Finnish Institute of Occupational Health

COCHRANE OCCUPATIONAL HEALTH FIELD

Interrupted Time Series

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A systematic review

1. Well-formulated question (PICO)
    a) Types of study designs
2. Thorough search
3. Objective selection of studies
4. Critical assessment of methodological quality
5. Objective data extraction
6. Synthesis of the data
    a) appropriate comparisons of interventions and controls
    b) meta-analysis per comparison
7. Conclusions for practice and research

Noise Reduction in Factories

- Noise exposure still wide spread
- Review of interventions to reduce noise exposure in workplaces with high noise levels
- What type of study designs to include and why?

Study Designs

- Randomised Controlled Trials
  - Cluster Randomised Trials
  - Cross-over trials
- Non-Randomised Controlled
  - Controlled-Before After Studies
    - prospective cohort
    - retrospective cohort
    - quasi-experimental
    - controlled clinical trial
  - Interrupted Time-Series
  - Case-Control Studies
- Non-Randomised Partially Controlled
  - Controlled Post Test Study
- Non-randomised Non Controlled
  - Before-After Studies
  - Case/Patient Series
  - Case Study

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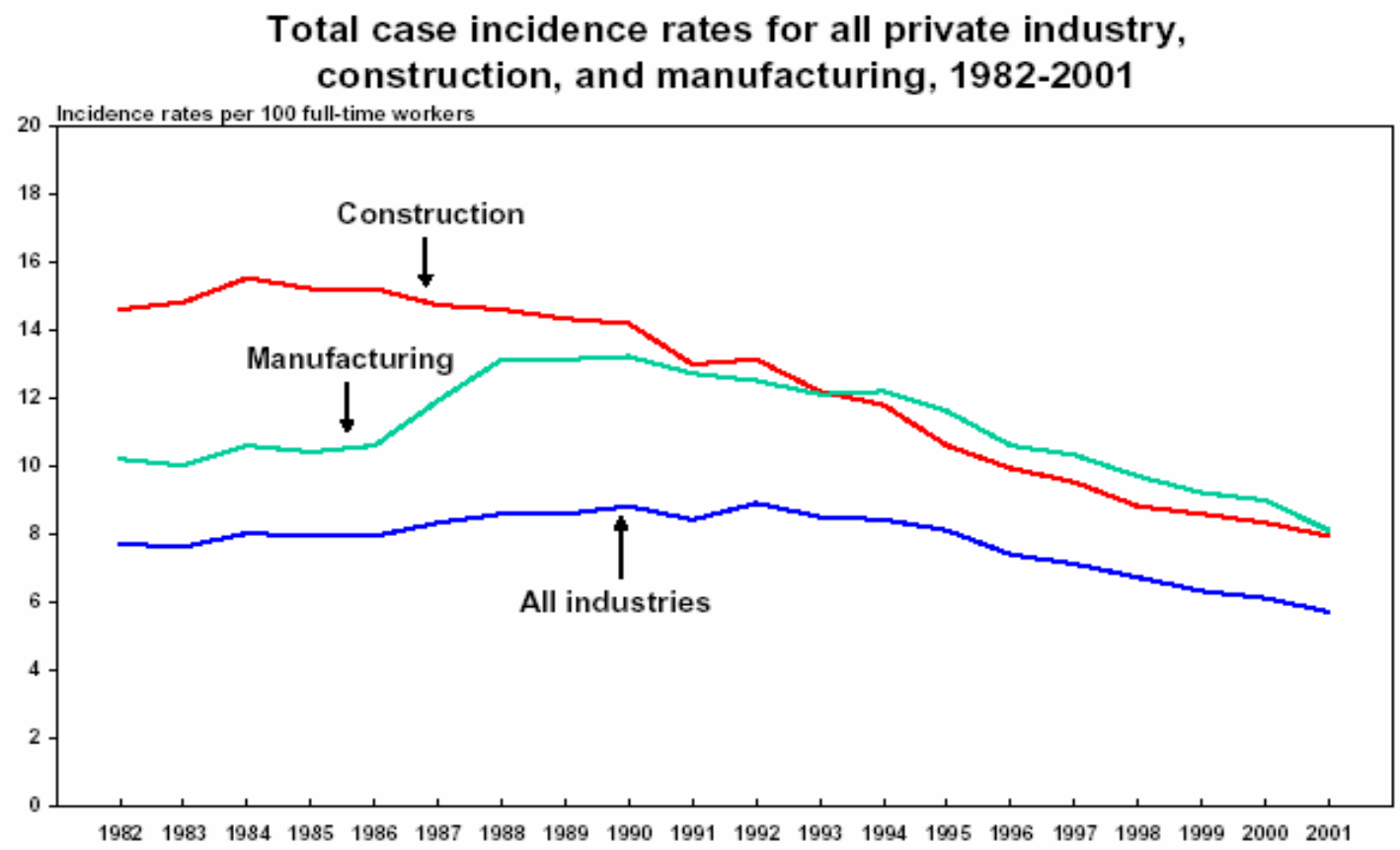
Non-Fatal Injuries



In contrast to the 1994 to 2000 period when the construction rates were lower than those for manufacturing, the rates in construction and manufacturing were about the same for 2001.

Source: Bureau of Labor Statistics, U.S. Department of Labor
December 2002

Time trend in fatal accidents in Italy

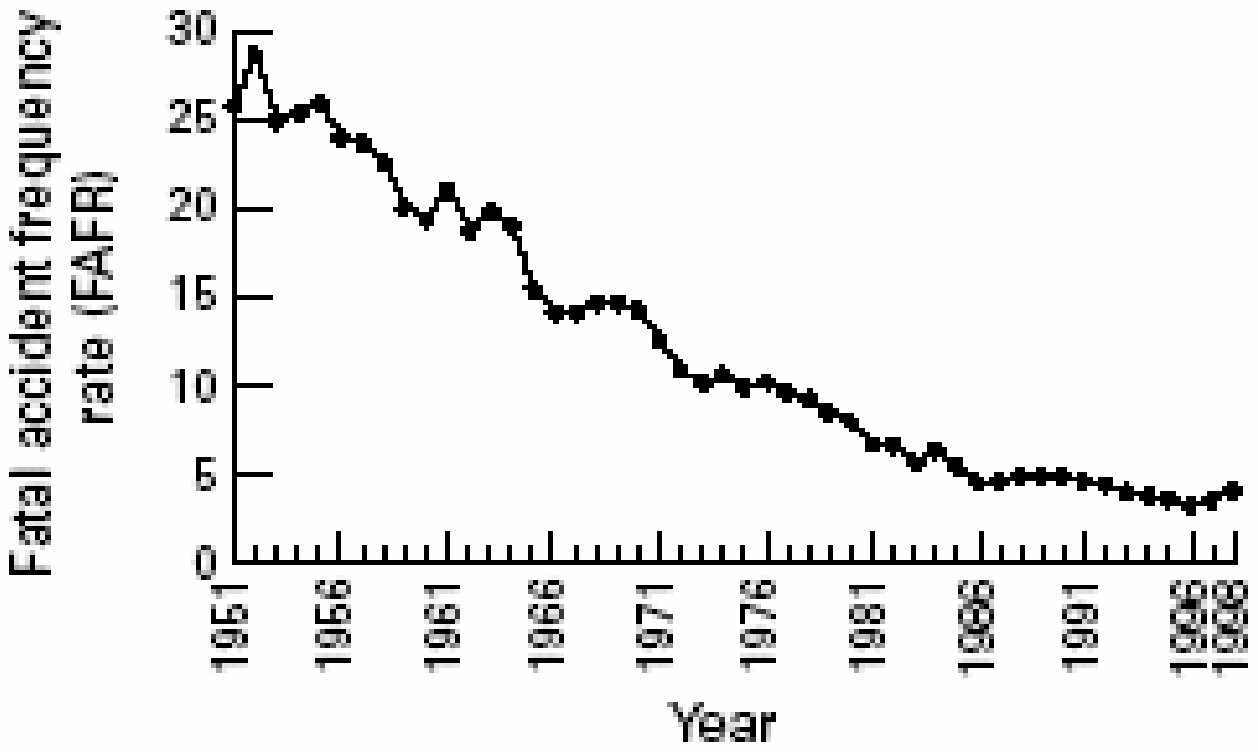


Figure 13 Frequency of fatal accidents over the period 1951–98.

Fabiano OEM 2001

ITS: outcome measures?

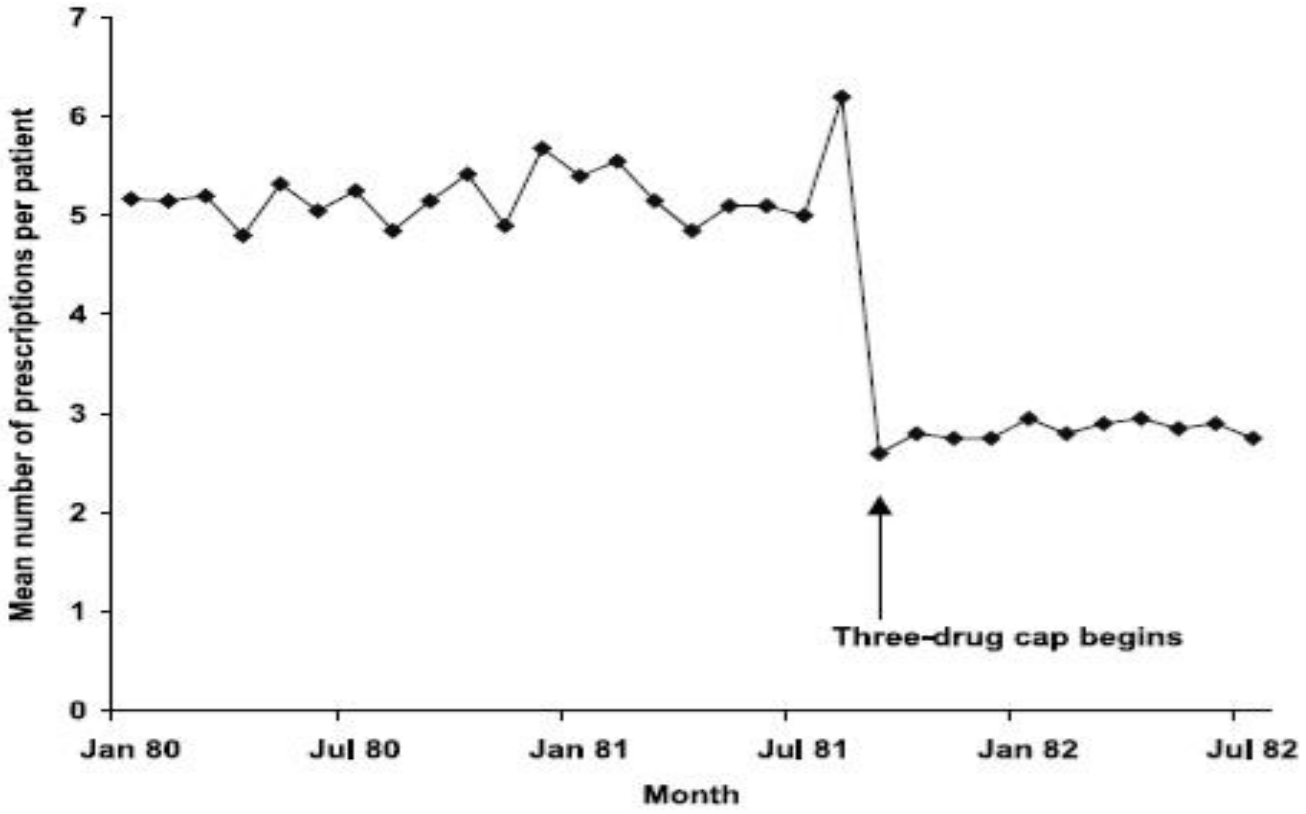
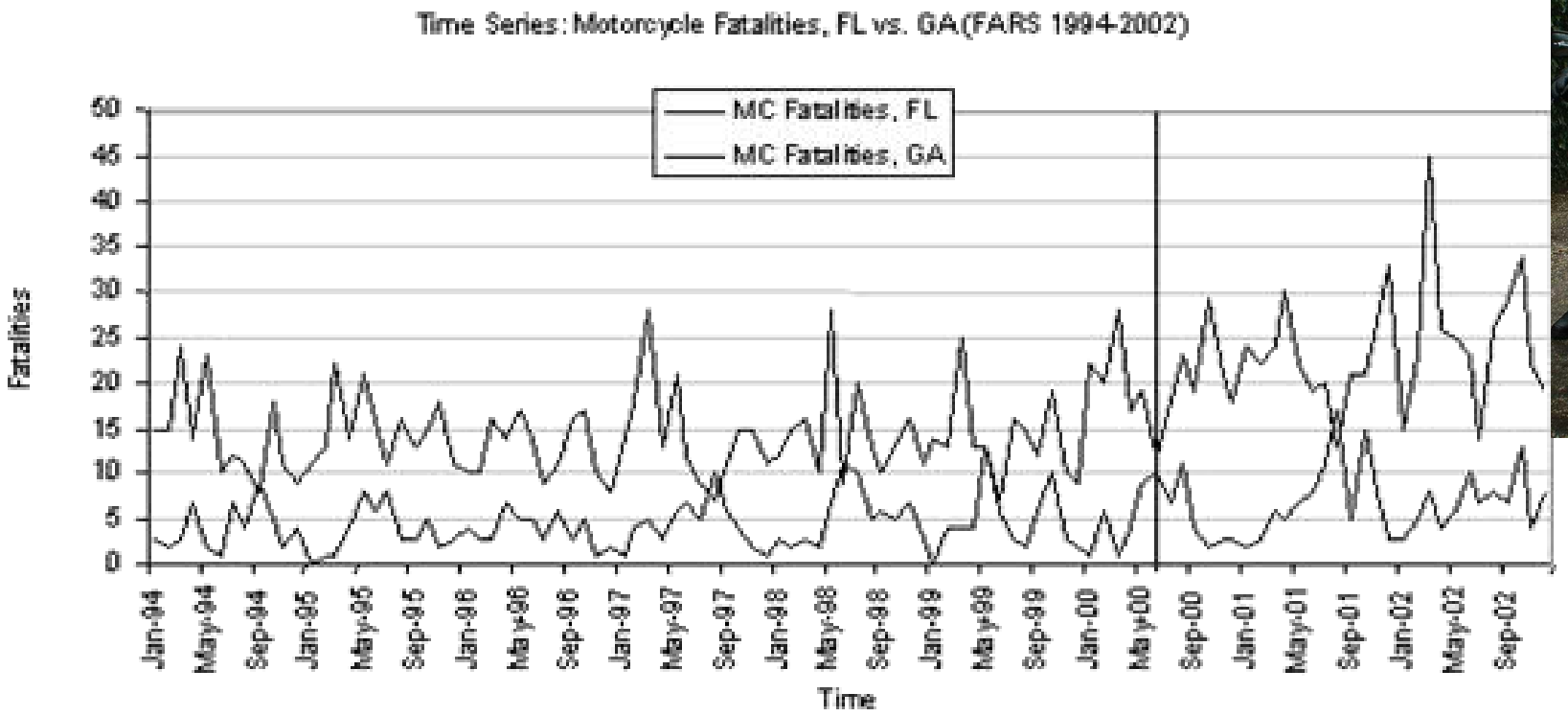


Fig. 1. Average number of constant-size prescriptions per continuously eligible Medicaid patient per month among multiple drug recipients (2).

ITS: seasonal and cyclical variations



ITS:outcome measures: level and slope

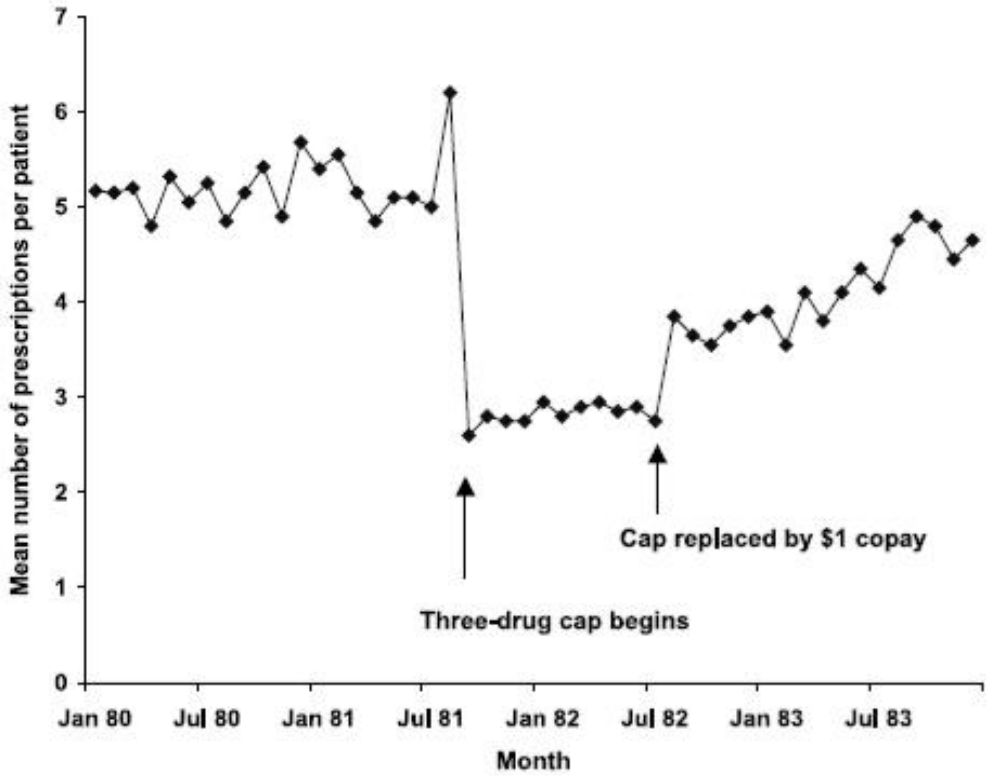
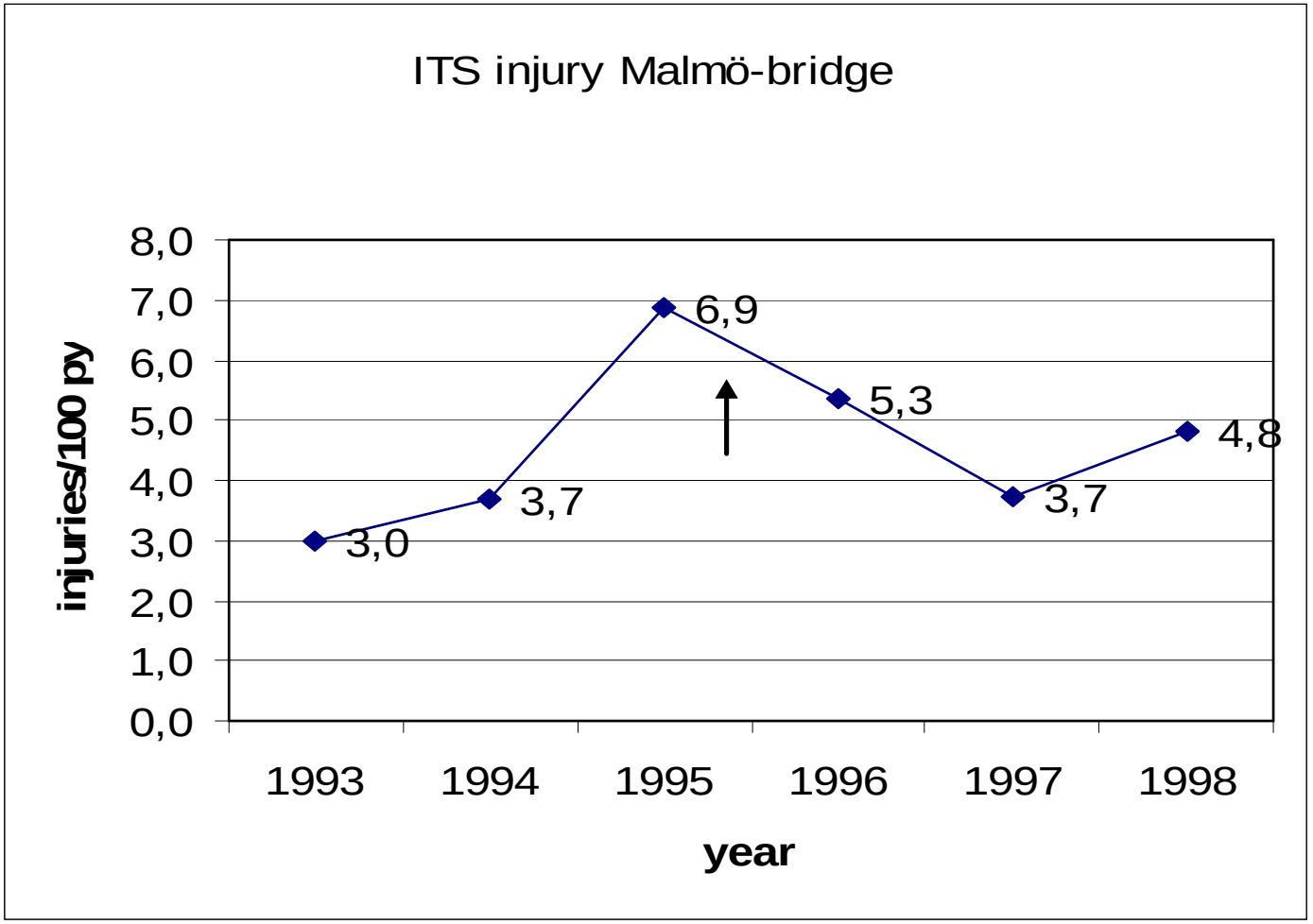
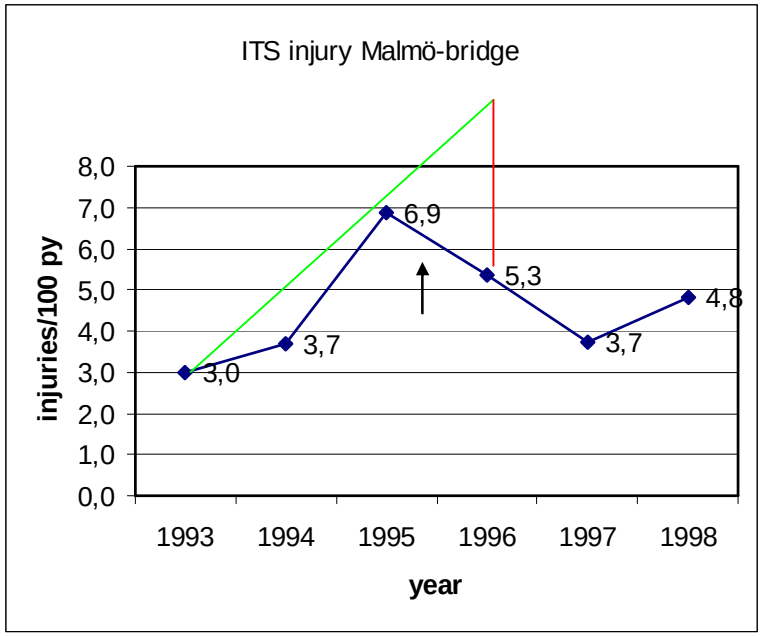


Fig. 2. Average number of constant-size prescriptions per continuously eligible Medicaid patient per month among multiple drug recipients (2).

Time-series injuries OSH

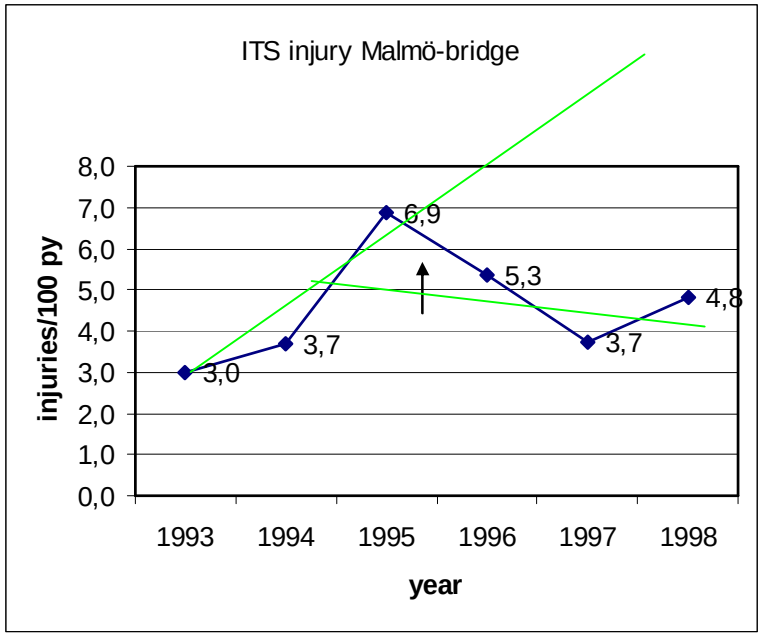


Time-series injuries



- Changes:
  - Injury Level Change
    - 3.8/ 100 personyears
      SE 1.1 p 0.08

Time-series injuries



- Changes:
  - Injury Level Change
    - 3.8/ 100 personyears
      SE 1.1 p 0.08
  - Injury Trend Change
    - 2.7/ 100 personyears /year
      SE 0.5 p 0.04
      - pre-intervention trend 2.2
      - post-intervention trend: -0.5

How to calculate

Time	Injury	Intervention	Pre Time	Post Time
1	3,0	0	1	0
2	3,7	0	2	0
3	6,9	0	3	0
4	5,3	1	4	0
5	3,7	1	4	1
6	4,8	1	4	2

How to calculate: Arima Regression

```
. prais injuries time intervention posttime, rhotype(regress)
      Prais-Winsten AR(1) regression -- iterated estimates
      Source |       SS       df       MS              Number of obs =       6
-------------+------------------------------           F(  3,     2) =   39.95
       Model |  52.3674093     3  17.4558031           Prob > F      =  0.0245
    Residual |  .873854462     2  .436927231           R-squared     =  0.9836
-------------+------------------------------           Adj R-squared =  0.9590
       Total |  53.2412638     5  10.6482528           Root MSE      =    .661
------------------------------------------------------------------------------
    injuries |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        time |   2.176081   .4314862     5.04   0.037     .3195455    4.032616
intervention |  -3.750879   1.137339    -3.30   0.081    -8.644454    1.142696
    posttime |  -2.676039   .5209576    -5.14   0.036    -4.917539   -.4345397
       _cons |   .0524371   .9178175     0.06   0.960    -3.896613    4.001487
-------------+----------------------------------------------------------------
                                 rho |  -.8155088
------------------------------------------------------------------------------
               Durbin-Watson statistic (original)    3.000553
               Durbin-Watson statistic (transformed) 2.992184
```

arima= linear autoregressive moving-average

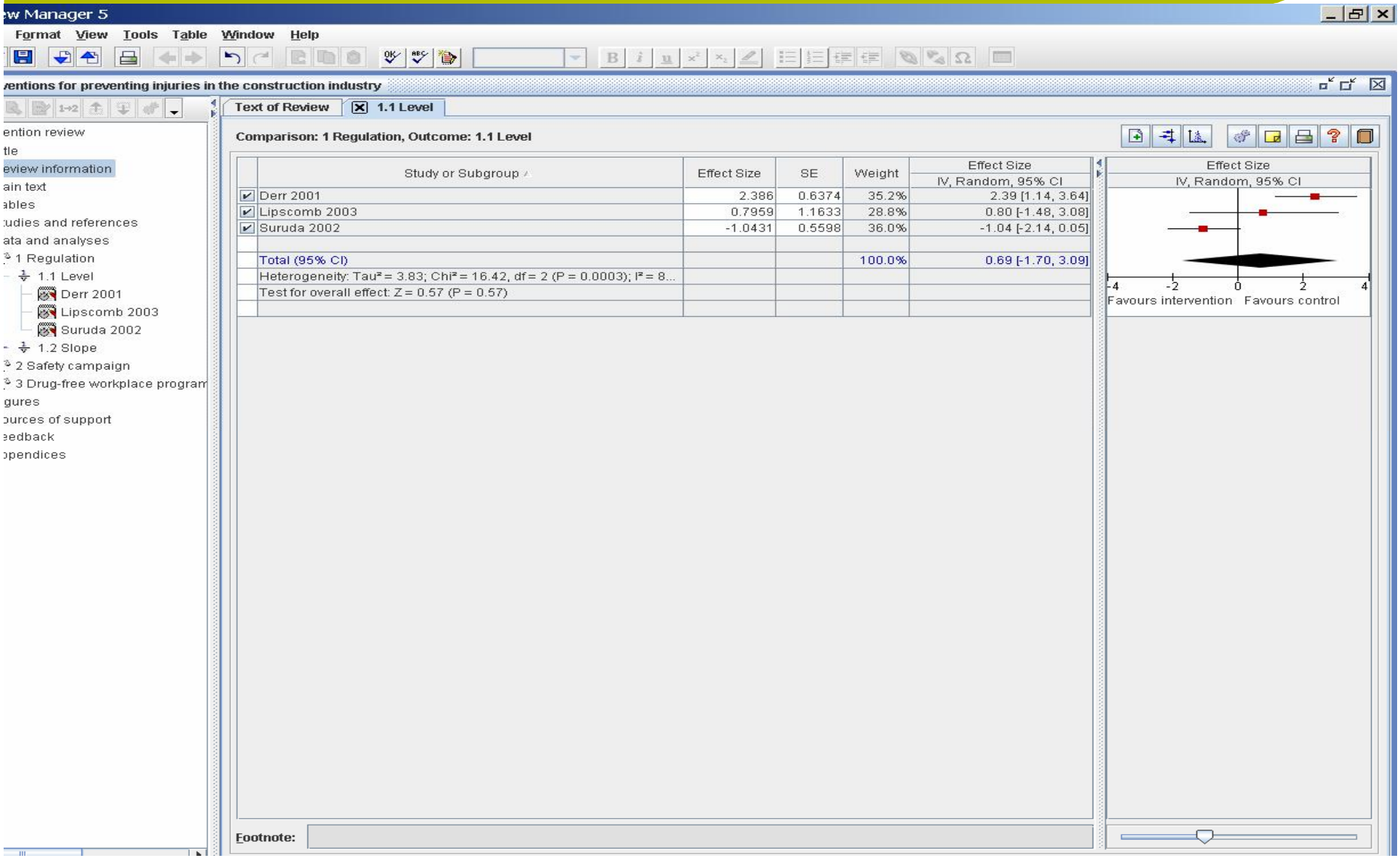
Quality Criteria / Risk of Bias

1. Intervention independent from other changes
2. Intervention did not affect data collection
3. Outcome blindly assessed
4. Reliable outcome measure
5. Each time point covers 80% of participants
6. Prespecified shape of the intervention effect
7. Rationale for number and spacing of data
8. Testing with Arima or Time Series Regression

Meta-analysis of ITS

- Ramsay 2004
  - Standardise data by dividing Level/Slope and Standard Error by Standard Deviation of pre-intervention slope
    - Standardised Level = Effect Size = Standardised Mean Difference
    - Standardised Slope = Effect Size = Standardised Mean Difference
  - Put Effect Sizes for Level and Slope in RevMan5 with Generic Inverse Variance method

Level Generic Inverse Variance RevMan5



Exercise

- Take the article of Suruda 2002
  - extract the data to be analysed.
  - assess the quality with the checklist
  - do you agree with the author's conclusion that this is evidence of effectiveness of OSHA regulation?