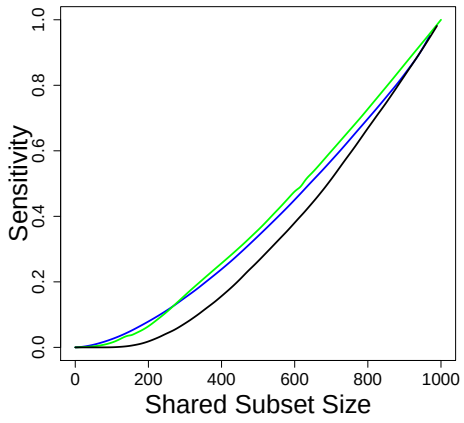
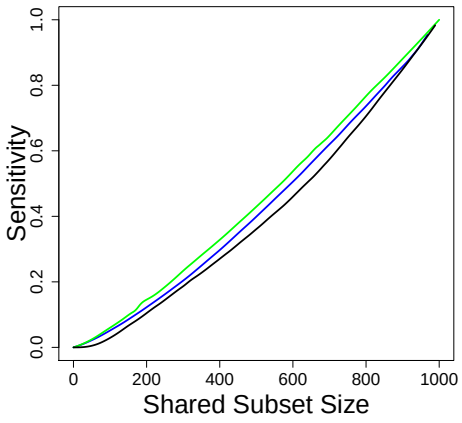
## 1. Supplementary file for simulations studying the performance of the methods in the presence of shared SNPs with very small effects

This supplemenatry file contains more detailed results related to the simulation study presented in subsection 5.4. The goal of the simulation study in subsection 5.4 was to understand how the methods (based on QRR, Lasso and RO) performed when the effect size of the shared SNPs were much smaller compared to the effect sizes in simulations presented in other subsections. The simulation strategy employed in this subsection was very similar to that in subsection 5.2, except that *shared-effect-SNP-selection-method-3* was used to ensure that all true shared SNPs had comparatively much smaller effect sizes.

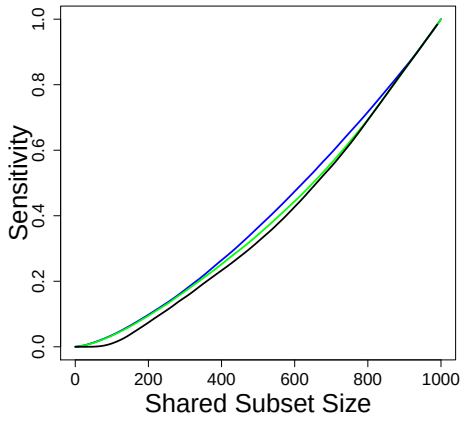
The three scenarios considered for this simulation study are (i) M = 1000, N = 300 (subplots (a) and (b) in the figure below), (ii) M = 1000, N = 3000 (subplots (c) and (d)), and (iii) M = 10,000 and N = 3000 (subplots (e) and (f)). To save space only the plots related to (i) and (ii) were presented in the main text. However, in this supplementary file, the plots related to (iii) are also presented. It is instructive to look at (iii) as well, as in this case clearly Lasso exhibits a better performance over the other two approaches. TPR values were very low except in the case (ii) with high between-SNPs correlation. Thus, only sensitivity plots are presented in the following figure. Even in these plots, sensitivity values are reasonably large only when shared-SNP-subsets of fairly big sizes are selected. Such large subsets may not be feasible in practice, and hence none of the methods may be effective when the shared effect sizes are extremely small. Nevertheless, this simulation study does give a limited opportunity to compare across the methods and provide some indication (based on subplots (a), (b), (e) and (f) below) that among the three methods, only Lasso may select shared SNPs with very small effect sizes at least in some scenarios. This information does corroborate with real data analyses in the main text where we see Lasso selecting shared SNPs with small effects when the other two methods do not. Finally we note that in the following figure, the left panels correspond to between-SNP correlation range (0.05, 0.15) and the right panels correspond to the correlation range (0.40, 0.60).



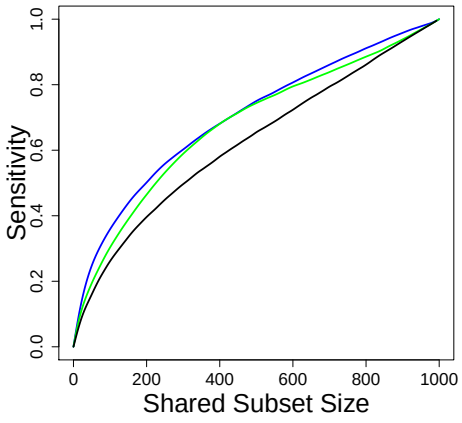

(a) M = 1000, $M_c$ = 100, N = 300, cor: (0.05, 0.15)



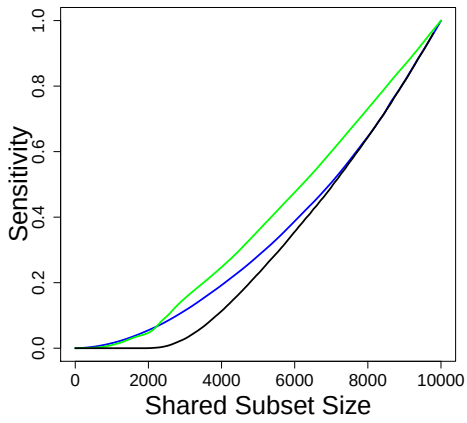

(b) M = 1000, $M_c$ = 100, N = 300, cor: (0.40, 0.60)



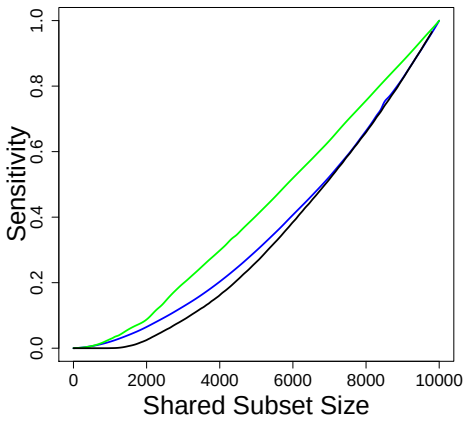

(c) M = 1000, $M_c$ = 100, N = 3000, cor: (0.05, 0.15)




(d) M = 1000, $M_c$ = 100, N = 3000, cor: (0.40, 0.60)




(e) M = 10000, $M_c$ = 500, N = 3000, cor: (0.05, 0.15)




(f) M = 10000, $M_c$ = 500, N = 3000, cor: (0.40, 0.60)

Figure 1: Performance (based on sensitivity) of the methods when the shared-SNP effect sizes are very small. QRR: blue, Lasso: green, RO: black.