



B.I.R.O.

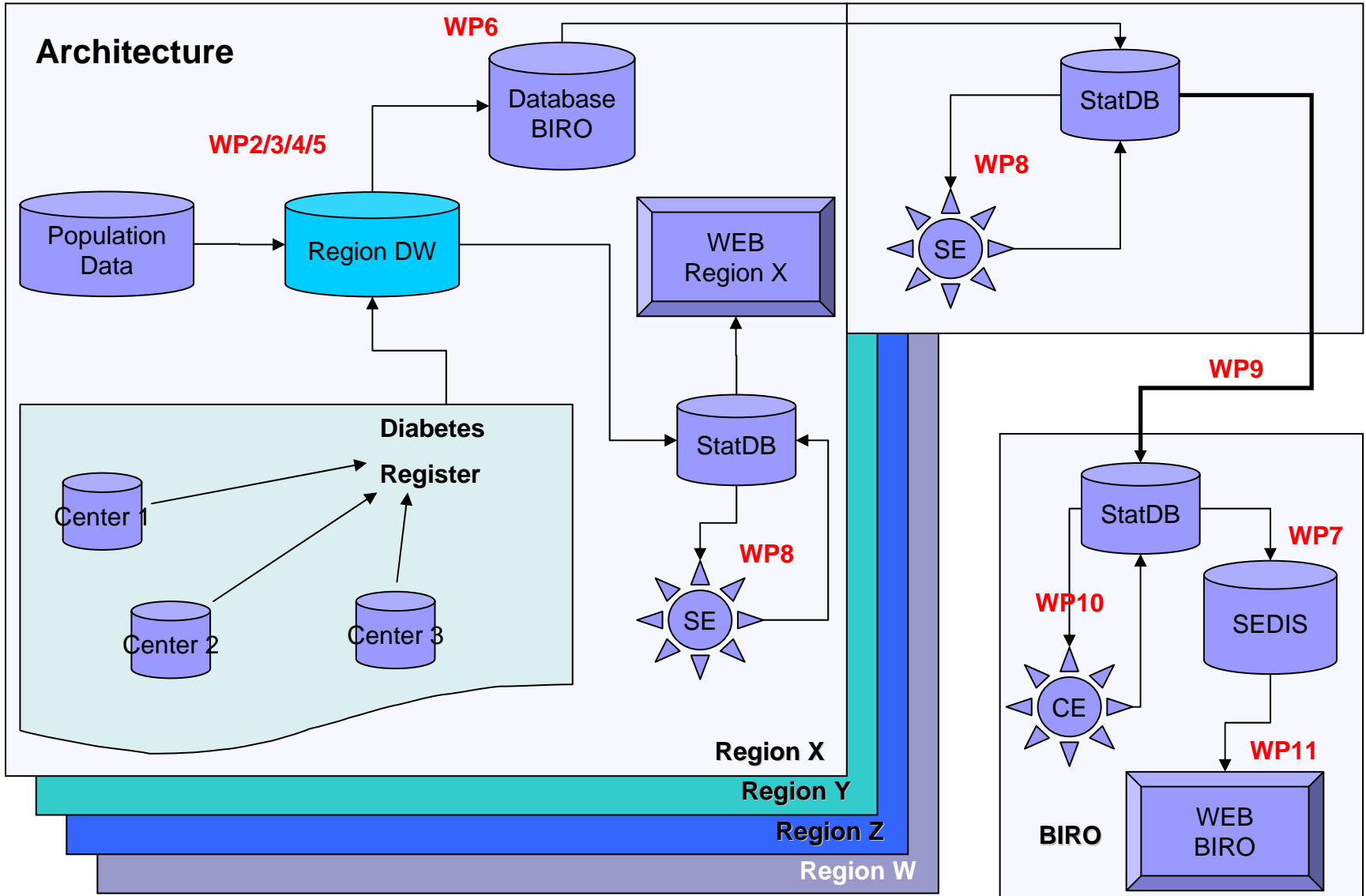
Best Information through Regional Outcomes

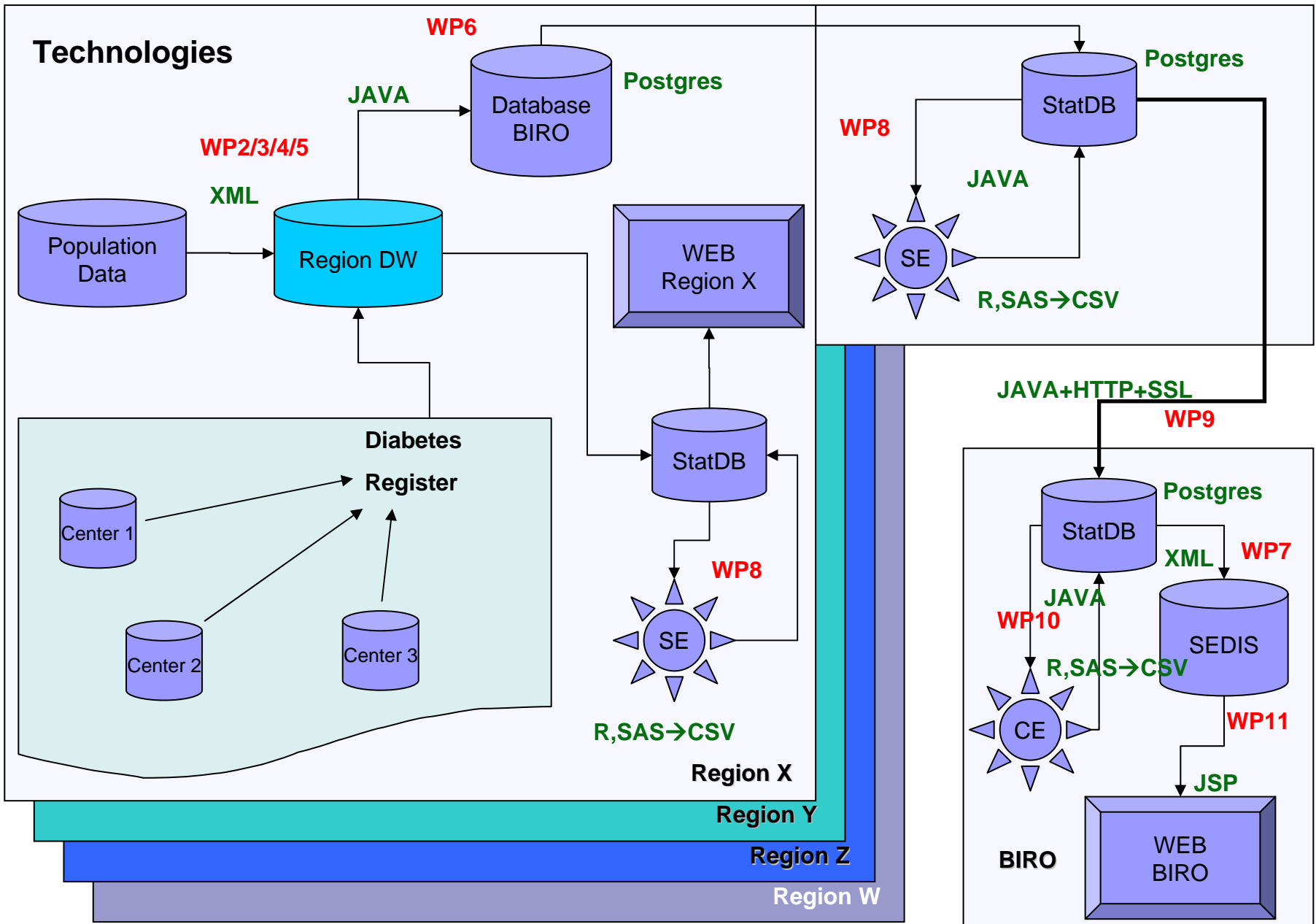
A European Public Health Project, DG-SANCO, 2005-2008

Building the B.I.R.O. database

Statistical Analysis

BIRO Graz Meeting, 29-30 September 2006







Statistical Analysis

Delivery of integrated, automatic reports for each region and the EU, stratified by selected criteria (GP, primary care group, local health authority, region)

OUTPUTS:

- Tables
- Graphs (histograms, boxplots, maps, trends)
- Modeling (regression parameters)
- Benchmarking (O-E, Starplots)



Added value of the BIRO statistical model

BIRO Model (based on regional outcomes)

$$Y(\%) = B_0 + B_1(\text{Female}) + B_1(\text{Age}) + B_2(\text{Diabetes Duration}) + \dots$$

↓ ↓ ↓ ↓

Any EU Region

$$\text{Predicted } Y_i = B_0 + B_1(\text{Female})_i + B_1(\text{Age})_i + B_2(\text{Diabetes Duration})_i + \dots$$

$$\sum \text{Pred}_i \times 100 = \text{Expected Rate}$$

$$\text{Standardized Rate} = (\text{observed rate} - \text{expected rate}) + \text{population rate}$$

$$[\text{Standard Error} = \text{RMSE} \times \sqrt{n}]$$



Benchmark

Summary Benchmarking Interval:

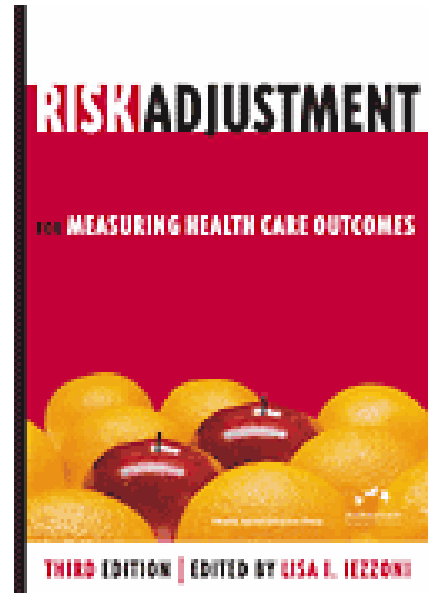
$$(O-E)/E \% \pm 1.96 SE$$

WHERE DO YOU STAND?



Reference

- **Risk Adjustment for Measuring Healthcare Outcomes, 3rd Edition**
edited by Lisa I. Iezzoni, M.D. 508 pp, ISBN AcademyHealth & Health Administration Press
August 2003, Price: \$94.00





Hba1c Rates at 12 mts

Results 2003-2004 by district

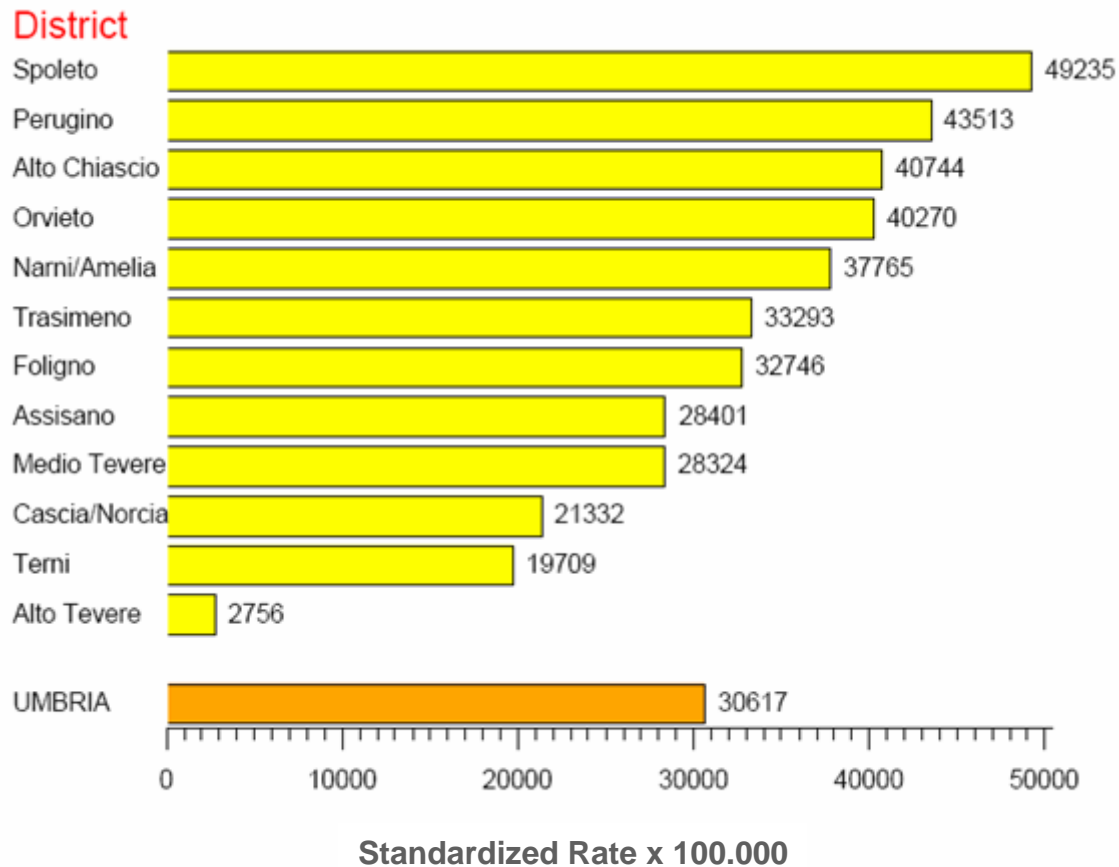
(administrative data only)

District	DEN. (Residenti)	NUM. HbA1c Osservati [O]	Rate HbA1c (x100,000)	Standardized Rate x 100,000 (I.C.95%)	HbA1c Expected [E]	[(O-E)/E]% (I.C.95%)
Alto Tevere	7900	387	2449	2756 (1944-3567)	2395	-91.9 (-94.6,-89.2)
Alto Chiascio	1333	1085	40698	40744 (38769-42719)	408	+33.1 (+26.7,+39.6)
Perugino	12462	10942	43901	43513 (42867-44159)	3864	+41.6 (+39.5,+43.7)
Assisano	4151	2372	28571	28401 (27282-29520)	1278	-7.2 (-10.8,-3.6)
Medio Tevere	3877	2201	28385	28324 (27166-29482)	1189	-7.5 (-11.3,-3.7)
Trasimeno	4070	2727	33501	33293 (32162-34423)	1255	+8.7 (+5.0,+12.3)
Cascia/Norcia	1242	513	20652	21332 (19286-23378)	372	-31.0 (-37.9,-24.2)
Foligno	8038	5226	32508	32746 (31942-33551)	2442	+7.0 (+4.4,+9.7)
Spoletto	4370	4276	48924	49235 (48145-50326)	1324	+61.4 (+57.8,+65.0)
Terni	10320	4026	19506	19709 (18999-20419)	3139	-35.9 (-38.2,-33.5)
Narni/Amelia	4901	3717	37921	37765 (36735-38795)	1508	+23.2 (+19.9,+26.6)
Orvieto	4527	3672	40557	40270 (39198-41342)	1399	+31.2 (+27.8,+34.7)
UMBRIA	67191	41144	30617			



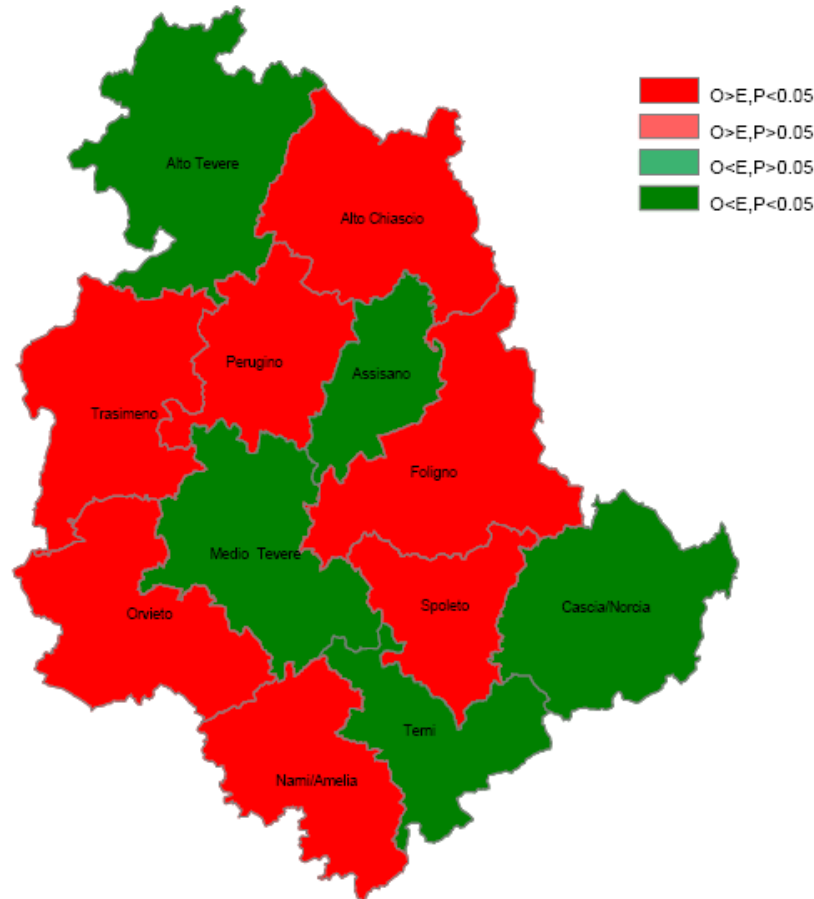
Hba1c Rates at 12 mts

Average 2003-2004 by district
(administrative data only)





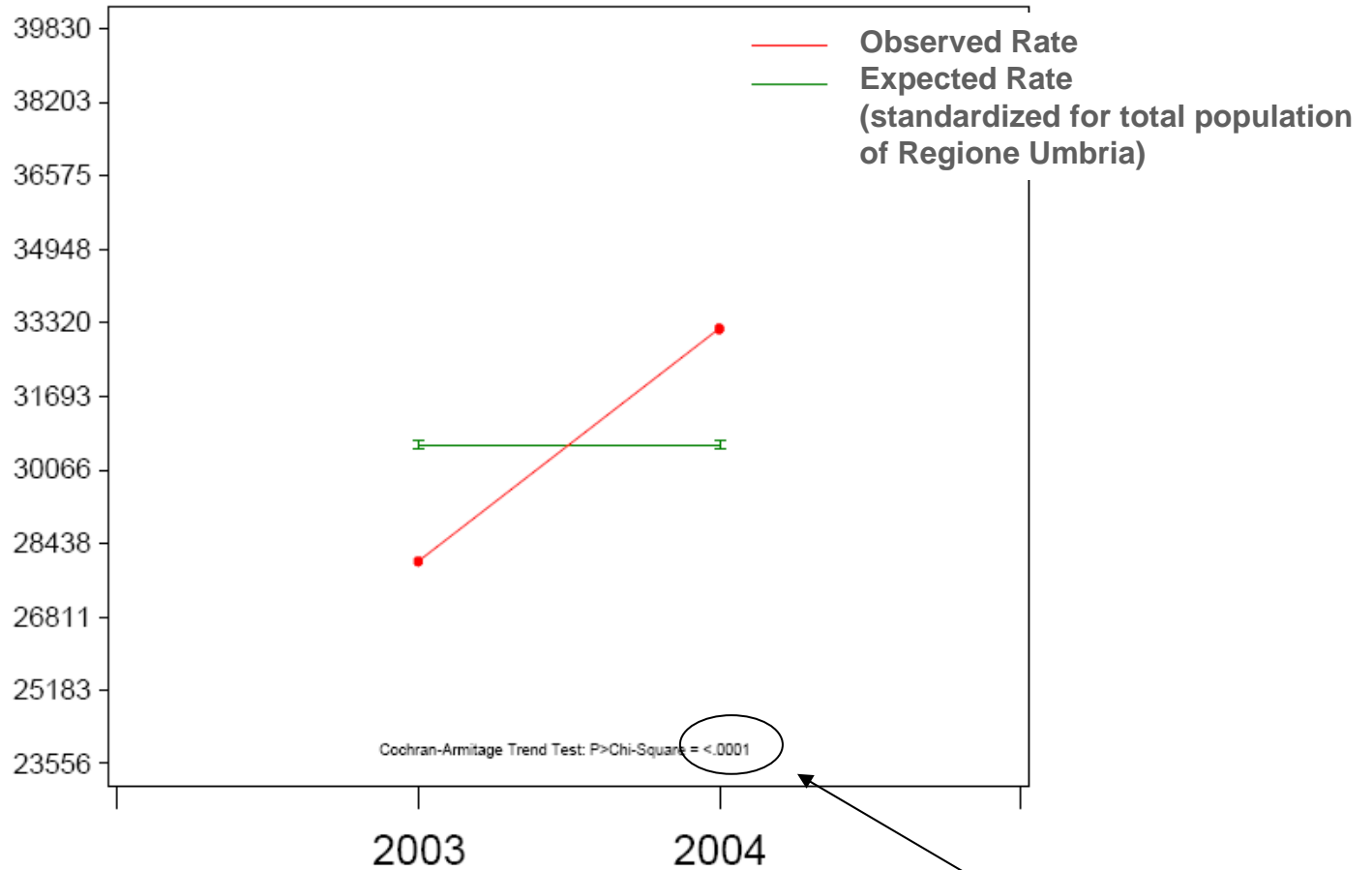
Hba1c Rates at 12 mts (O-E)/E by District





Hba1c Rates at 12 mts

Trend



Trend



Adjustment Model

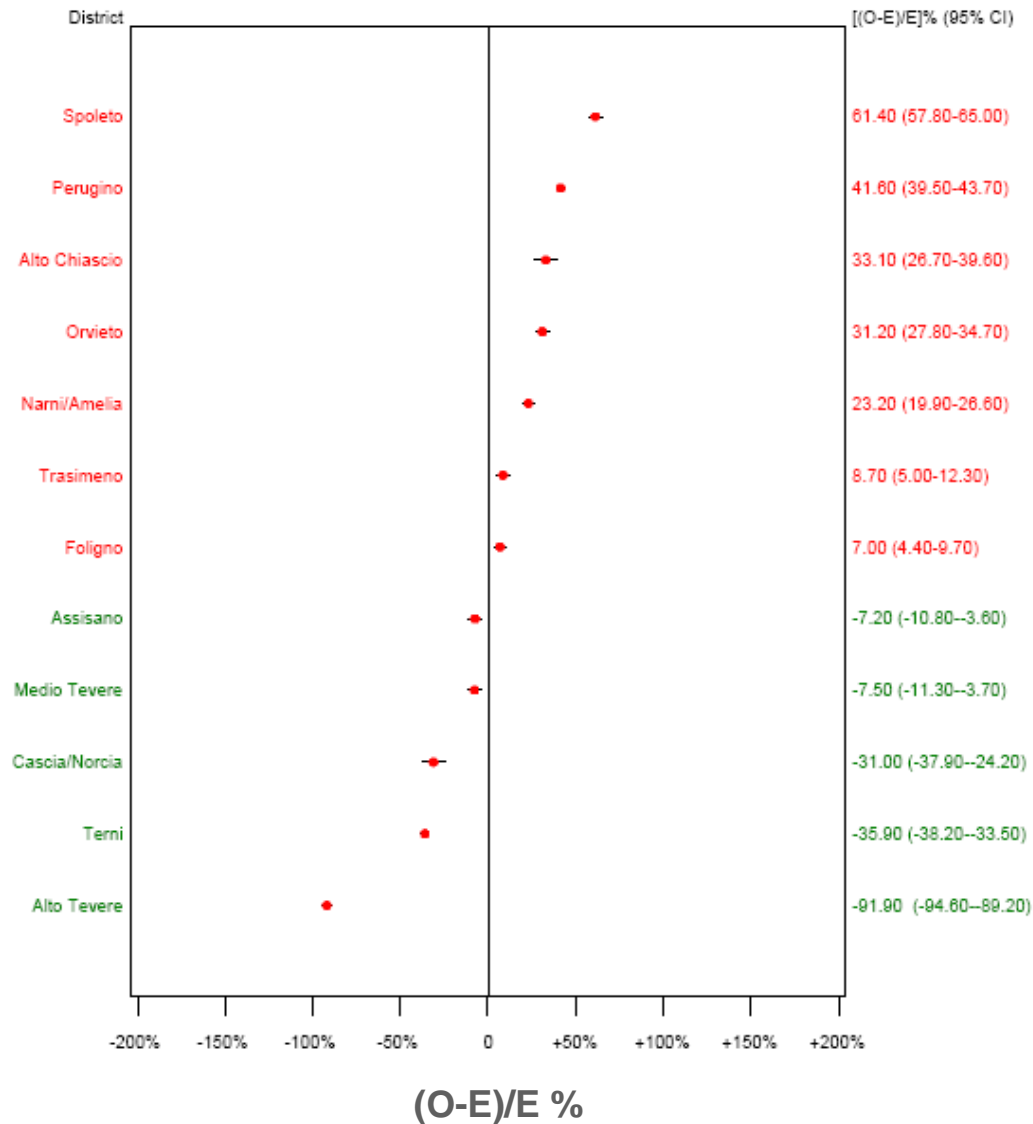
Overall

- Wider Population
- Across multiple years
- Allows external O-E calculation (no need to run analysis for third parties)

PARM	ESTIMATE	LOWERCL	UPPERCL	Pr > t
Intercept	0.3250605925	0.3153156569	0.3348055280	<.0001
FEMMINE[1]	0.0049937588	-0.0090519072	0.0190394247	0.4859
ETA[18-25<]	-0.0697856245	-0.1186184918	-0.0209527572	0.0051
ETA[25-30<]	-0.0819322556	-0.1283113391	-0.0355531720	0.0005
ETA[30-35<]	-0.0375067808	-0.0746722853	-0.0003412763	0.0479
ETA[35-40<]	-0.0675092825	-0.0980645572	-0.0369540079	<.0001
ETA[40-45<]	-0.0428196762	-0.0680867767	-0.0175525757	0.0009
ETA[45-50<]	0.0169323229	-0.0046173019	0.0384819476	0.1236
ETA[50-55<]	0.0043081031	-0.0130181474	0.0216343536	0.6260
ETA[55-60<]	0.0156567426	0.0004881087	0.0308253765	0.0431
ETA[65-70<]	0.0308801908	0.0178035602	0.0439568215	<.0001
ETA[70-75<]	0.0211240991	0.0090546001	0.0331935982	0.0006
ETA[75-80<]	-0.0196595893	-0.0320425286	-0.0072766499	0.0019
ETA[80-85<]	-0.0679613760	-0.0812158839	-0.0547068680	<.0001
ETA[85>]	-0.1613021686	-0.1769277389	-0.1456765982	<.0001
FEMMINE*ETA[18-25<]	0.0195251775	-0.0443331411	0.0833834960	0.5490
FEMMINE*ETA[25-30<]	0.1060623473	0.0489239910	0.1632007036	0.0003
FEMMINE*ETA[30-35<]	0.0773626329	0.0323179720	0.1224072938	0.0008
FEMMINE*ETA[35-40<]	0.0865479856	0.0469336767	0.1261622944	<.0001
FEMMINE*ETA[40-45<]	0.0281415493	-0.0080122757	0.0642953743	0.1271
FEMMINE*ETA[45-50<]	-0.0180669549	-0.0508747929	0.0147408831	0.2804
FEMMINE*ETA[50-55<]	-0.0224957950	-0.0495956906	0.0046041005	0.1037
FEMMINE*ETA[55-60<]	0.0323617231	0.0095264279	0.0551970183	0.0055
FEMMINE*ETA[65-70<]	0.0222226256	0.0031015940	0.0413436572	0.0227
FEMMINE*ETA[70-75<]	0.0044304500	-0.0128522780	0.0217131780	0.6154
FEMMINE*ETA[75-80<]	0.0168974401	-0.0003973646	0.0341922447	0.0555
FEMMINE*ETA[80-85<]	0.0284172456	0.0105468641	0.0462876271	0.0018
FEMMINE*ETA[85>]	-0.0066206350	-0.0269079848	0.0136667148	0.5224



O-E Standardized Benchmark





BIRO Stat Basic Plan

- All regions to export Data Dictionary Data and submit to the Local Statistical Engine
- Crunch numbers to produce regional reports
- Transfer **at least** (*P.I.A.*) aggregated tables to the BIRO server, stratified by levels of adjustment variables and outcome (weighted analysis)
- Compute overall indicators and EU models via Central Statistical Engine
- Use EU Models to estimate regional and sub-regional O-E via Local Statistical Engine
- Use regional aggregated data to investigate the role of potential determinants on the variability of quality of care and outcomes in diabetes