Andrea Werdecker, Ulrich Mueller

Regional Differences in Diabetes Mellitus Type 2 (T2DM) Morbidity and Mortality in North America and Europe: Reality or Measurement Artefact?

Extended Abstract Prepared for Presentation at PAA 2013

Cancer, the Metabolic Syndrome and Dementias are the dominant health problems in aging societies, T2DM advancing at least the second and third one. There are considerable regional differences in T2DM prevalence which may be questioned, since today most new cases in North America and in Europe are found in screening or as co-morbidity. Accounting for undiagnosed T2DM is questionnable.

1. The OECD[1] multiplied observed prevalence for the UK by 1,5 and doubled for other European countries. In the US[2], the lowest prevalence of diabetes is found in the Midwest and Northeast, the highest in Southern and Appalachian states, with a variation of app. 150% as compared to the lowest, applying for men and for women, and for younger and older (60+) alike. In the European Union, prevalence variation for ages 20-79 is even higher at 180-200% highest in Portugal, Germany vs. UK, Sweden. However, when correlated[3] with variation in obesity or in mortality from ischemic heart disease and stroke – prevalences or events much easier to determine than diabetes - this variation seems plausible, and is good news since it justifies region specific prevention strategies.

Among the 50 US states plus Washington D.C. (data from 2003-2010), if we correlate unweighted diabetes and adipositas prevalences, we get ordinal correlation coefficients between adipositas prevalence and diabetes prevalence at ages 30-59 of Kendals T_b = .444 at p<.0004, Gamma (being robust against outliers) = .451 at <.0004, Spearman's ρ=.546 at p<.0004; and at ages 60+ of Kendals T_b .328 at p=.001, Gamma = .333 at =.001, Spearman's ρ=.436 at p=.001.

Among the 20 European States for which the OECD 2010 has data for diabetes mellitus and adipositas (Bulgaria, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Turkey, but without the United Kingdom where OECD applies another technique of estimating undiagnosed cases of DM than in all other countries), if we correlate unweighted diabetes and adipositas prevalences, we get ordinal correlation coefficients between adipositas prevalence and diabetes prevalence at ages 20-79 of Kendals T_b = .265 at p<.150, Gamma= .266 at p<.150, Spearman's ρ=.363 at p<.121.

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[1] http://ec.europa.eu/health/reports/european/health_glance_2010_en.htm

[2] Danaei G, Friedman AB, Oza S Murray CJL, Ezzat M (2009) Diabetes prevalence and diagnosis in US states: analysis of health surveys. Population Health Metrics 2009, 7:16;
http://www.cdc.gov/obesity/data/adult.html
http://www.census.gov

[3] Diabetes and Adipositas Prevalences from OECD "Health at a Glance 2010"

A graphical representation of these associations can be found in figures 1, 2 and 3.

(insert Figures 1,2 and 3 here)

If we furthermore, unlike in previous publications[4], we use population sized weighted measures, taking into consideration the relative importance of region-specific influences, even if the regional sample size in surveys may be the same in smaller and larger populations, even stronger associations can be observed.

2. If "Undiagnosed Diabetes" is defined as such[5]:

1. Never received a diabetes diagnosis, never took antidiabetic medication.
2. Glycenated Haemoglobin (HbA1c) ≥ 6,5%
   OR
   Elevated Plasma Glucose
   - Fastening (≥ 8 h): ≥ 126 mg/dL (7,0 mmol/L)
   or
   - Occasional : ≥ 200 mg/dL (11,1 mmol/L)

then estimating undiagnosed T2DM, however, leads to much lower total prevalence than still assumed in authoritative sources.

In Germany, for example, undiagnosed diabetes then had a prevalence of 1.1% for females and 3.1% for males at ages 18-79, both sexes combined of 2.1% in 2010[6]. This is about 25-30% of the diagnosed cases, and way below the 100% suggested by the OECD in Health at a Glance 20120, for example.

Conclusion:

The current approach, extrapolating population diabetes prevalences from self declared cases of diagnosed diabetes mellitusfrom surveys of representative population samples, gives fairly valid results. Regional Differences in diabetes prevalences measured by this approach in the US or in Europe are real. A practical consequence is that region specific influences may play a significant role in the genesis of adipositas as well as diabetes and, therefore, effective prevention strategy should be region specific.

[4] Danaei G, Friedman AB, Oza S Murray CJL, Ezzat M (2009) Diabetes prevalence and diagnosis in US states: analysis of health surveys. Population Health Metrics 2009, 7:16;

[5] American Diabetes Association (ADA) 2010; Diabetes Care 33 (Suppl.1): S62-S69
WHO 2011; http:// www.who.int/diabetes/publications/report-hba1c_2011.pdf

[6] Christin Heidemann, Yong Du, Christa Scheidt-Nave (2012): Diabetes mellitus: How many adults in Germany have diabetes? Bundesgesundheitsbl DOI 10.1007/s00103-011-1504-5

Figure1

Adult Adipositas and Diabetes Age 30-59 Population Size Weighted Prevalences in US States

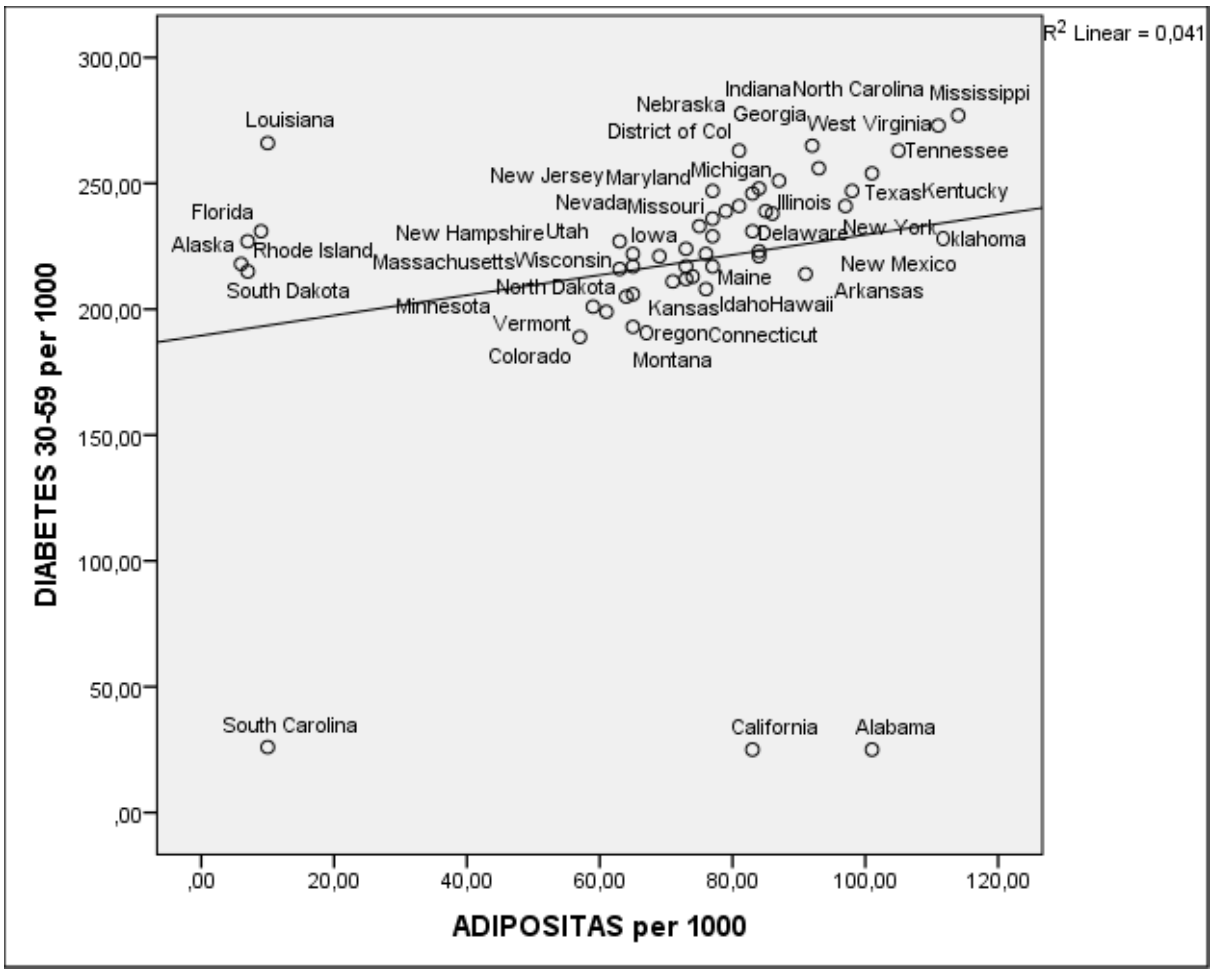

Figure2

Adult Adipositas and Diabetes Age 60+ Population Size Weighted Prevalences in US States

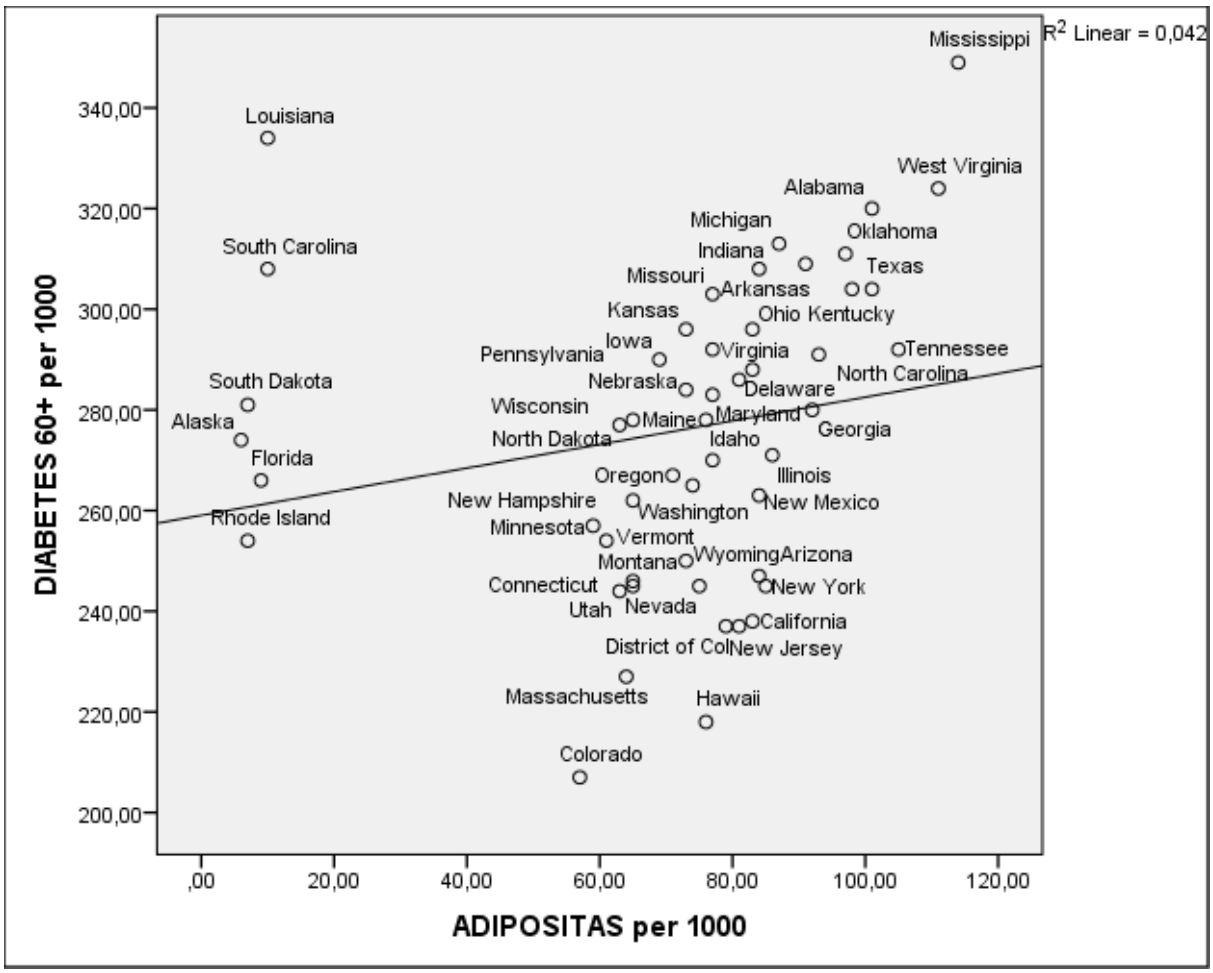

Figure 3

Adult Adipositas and Diabetes Population Size Weighted Prevalences in European Countries