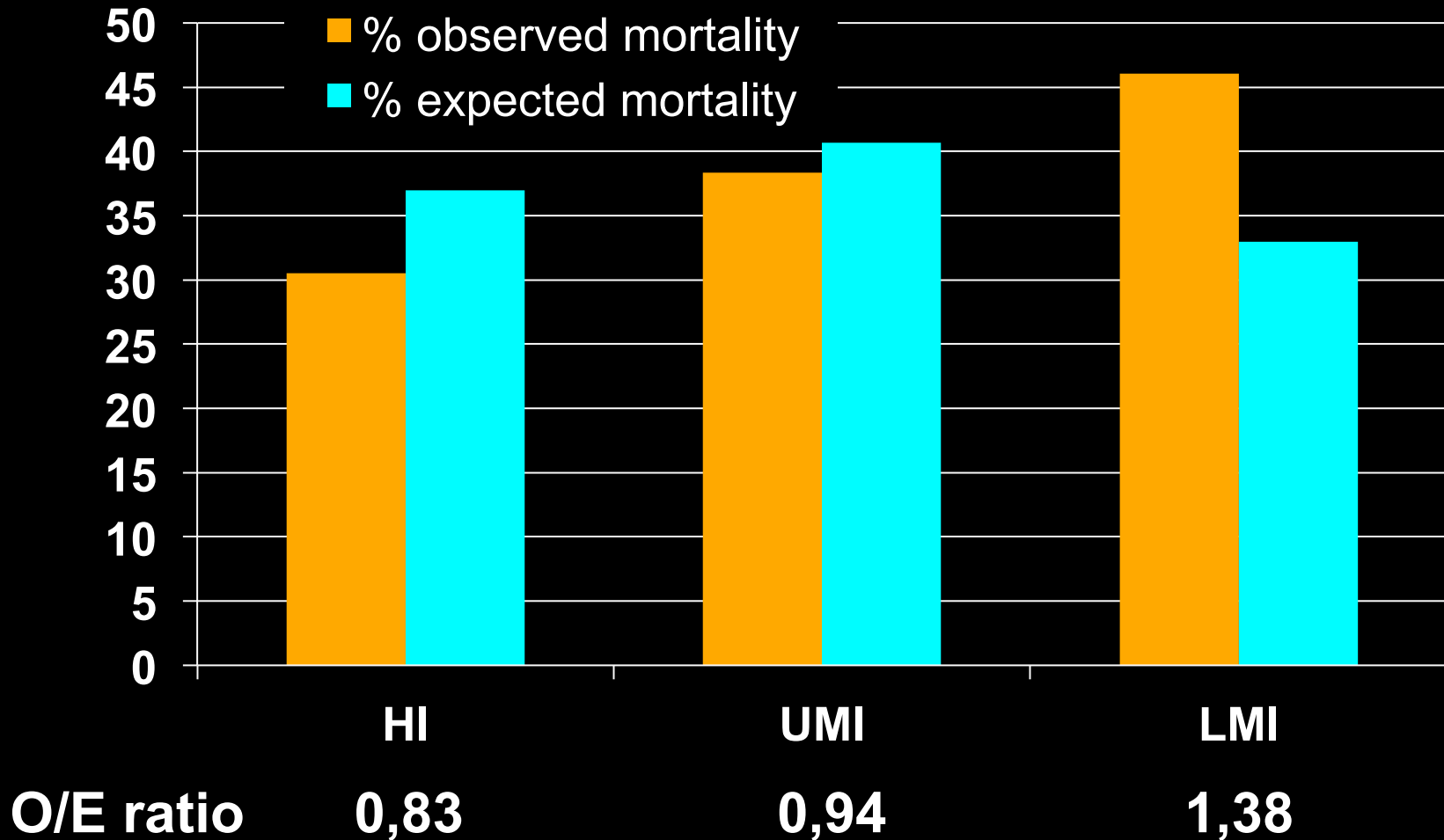


# Data Analysis

- **Computation of individual quality scores for each patient**
- **Calculation of average score for each center / each region**
- **Analysis of effects of quality of care on outcomes**
  - **Mortality, rates of good recovery**
- **Analysis of funding on quality of care**

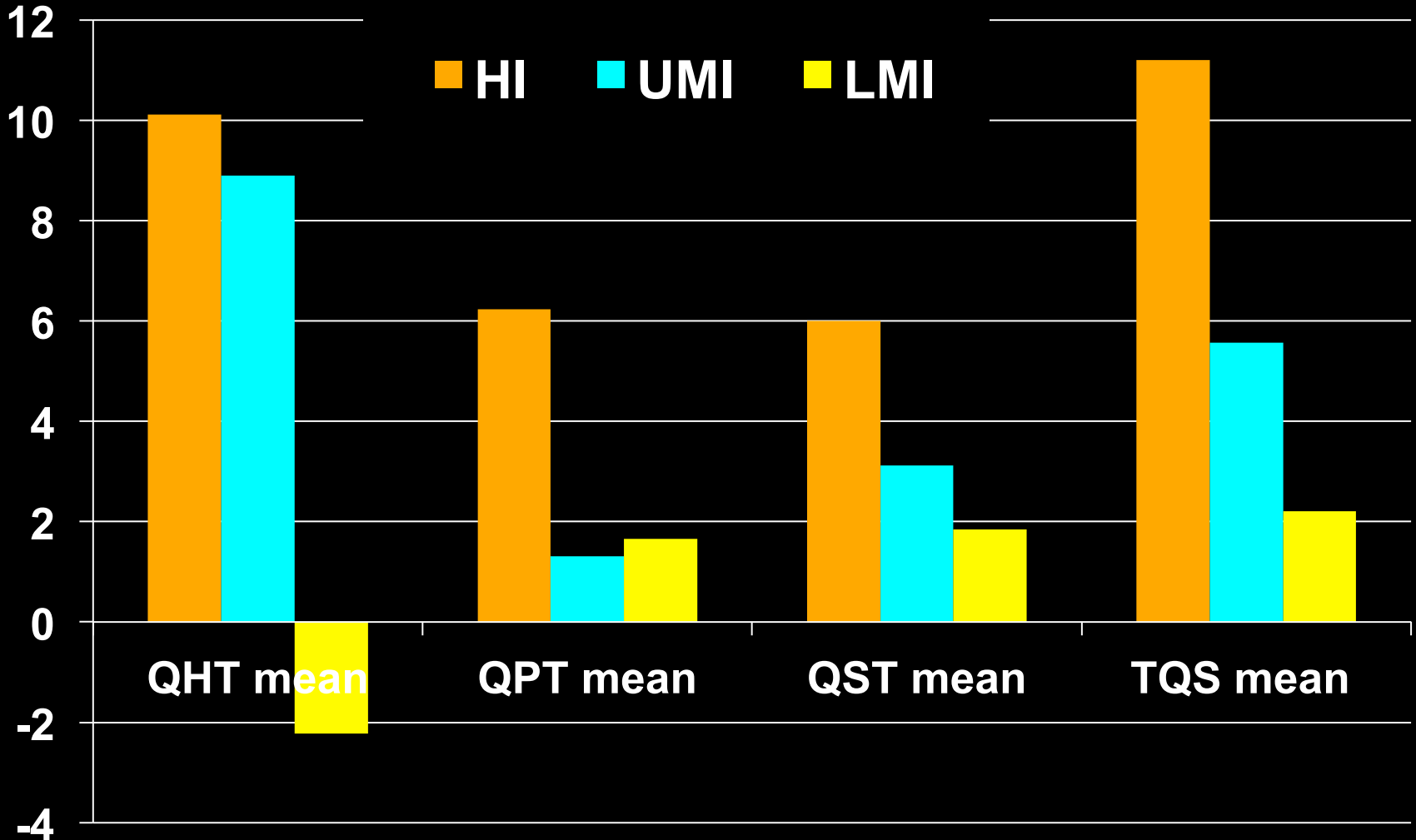


# Mortality





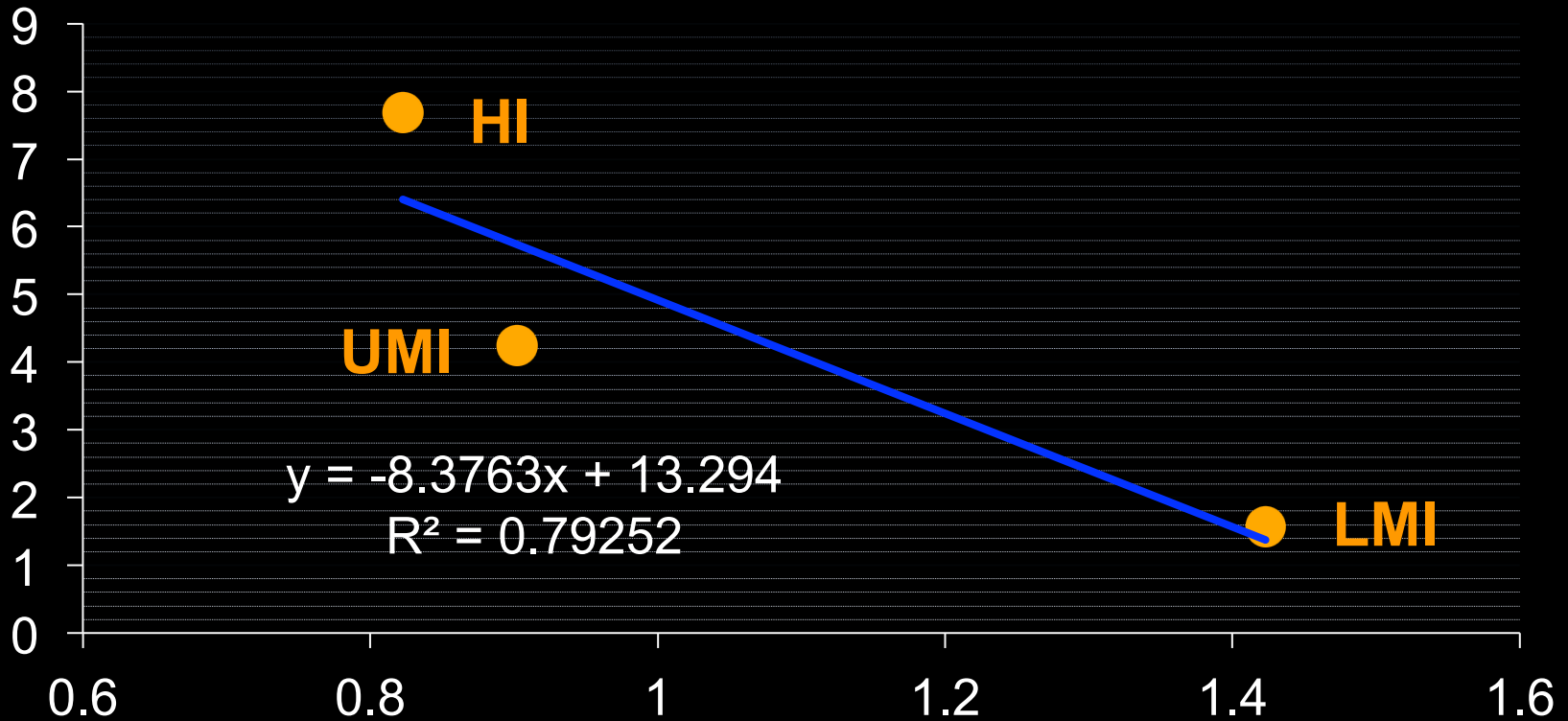
# Quality Scores





# Quality Scores vs. O/E ratio

## TQS vs. O/E ratio (ICU)



● Mittelwert von TQS

— Linear (Mittelwert von TQS)



# Factors related to ICU survival (logistic regression, survival coded as “1”)

**Model 1:**

**center effects ( $R^2 = 0.026$ ; HI centers = 1)**

Factors	Odds Ratio	95% CI	P
UMI center	0.70	(0.51- 0.96)	<0.05
LMI center	0.51	(0.38- 0.68)	<0.0001



# Factors related to ICU survival (logistic regression, survival coded as “1”)

**Model 2:**

**adjusted for age, GCS and ISS ( $R^2 = 0.457$ )**

Factors	Odds Ratio	95% CI	P
UMI center	0.75	(0.51-1.10)	n.s.
LMI center	0.16	(0.11-0.24)	<0.0001
Age	0.96	(0.96-0.97)	<0.0001
First GCS	1.44	(1.34-1.54)	<0.0001
ISS	0.95	(0.93-0.96)	<0.0001





# Factors related to ICU survival (logistic regression, survival coded as “1”)

**Model 3: adjusted for age, GCS, ISS and  
Quality Score ( $R^2 = 0.469$ )**

Factors	Odds Ratio	95% CI	P
UMI center	1.23	(0.66-2.24)	n.s.
LMI center	0.49	(0.23-1.08)	n.s.
Age	0.96	(0.95-0.97)	<0.0001
First GCS	1.46	(1.35-1.57)	<0.0001
ISS	0.94	(0.93-0.96)	<0.0001
QPT	0.99	(0.95-1.03)	n.s.
QHT	1.04	(1.01-1.06)	<0.01
QST	1.20	(1.03-1.41)	<0.05



# Conclusions

- ➔ **Patients from regions that spend more on health care have better outcomes after TBI**
- ➔ **These outcomes are determined by the quality of care these patients received**
- ➔ **Quality of care is dependent on the level of health care funding**
- ➔ **Funding of health care is a major determinant of health and health care**