

Data generation

Haziq: could you please give below the steps that you use to generate the data with the gold standard. I outline what I think it should be the steps: Within each replication, the data are generated as follows:

Haziq: This is correct. Note that I have now used MCMC (JAGS) as a method of fitting all models LC, LCRE and FM.

1. item class probabilities for six items (the sixth item is the gold standard that has sensitivity and specificity 1) and prevalence are set (2 latent classes are assumed).
2. Posterior probabilities are computed for each respondent (n=250 or n=1000).
3. Given the respondent's latent class you generate the binary indicators for the six items. Unless there is 100% missigness of the gold standard in which case you only generate five items.
4. After a data set is being generated, the three models are fitted and you report the parameter estimates (item class probabilities and prevalence for all items, asymptotic standard errors).
 - In the case of 20% and 50% missing data in item 6 you still fit the model to all six items and treat the missigness as missing at random. since you use ML there should be no problem. you should also get estimates for the 6th item that should be close to one. is that true? when the gold standard is missing 100% then you only estimate parameters for the five items.
5. The above steps are repeated R times where R is the number of replications.

Performance criteria

We compute the bias and mean squared error (MSE) for each parameter as follows:

$$Bias = \frac{1}{R} \sum_{i=1}^R (\hat{\theta}_i - \theta) ,$$

and

$$MSE = \frac{1}{R} \sum_{i=1}^R (\hat{\theta}_i - \theta)^2 ,$$

where R here is the number of valid replicates, $\hat{\theta}_i$ is the estimate of a parameter or of its asymptotic standard error at the i^{th} valid replication, and θ is the corresponding true value. In the case of standard errors, where the true value θ is unknown, the standard deviation of parameter estimates across valid replications is used (those are the standard deviations that you report in the output). My understanding is that you do not compute any asymptotic standard errors.

Haziq: The output of the simulations are the MCMC samples of the prevalences, sensitivities and specificities. I am able to compute the posterior mean and posterior standard deviations of these parameters.

Presentation of results

- we can present the bias and MSE of the parameters using graphs and in particular lines where each dot on the line will represent an item. The x-axis will be the items. the y-axis will be the bias or MSE. We do not need to include any confidence levels.

How to present the results: Our aim is to compare the three different models when each one of those model is true (data generating mechanism) each time:

Haziq: I attach the plots in the respective places below

Haziq: Since the true posterior standard deviations are not known, I don't know how to calculate bias and MSE.

- Figure 7: MSE of estimated asymptotic standard errors (sensitivities), $n=250$, $p=0.04$, gold standard=20,40,100, Models:LC,LCRE,FM. (total of 9 lines).
- Figure 8: MSE of estimated asymptotic standard errors (specificities), $n=250$, $p=0.04$, gold standard=20,40,100, Models:LC,LCRE,FM. (total of 9 lines).

The above can be repeated for $p=0.80$. Figures 1-4 are for bias and MSE of item class probabilities (sensitivities and specificities) and Figures 5-8 are for bias and MSE for estimated standard errors.

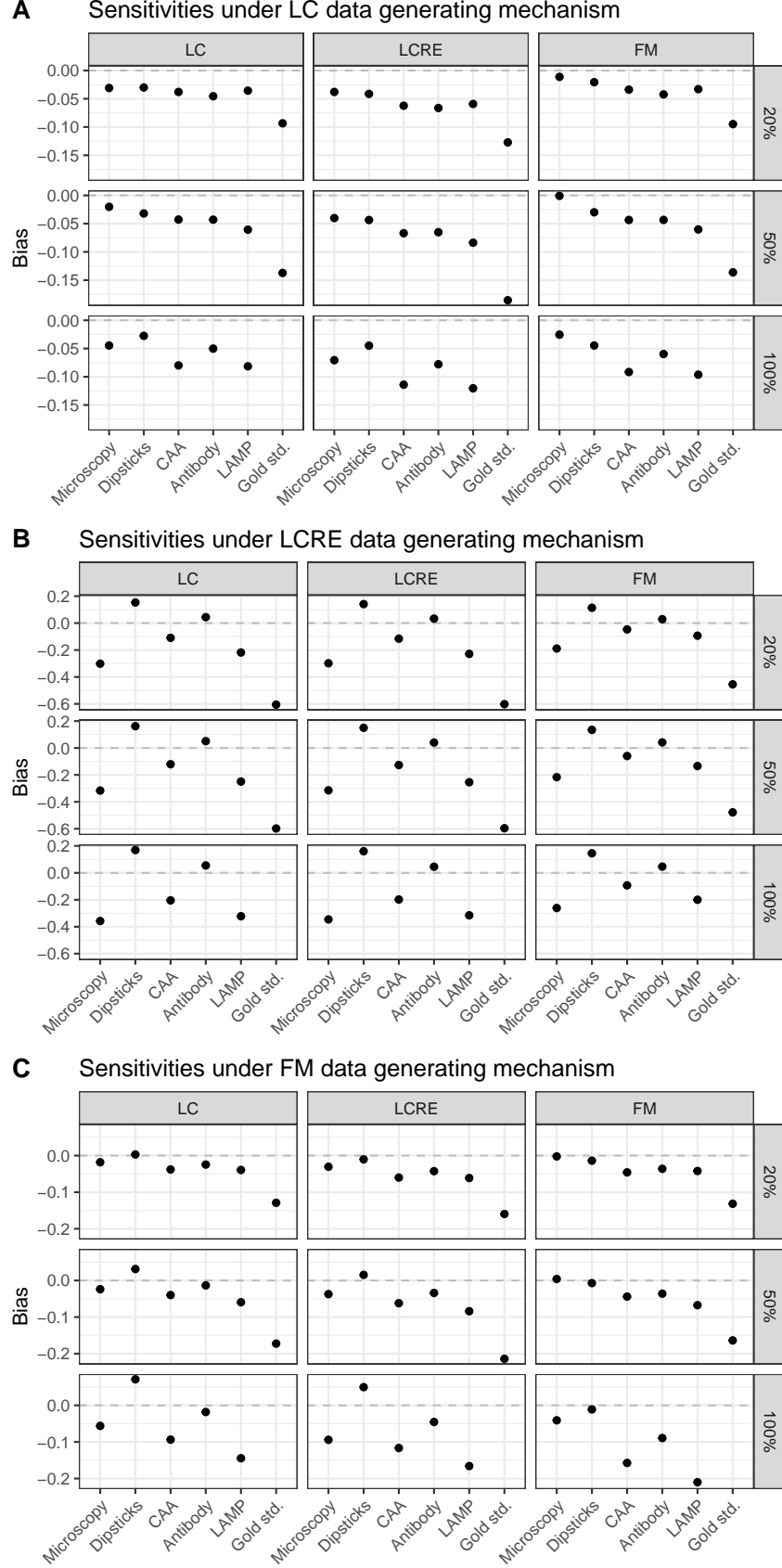


Figure 1: Bias of parameter estimates (sensitivities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).

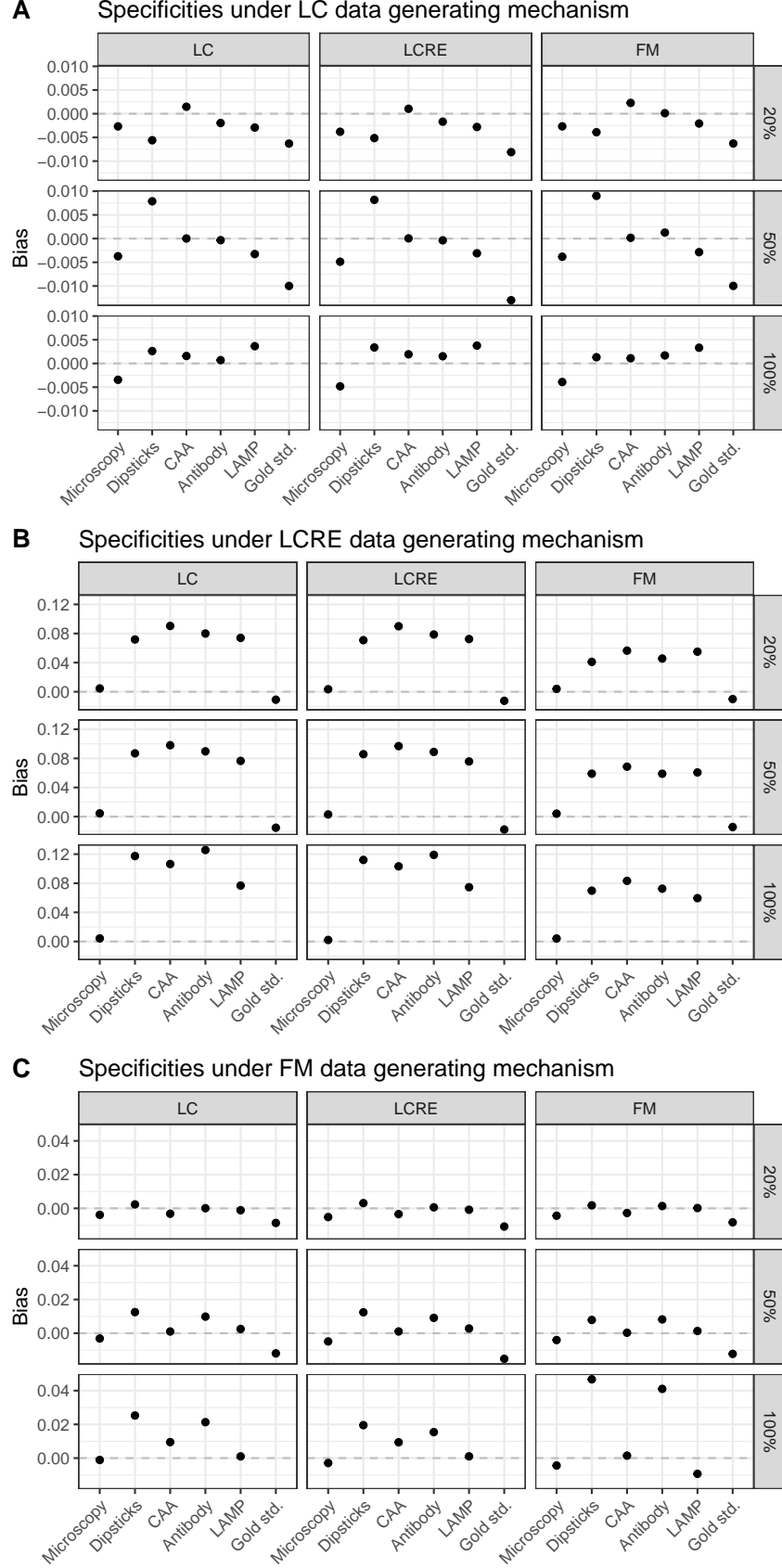


Figure 2: Bias of parameter estimates (specificities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).

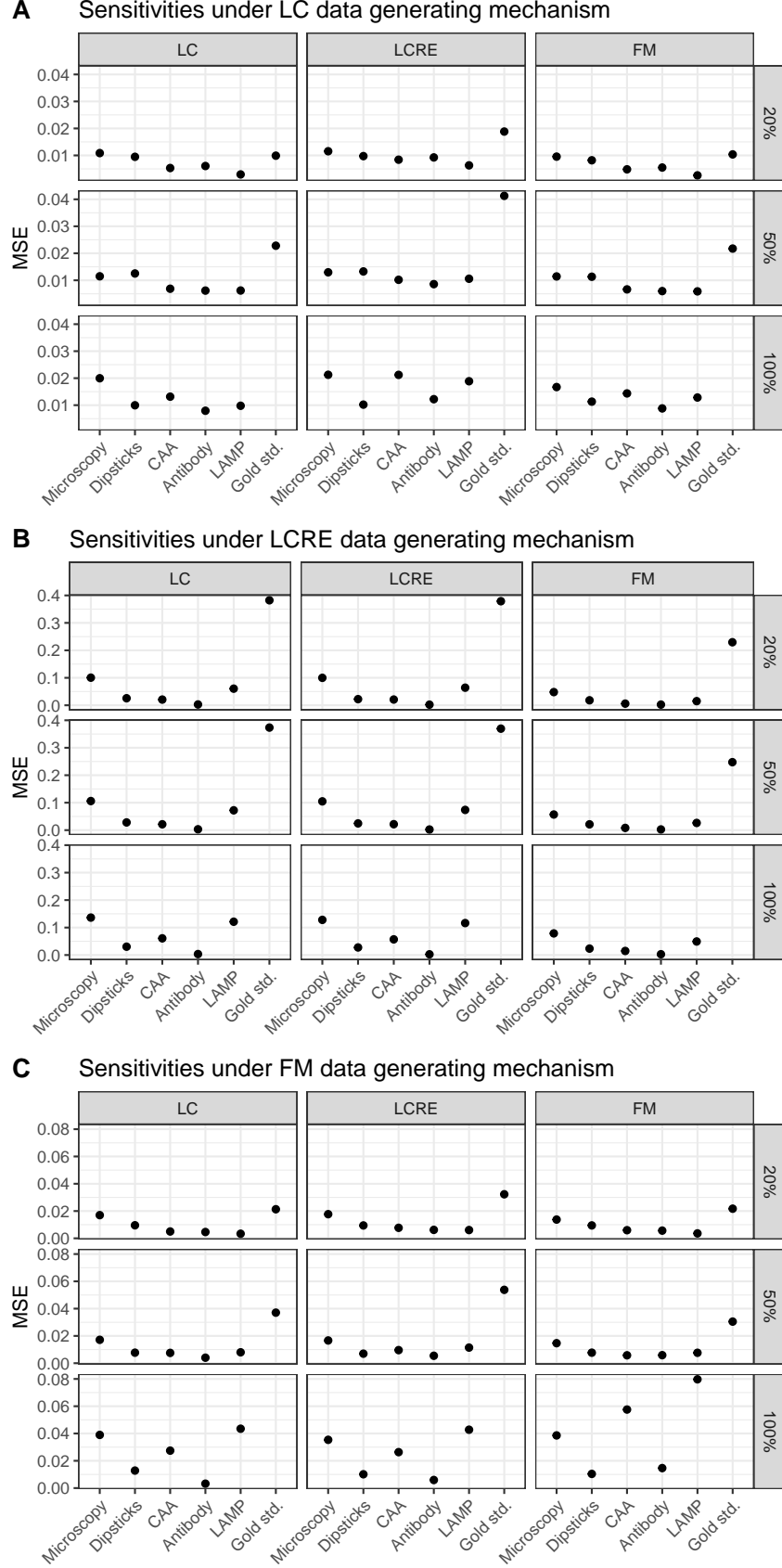


Figure 3: MSE of parameter estimates (sensitivities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).

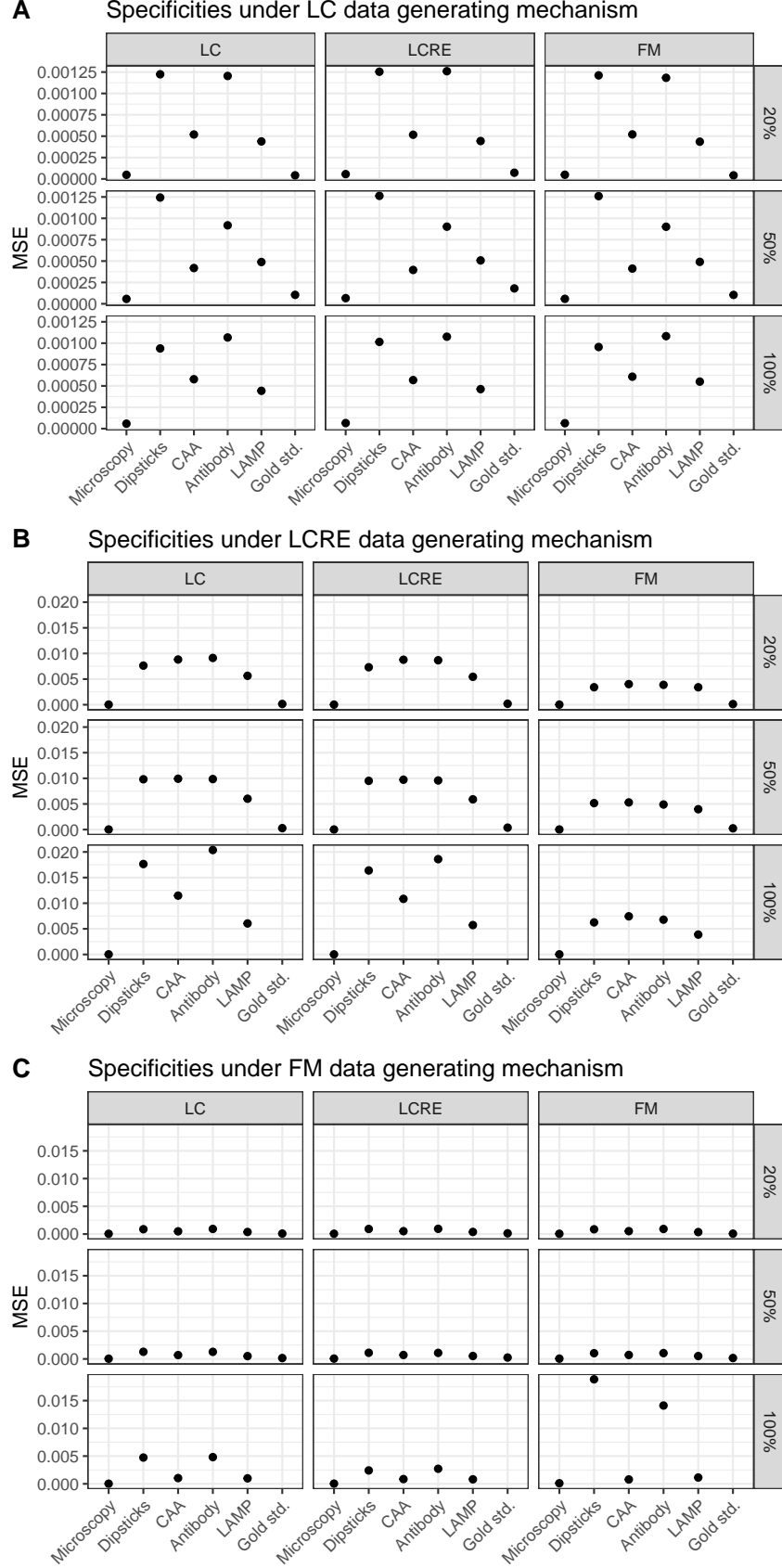


Figure 4: MSE of parameter estimates (specificities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).

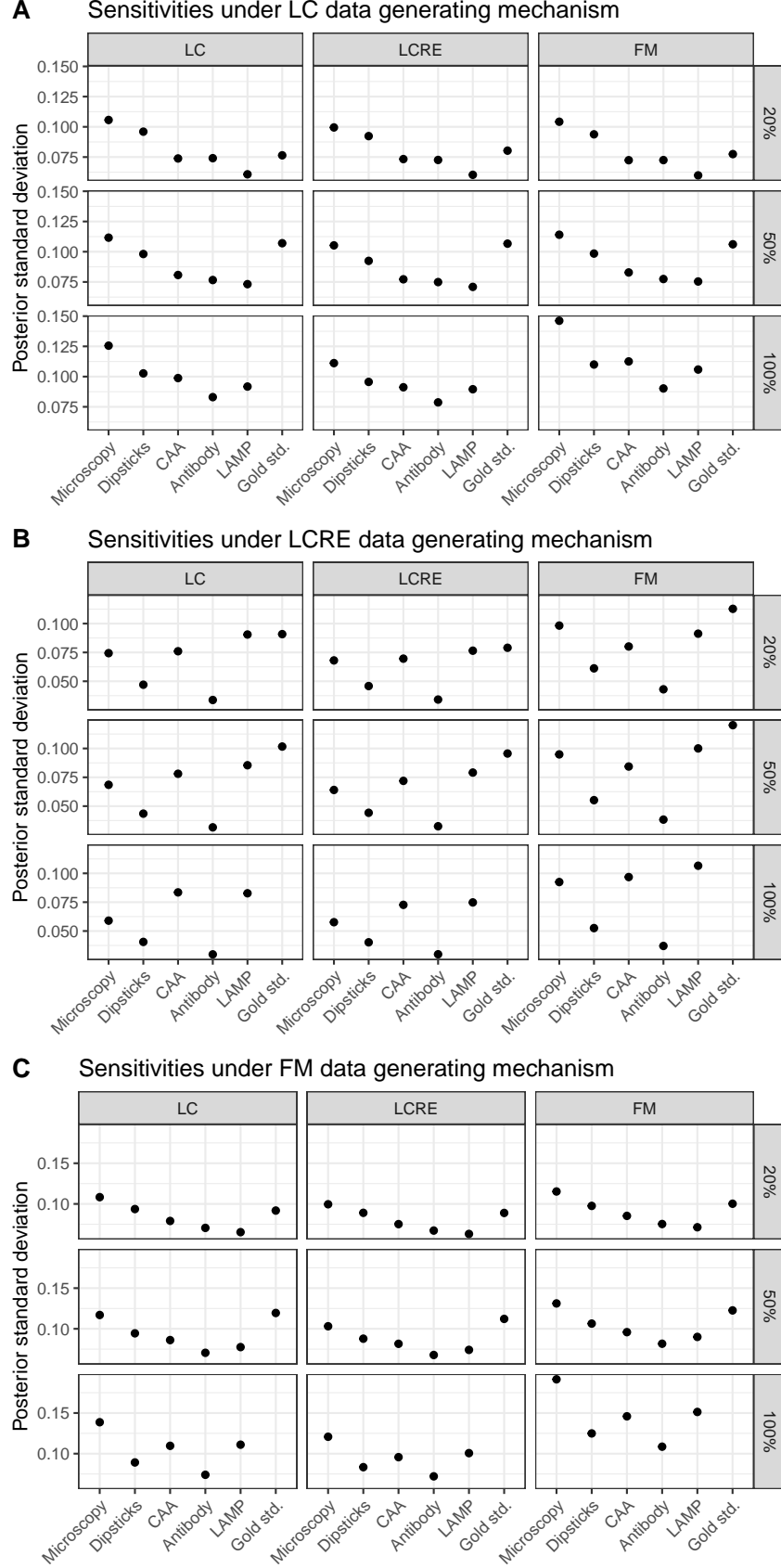


Figure 5: Post. SD of parameter estimates (sensitivities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).

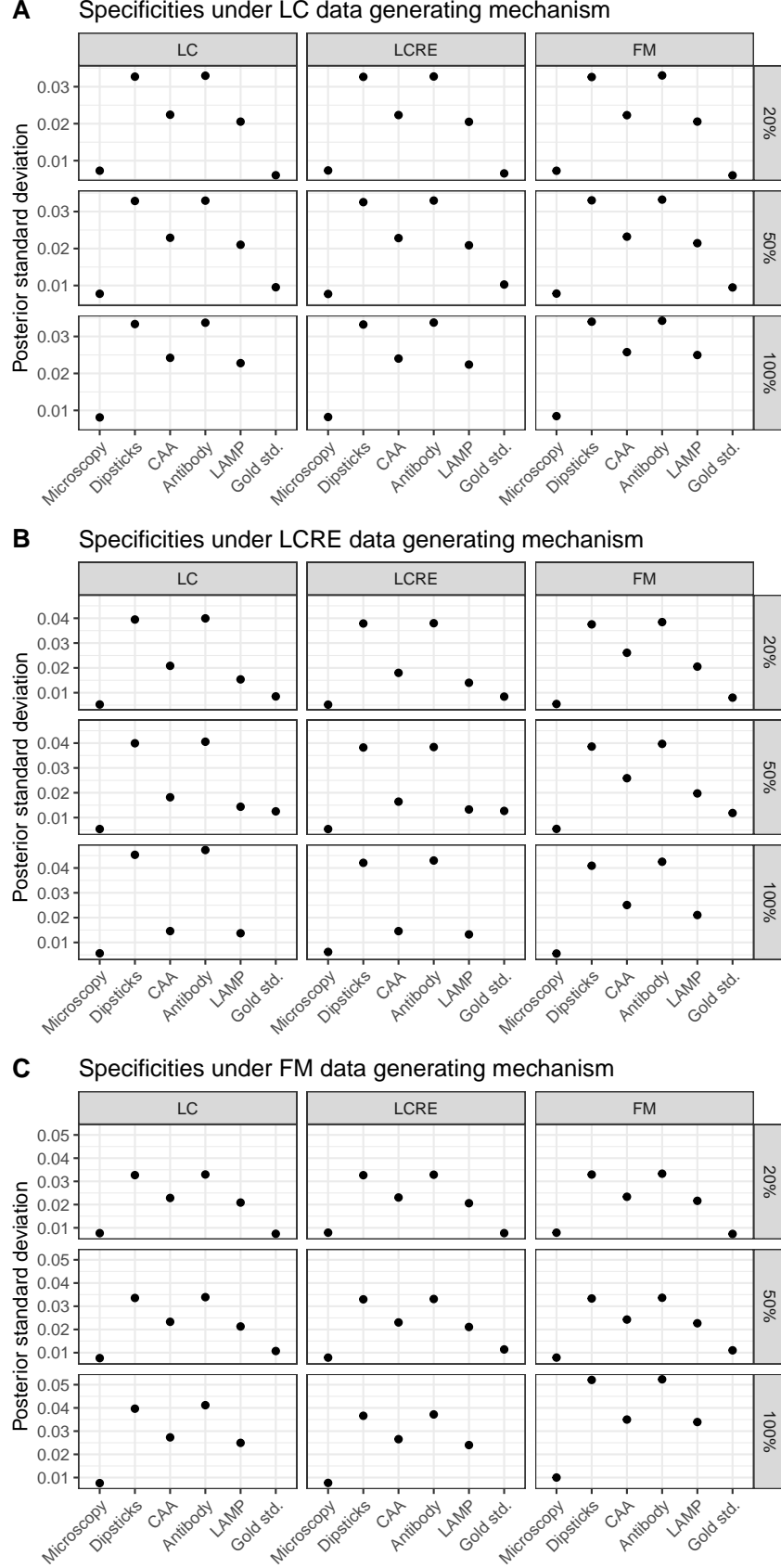


Figure 6: Post. SD of parameter estimates (specificities) as estimated by the LC, LCRE and FM models under differing proportions of missing gold standard, and under differing data generating mechanisms ($n = 250$, $p = 0.08$).