Tips and tricks for performing standard meta-regression analysis with SPSS

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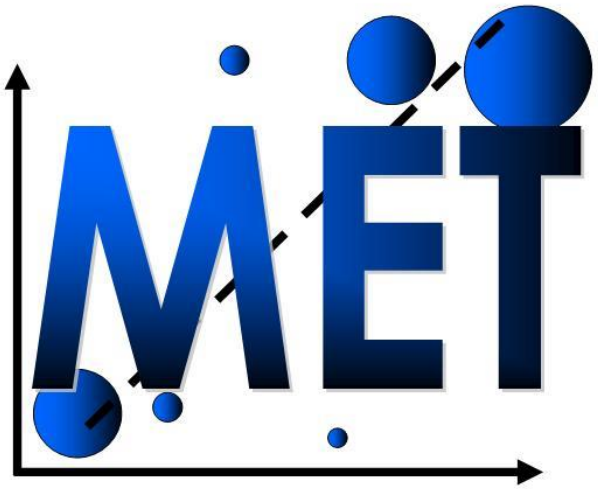
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Some bare facts

- A meta-regression analysis is a type of statistical analysis exploiting datasets build during systematic reviews
- It quantitatively explores interactions between a given effect (eg the risk of an event in patients treated with A vs B, as expressed with odds ratios) and a moderator or covariate of interest (eg prevalence of diabetes mellitus in each study)
- The key aspect of meta-regression is that each single study is given a specific weight which corresponds to its precision and/or size (to performed a weighted least squares [WLS] linear regression)

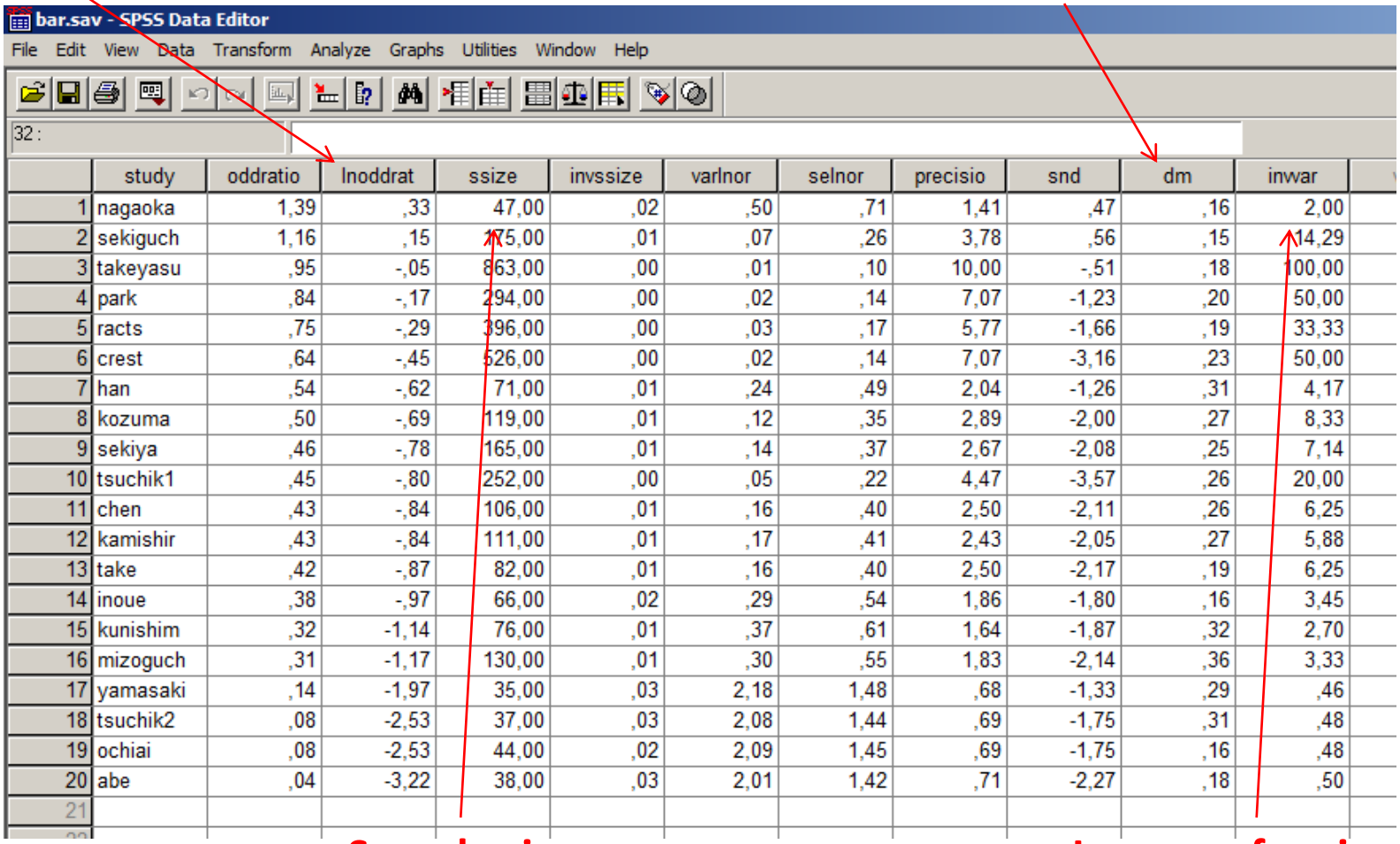
Building your dataset

- To perform a standard (fixed-effect) meta-regression analysis with SPSS, it is crucial to compute and extract from each individual study:
  - Natural log of odds ratios (OR): ln OR
  - Standard error (SE) of OR (or √variance)
  - Variance of OR (or SE^2)
  - Inverse of variance: 1/variance
  - Sample size: N
  - Moderators (ie covariates or independent variables) of interest (eg prevalence [in %] of diabetes mellitus [DM] in each study)

Building your dataset

Ln OR

Moderator or covariate (eg DM)



bar.sav - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Window Help

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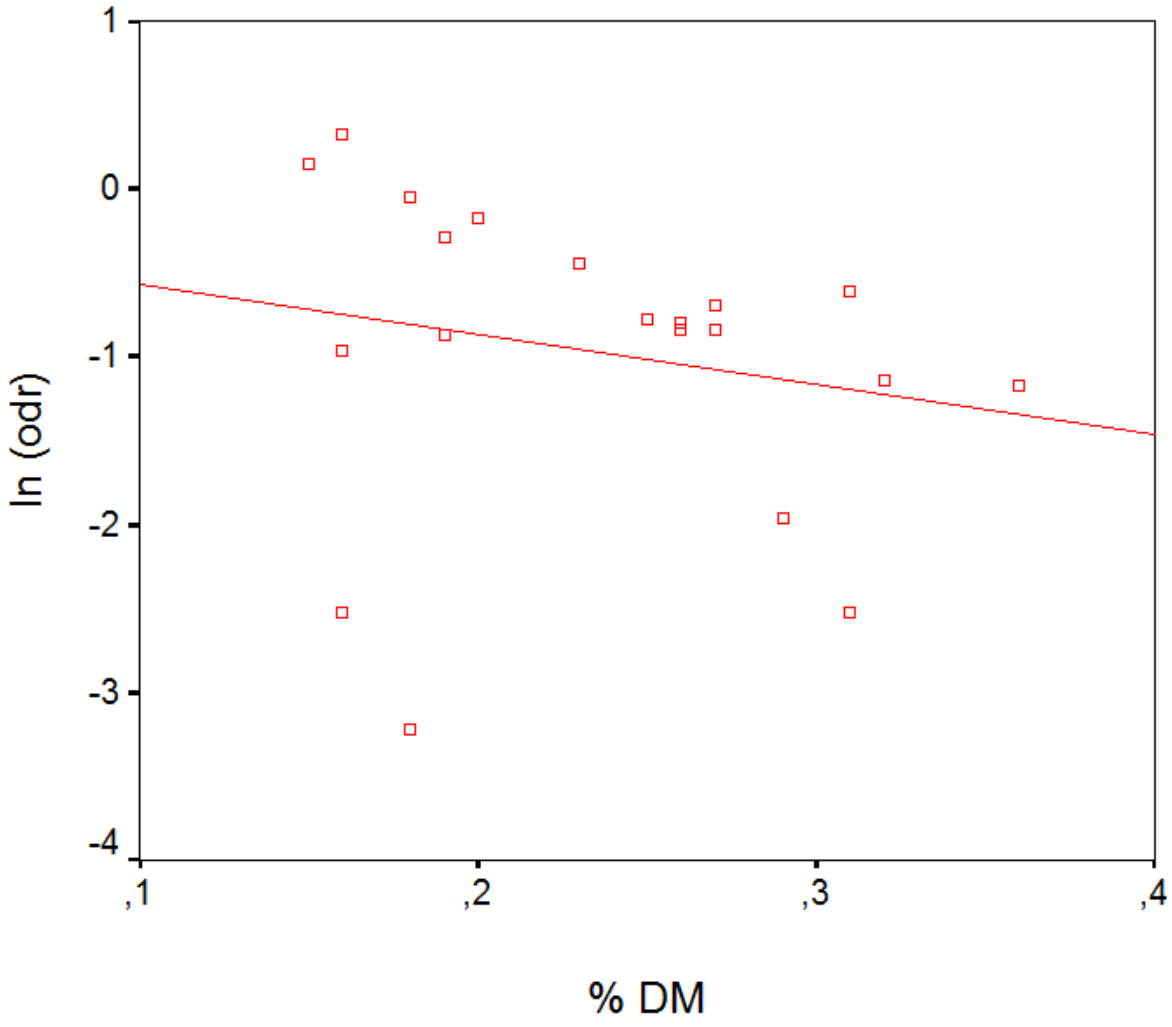
	study	oddratio	lnoddrat	ssize	invssize	varlnor	selnor	precisio	snd	dm	invar
1	nagaoka	1,39	,33	47,00	,02	,50	,71	1,41	,47	,16	2,00
2	sekiguch	1,16	,15	175,00	,01	,07	,26	3,78	,56	,15	14,29
3	takeyasu	,95	-,05	863,00	,00	,01	,10	10,00	-,51	,18	100,00
4	park	,84	-,17	294,00	,00	,02	,14	7,07	-1,23	,20	50,00
5	racts	,75	-,29	396,00	,00	,03	,17	5,77	-1,66	,19	33,33
6	crest	,64	-,45	526,00	,00	,02	,14	7,07	-3,16	,23	50,00
7	han	,54	-,62	71,00	,01	,24	,49	2,04	-1,26	,31	4,17
8	kozuma	,50	-,69	119,00	,01	,12	,35	2,89	-2,00	,27	8,33
9	sekiya	,46	-,78	165,00	,01	,14	,37	2,67	-2,08	,25	7,14
10	tsuchik1	,45	-,80	252,00	,00	,05	,22	4,47	-3,57	,26	20,00
11	chen	,43	-,84	106,00	,01	,16	,40	2,50	-2,11	,26	6,25
12	kamishir	,43	-,84	111,00	,01	,17	,41	2,43	-2,05	,27	5,88
13	take	,42	-,87	82,00	,01	,16	,40	2,50	-2,17	,19	6,25
14	inoue	,38	-,97	66,00	,02	,29	,54	1,86	-1,80	,16	3,45
15	kunishim	,32	-1,14	76,00	,01	,37	,61	1,64	-1,87	,32	2,70
16	mizoguch	,31	-1,17	130,00	,01	,30	,55	1,83	-2,14	,36	3,33
17	yamasaki	,14	-1,97	35,00	,03	2,18	1,48	,68	-1,33	,29	,46
18	tsuchik2	,08	-2,53	37,00	,03	2,08	1,44	,69	-1,75	,31	,48
19	ochiai	,08	-2,53	44,00	,02	2,09	1,45	,69	-1,75	,16	,48
20	abe	,04	-3,22	38,00	,03	2,01	1,42	,71	-2,27	,18	,50
21											

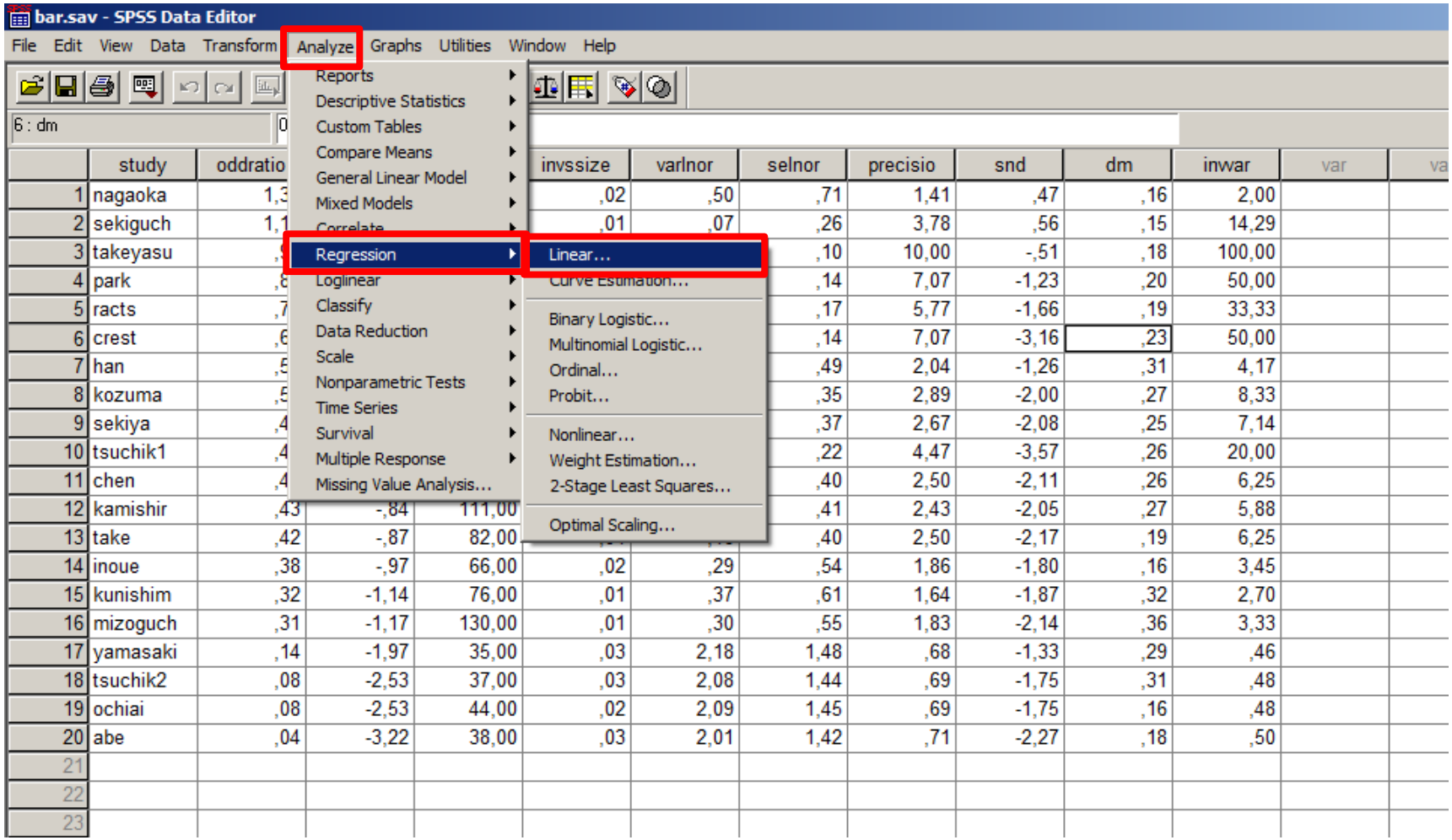
Sample size

Inverse of variance

Scatterplot



Analysis with SPSS



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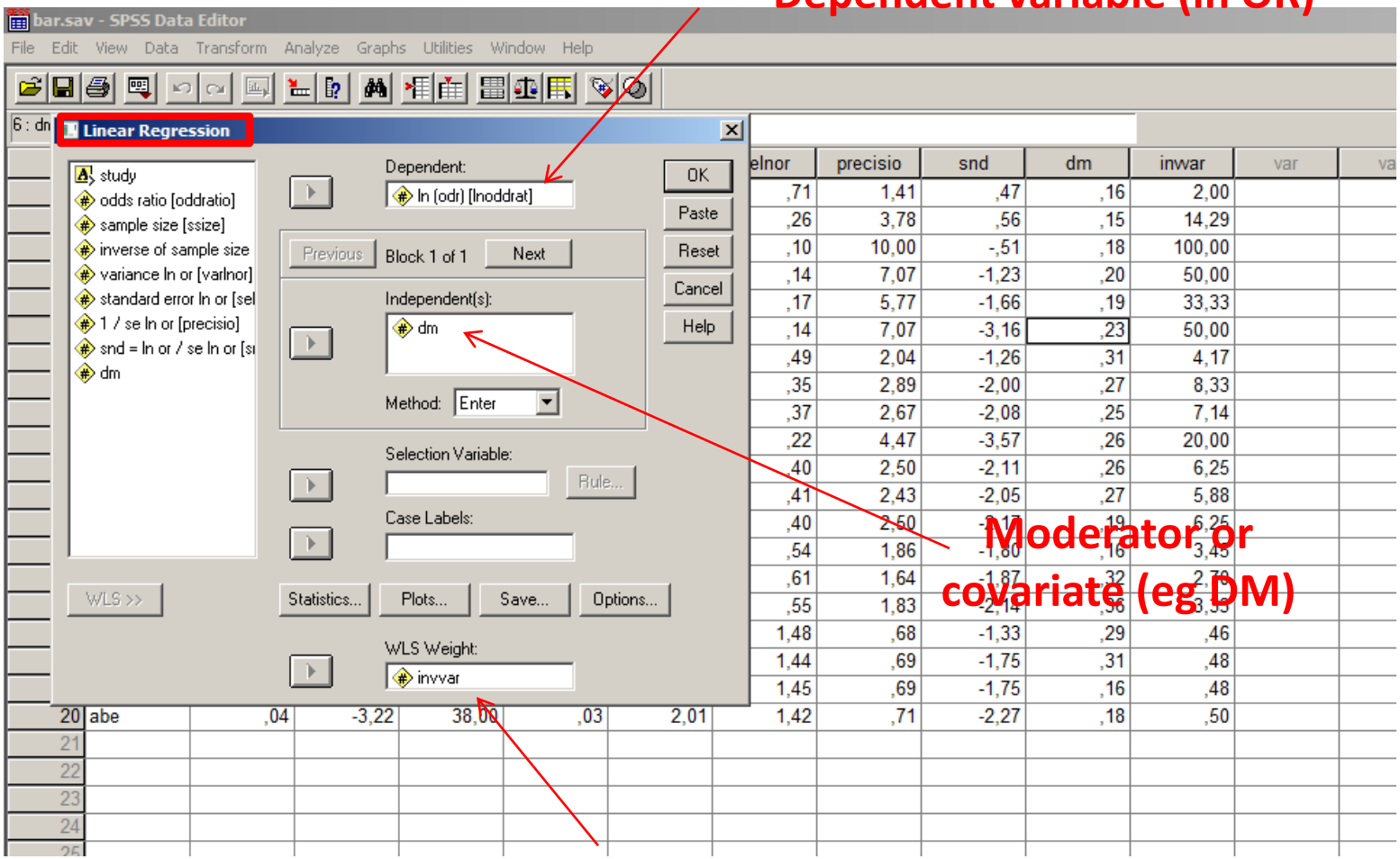

Results with SPSS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,742[a]	,551	,526	1,01899

a. Predictors: (Constant), DM

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22,957	1	22,957	22,109	,000[a]
	Residual	18,690	18	1,038		
	Total	41,647	19			

a. Predictors: (Constant), DM

b. Dependent Variable: ln (odr)

c. Weighted Least Squares Regression - Weighted by INVVAR

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,110	,310		3,575	,002
	DM	-6,906	1,469	-,742	-4,702	,000

a. Dependent Variable: ln (odr)

b. Weighted Least Squares Regression - Weighted by INVVAR

Beta (meta-regression coefficient)

P value for interaction

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Reporting results

- In our example, we can conclude that we found *a significant interaction between the treatment* of interest vs the comparator (expressed as ln OR) *and the prevalence of diabetes (beta=-6,9, p<0.001)*.
- Thus *treatment A becomes significantly more beneficial than treatment B with an increasing prevalence of diabetes*

Further details

- Any SPSS version can be used (eg 11.0 [the version used in these examples] to 16.0)
- In selected cases, sample size can be used instead of the inverse of variance as weight for the regression analysis (yielding in this example beta=-6.1, p=0.018)
- This type of meta-regression is based on a fixed-effect method, but other approaches are needed for a random-effect meta-regression (eg GLM)
- Examples of similar meta-regression analyses:
  - Biondi-Zoccai et al, *American Heart Journal* 2005;149:504-11
  - Biondi-Zoccai et al, *American Heart Journal* 2007;153:587-93
  - Biondi-Zoccai et al, *American Heart Journal* 2008;155:1081-9

For further slides on meta-analysis, evidence-based medicine or similar topics please feel free to visit:

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http://www.imcsc-group.com