

IDENTIFYING OUTLYING PRACTICES IN PREVALENCE OF CKD IN PRIMARY CARE

On behalf of the UK National Chronic Kidney Disease Audit (NCKDA),
commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England

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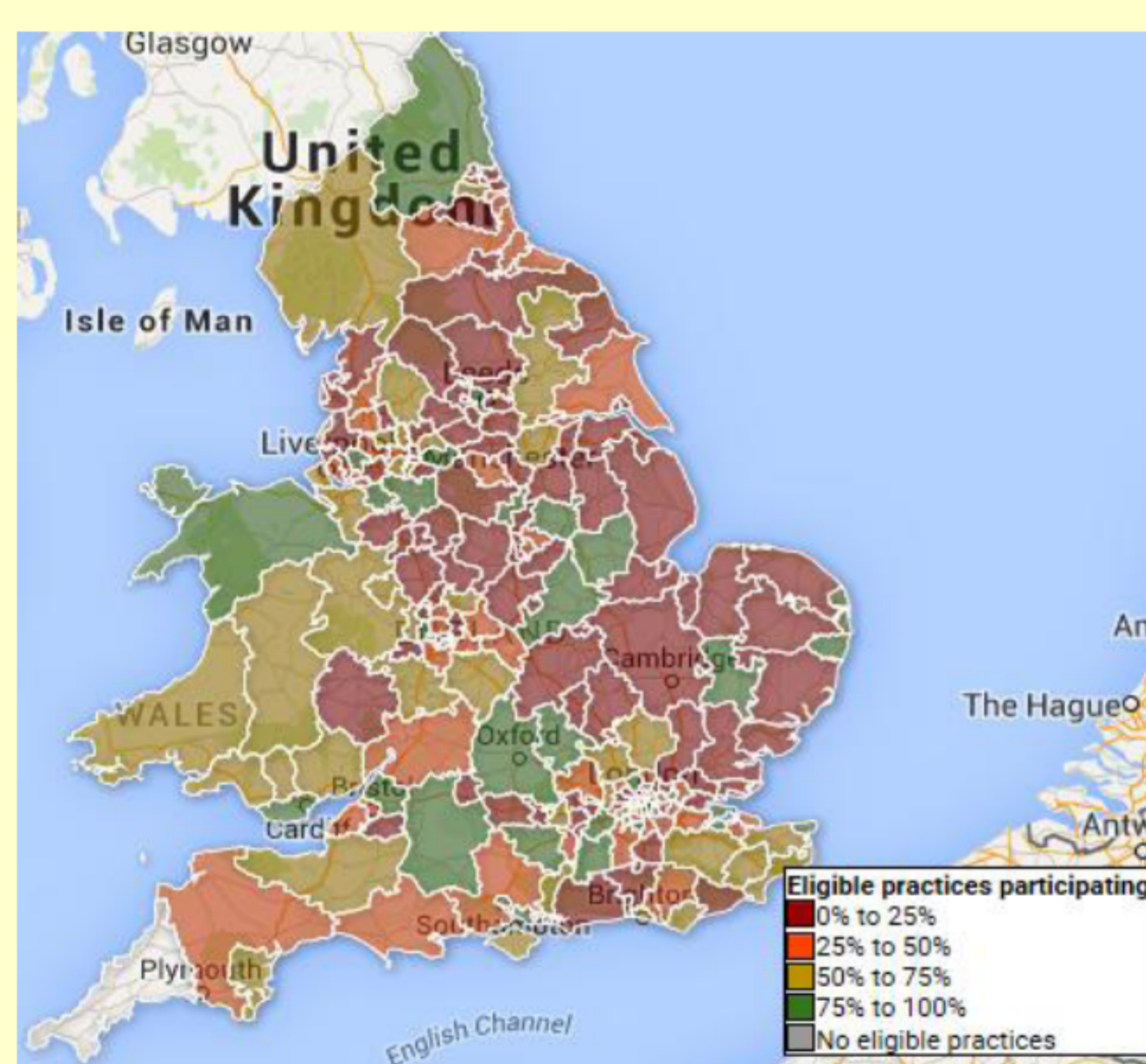
OBJECTIVES

- The National Chronic Kidney Disease Audit (NCKDA) is aimed at improving identification, management and outcomes for patients with CKD in England and Wales.
- **High variability** exists in coding of CKD between GP practices, due to a number of factors including differing practice risk profiles, testing effort and coding effort.
- **Funnel plot methodology** with adjustment for **overdispersion** is used in the audit to identify outlier practices, taking into account **variation in practice risk** as well as **unexplained variation** from unknown sources.

METHODS

- Data were extracted from **915 GP practices** in England and Wales in 2015.
- **Age-sex standardised CKD prevalence** was derived for all practices with available list size data.
- **Expected number of CKD cases** was derived for each practice using a **logistic regression** model, adjusted for practice-level diabetes, hypertension, CVD, index of multiple deprivation (IMD) and ethnicity.
- The **observed/expected ratio** was defined as the risk-adjusted performance measure for a practice.
- The magnitude of **overdispersion** was estimated directly from the data, and an overdispersion factor was derived assuming **multiplicative random-effects** to inflate control limits to reflect this further heterogeneity in GP practice CKD prevalence.
- **Winsorisation** was also applied to 10% of values in order to reduce the impact of **extreme values**.

RESULTS



Practice-level characteristics	Number of practices	Median (IQR)
List size (including under 18s)	756	7456 (4568, 10310)
Median age	756	40 (40, 45)
Female	756	49.4% (48.4%, 50.6%)
Median index of multiple deprivation	601	17179 (10575, 22866)
Black ethnicity	756	0.27% (0%, 1.27%)
Diabetes	756	6.1% (5.2%, 7.2%)
Hypertension	756	17.7% (15.0%, 20.4%)
CVD	756	6.2% (4.9%, 7.4%)
		Mean (SD)
Age-sex standardised CKD prevalence (%)	756	3.1% (1.2%)

Table 1: Summary of practice level characteristics

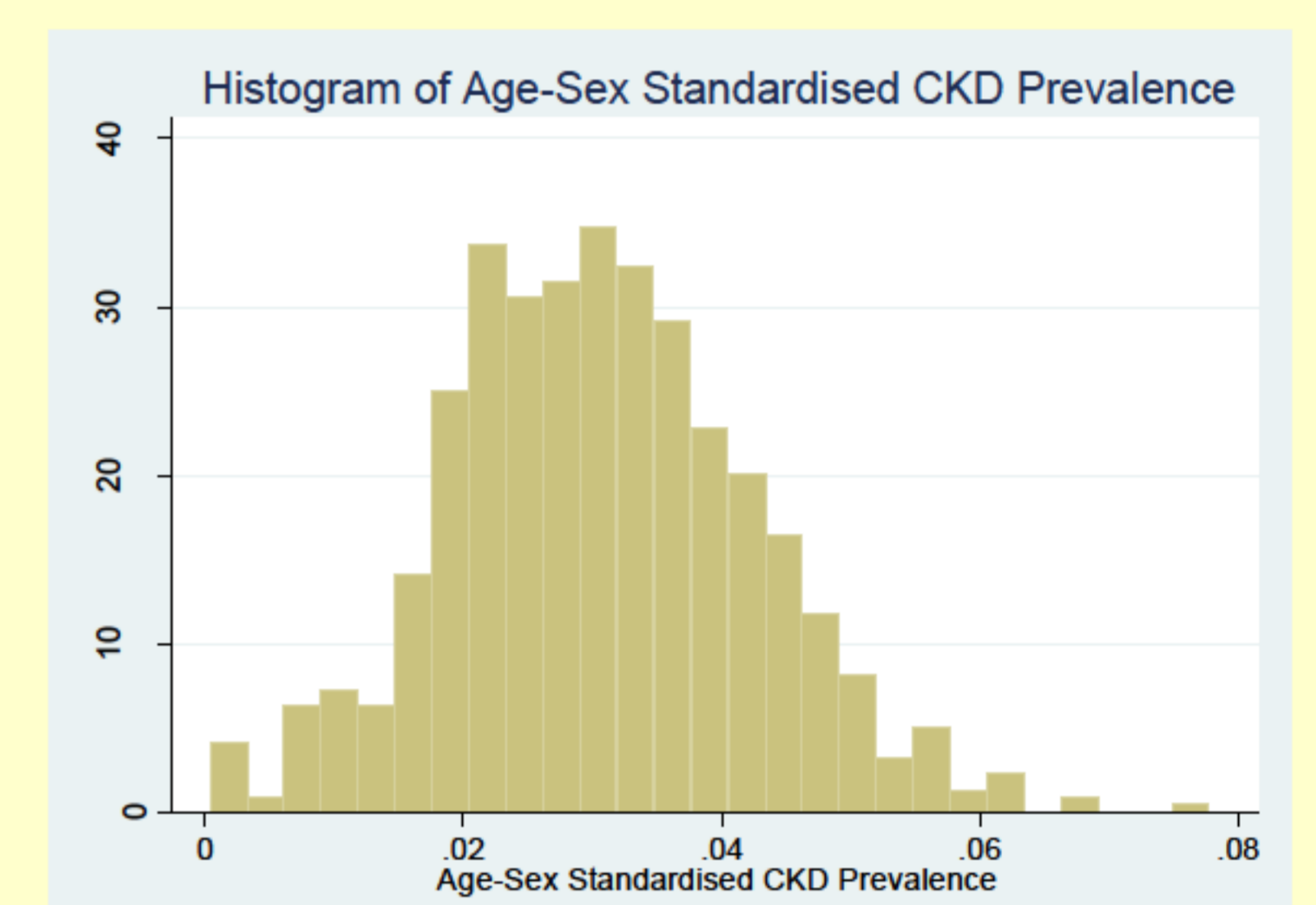


Figure 2: Histogram of age-sex standardised practice CKD prevalence

	Unadjusted	Adjusted for Practice Risk	Adjusted for Practice Risk & Overdispersion
Number of outlying practices identified (3SD)	226	239	20
Percentage of total practices analysed	30%	32%	2.6%

Table 2: Number of practices identified as outliers for low coded CKD prevalence for each analysis

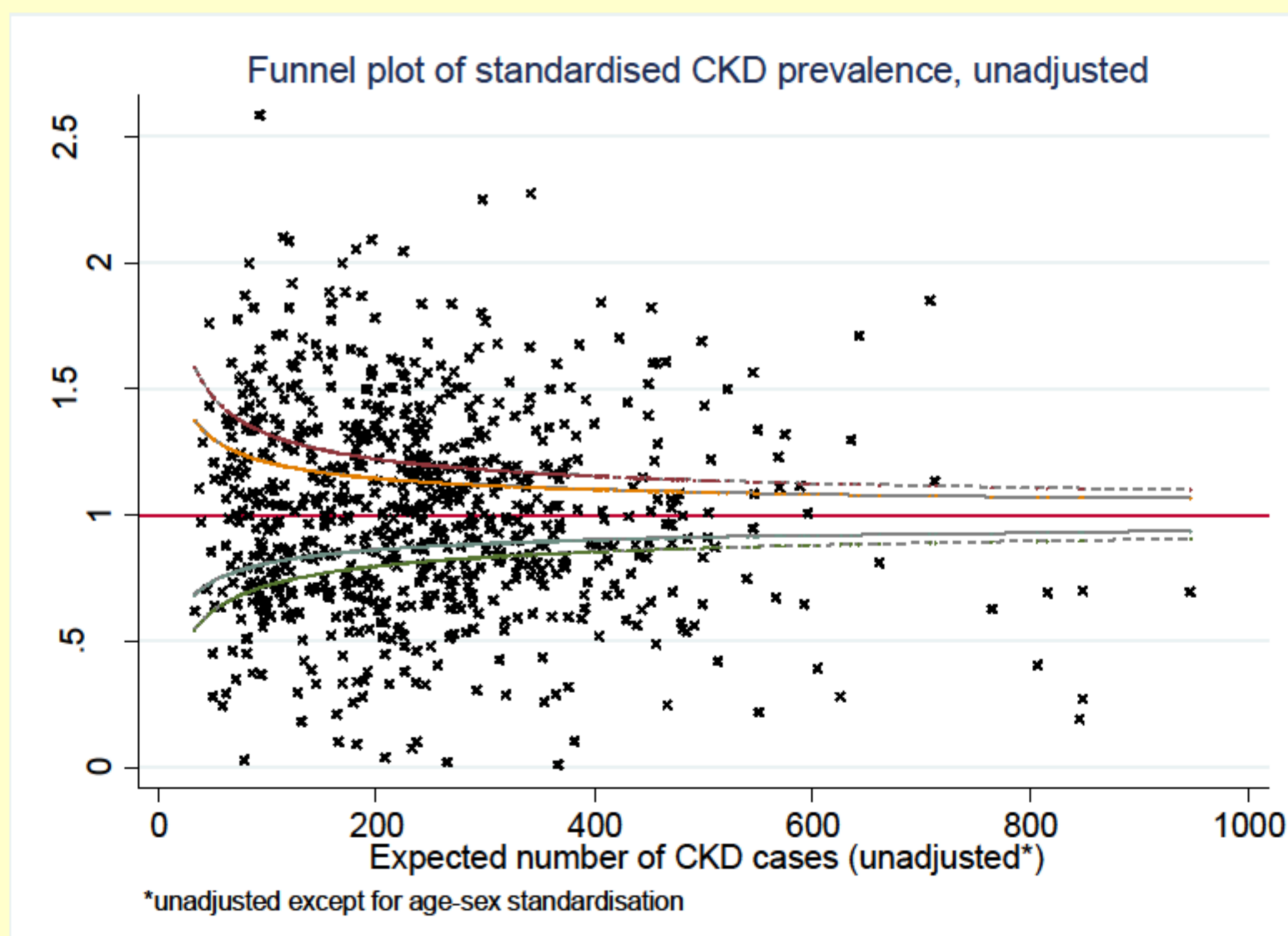


Figure 3: Funnel plot of standardised CKD prevalence, unadjusted for practice risk and overdispersion

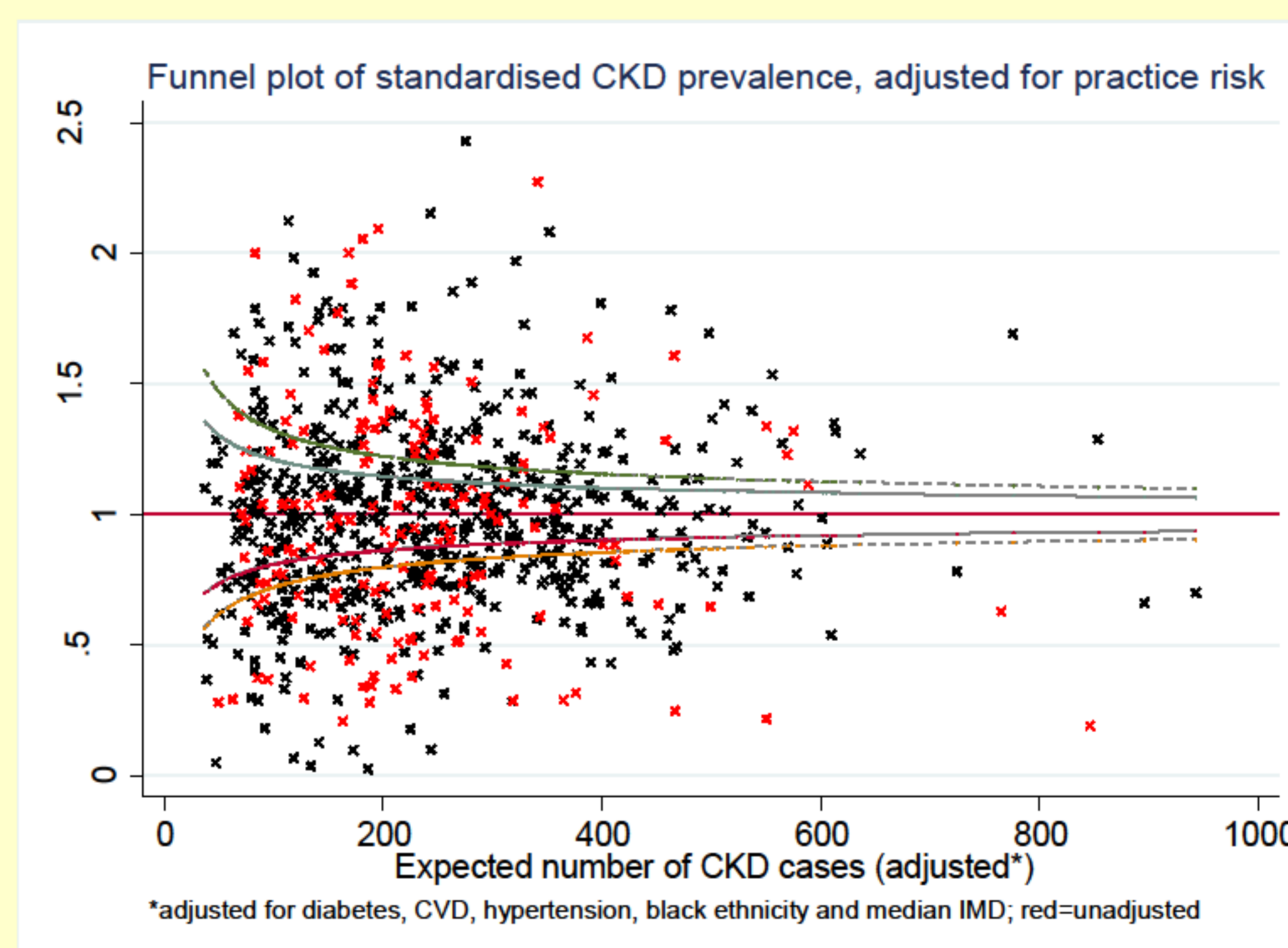


Figure 4: Funnel plot of standardised CKD prevalence, adjusted for practice risk

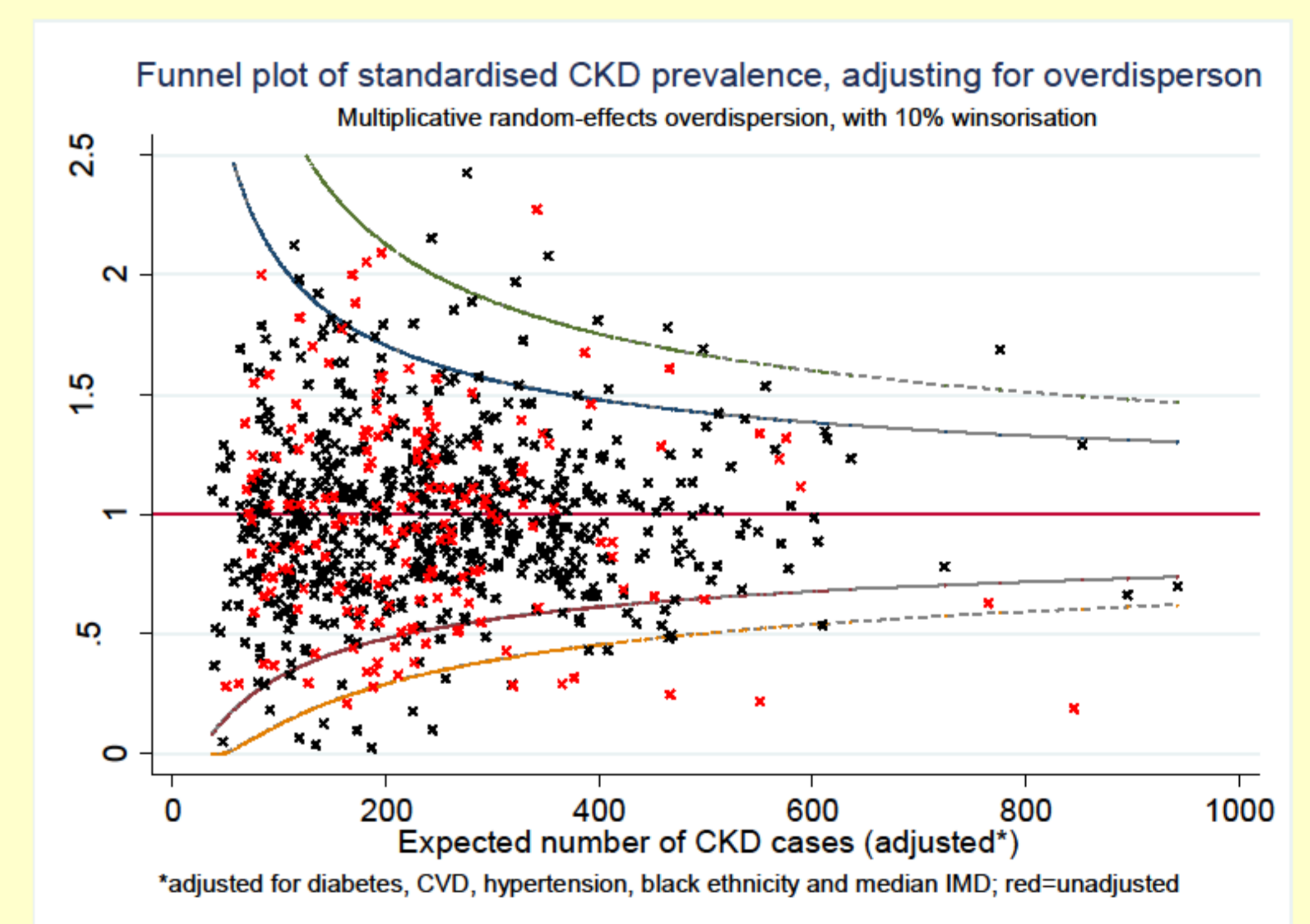


Figure 5: Funnel plot of standardised CKD prevalence, adjusted for practice risk and overdispersion

- Practice list size was available for **756 practices** (82.6%). Outlier review was therefore unable to be performed for the remaining 159 practices.
- Practice demographic characteristics are summarised in Table 1.
- **Mean age-sex standardised prevalence** of CKD in the sample was **3.1%** of total list size. Figure 2 shows the variation in CKD prevalence between practices.
- **Figure 3** shows the funnel plot for observed/expected CKD cases, **prior to any adjustment for known or unknown sources of variation**. Due to failure to take account of differences in practice risks and overdispersion due to unknown factors, an **excessive number of practices are identified as outliers using funnel plot methodology**.
- **Figure 5** shows the funnel plot for observed/expected CKD cases, **after adjustment for risk factors and overdispersion**. The number of outliers detected is vastly **reduced** after adjusting for practice risk and overdispersion, which may lead to more focussed intervention. See Table 2.

CONCLUSIONS

- In the presence of **between-practice heterogeneity**, conventional funnel plot methods are **unhelpful**, indicating a very large number of outliers, due to a failure to account for excess variability due to unknown factors.
- **Adjustment for known risk factors and overdispersion** modifies the control limits to reflect this heterogeneity so that only the most extreme practices are flagged as outliers.

References

1. Spiegelhalter DJ. *Statistical Methods for Healthcare Regulation: Rating, Screening and Surveillance*. Journal of the Royal Statistical Society. 2012.
2. www.ckdaudit.org.uk