

Supplementary Figure 1. Leave-one-out stability tests causal estimates of exposure (asthma) on overall OA, knee OA, and hip OA. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 2. Leave-one-out stability tests causal estimates of exposure (Overall OA, knee OA, and hip OA) on asthma. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 3. Funnel plot of single SNP analysis of exposure (asthma) by Inverse Variance Weighting and MR EGGER on overall OA, knee OA, and hip OA. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 4. Funnel plot of single SNP analysis of exposure (Overall OA, knee OA, and hip OA) by Inverse Variance Weighting and MR EGGER on asthma. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 5. Scatter plots of causal estimates of exposure (asthma) on overall OA, knee OA, and hip OA. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 6. Scatter plots of causal estimates of exposure (Overall OA, knee OA, and hip OA) on asthma. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 7. Leave-one-out stability tests causal estimates of exposure (GERD) on overall OA, knee OA, and hip OA. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 8. Leave-one-out stability tests causal estimates of exposure (Overall OA, knee OA, and hip OA) on GERD. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 9. Funnel plot of single SNP analysis of exposure (GERD) by Inverse Variance Weighting and MR EGGER on overall OA, knee OA, and hip OA. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 10. Funnel plot of single SNP analysis of exposure (Overall OA, knee OA, and hip OA) by Inverse Variance Weighting and MR EGGER on GERD. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

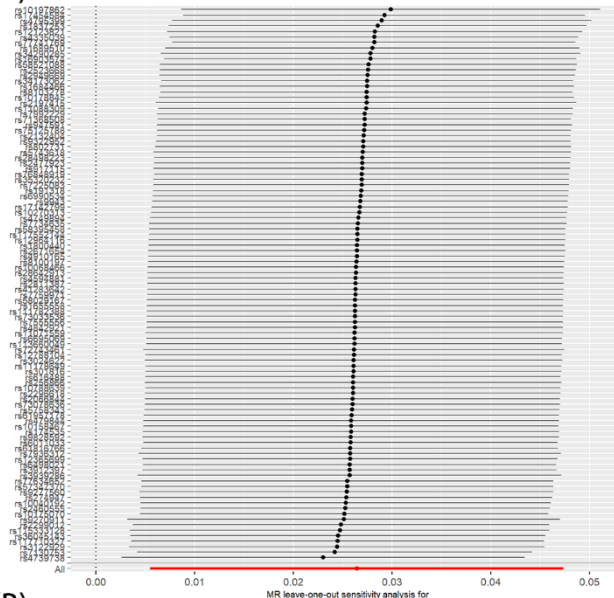
Supplementary Figure 11. Scatter plots of causal estimates of exposure (GERD) on overall OA, knee OA, and hip OA. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

Supplementary Figure 12. Scatter plots of causal estimates of exposure (Overall OA, knee OA, and hip OA) on GERD. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: A: Overall OA; B: Knee OA; C: Hip OA.

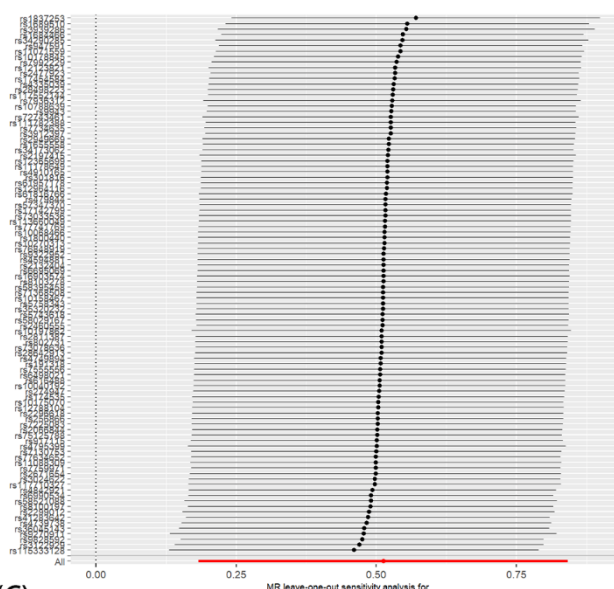
Supplementary Figure 13. Mendelian Randomization Analysis of the Causal Relationship between Exposure (Asthma) and Outcome (GERD). A: Leave-one-out stability tests; B: Funnel plot; C: Scatter plot.

Supplementary Figure 14. Mendelian Randomization Analysis of the Causal Relationship between Exposure (GERD) and Outcome (Asthma). A: Leave-one-out stability tests; B: Funnel plot; C: Scatter plot.

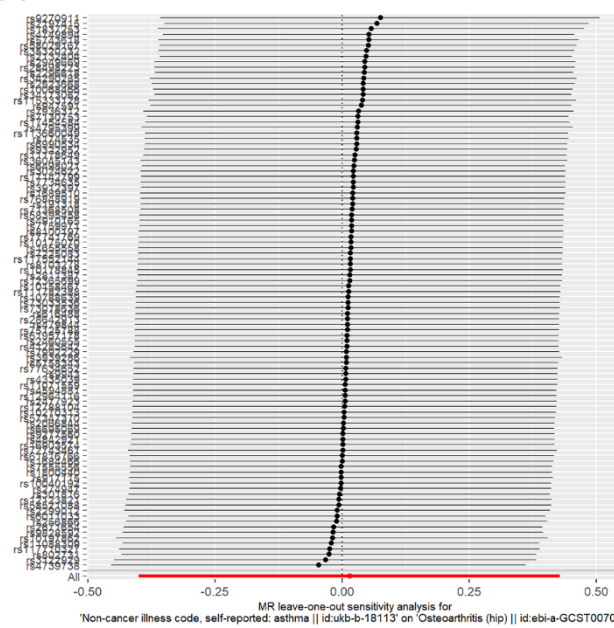
(A)



(B)



(C)



Supplementary Figure 1. Leave-one-out stability tests causal estimates of exposure (asthma) on overall OA, knee OA, and hip OA.

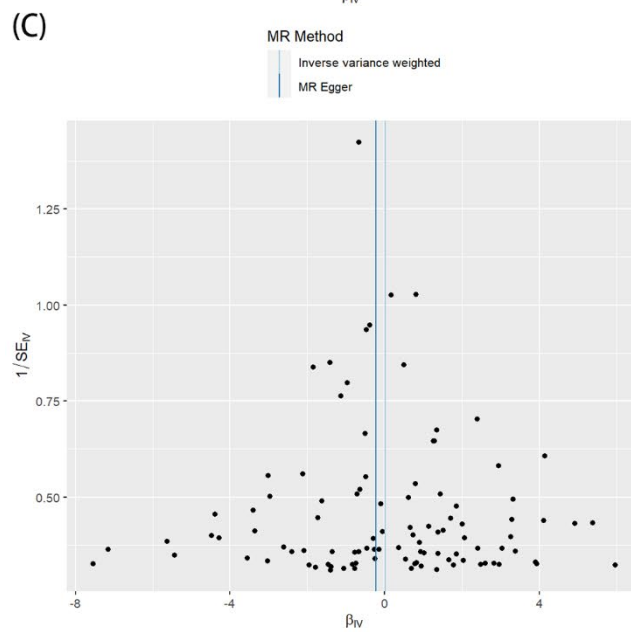
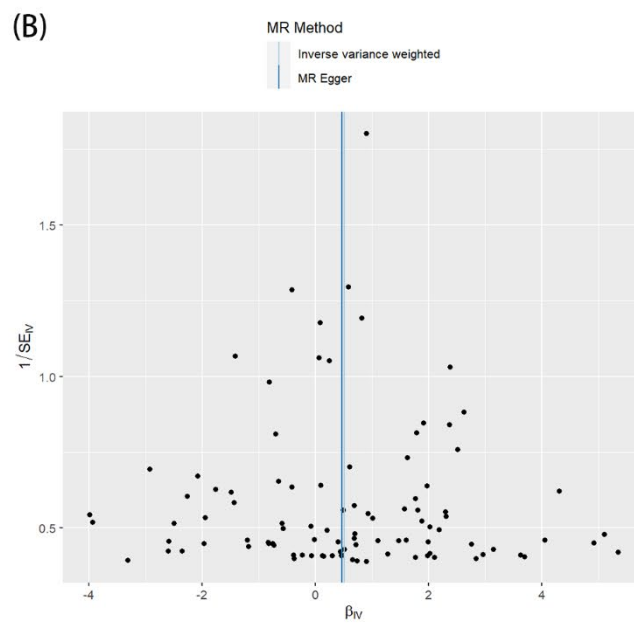
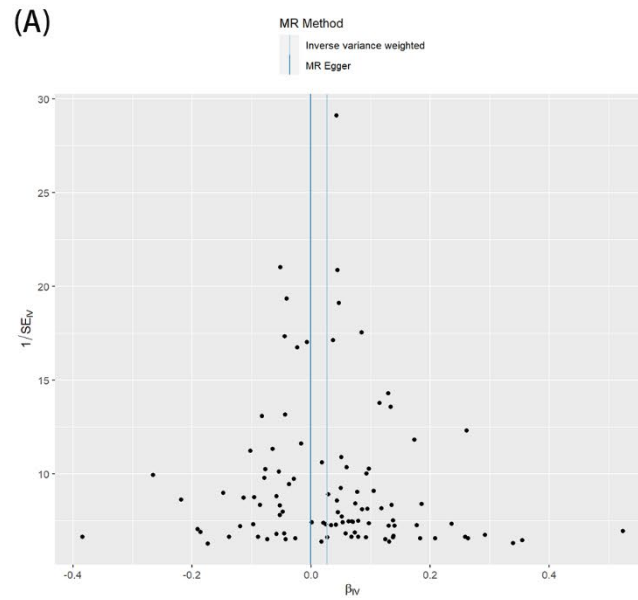
Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C:

Hip OA.

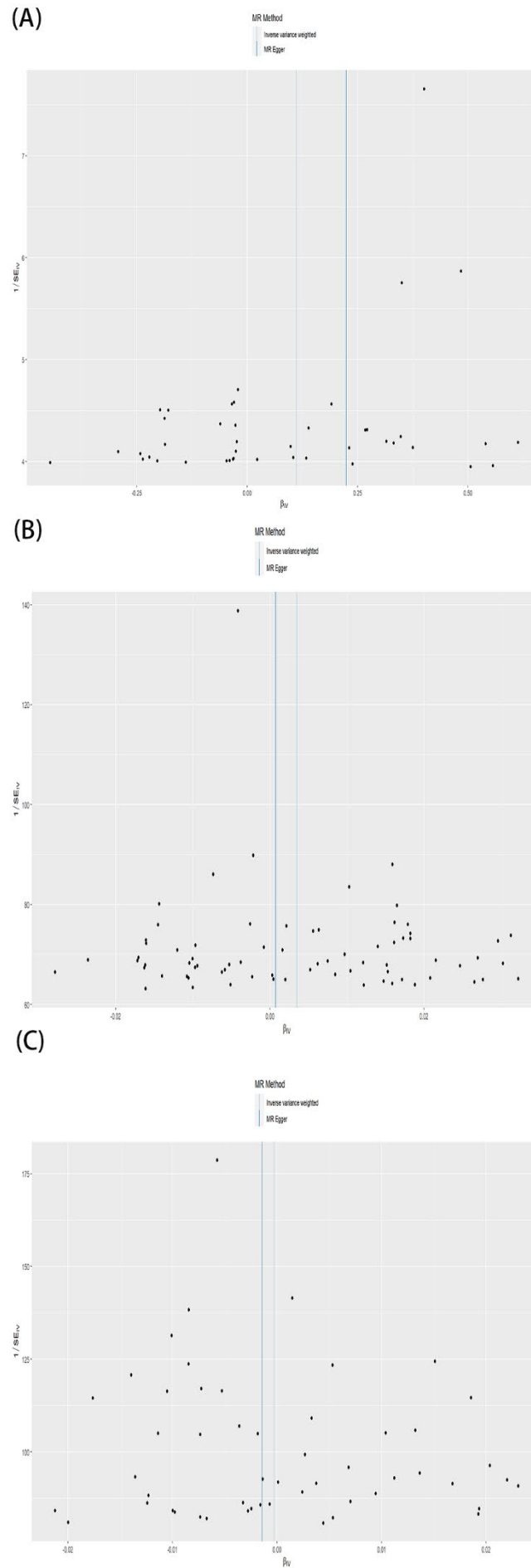
Supplementary Figure 2. Leave-one-out stability tests causal estimates of exposure (Overall OA, knee OA, and hip OA) on asthma.

Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C:

Hip OA.

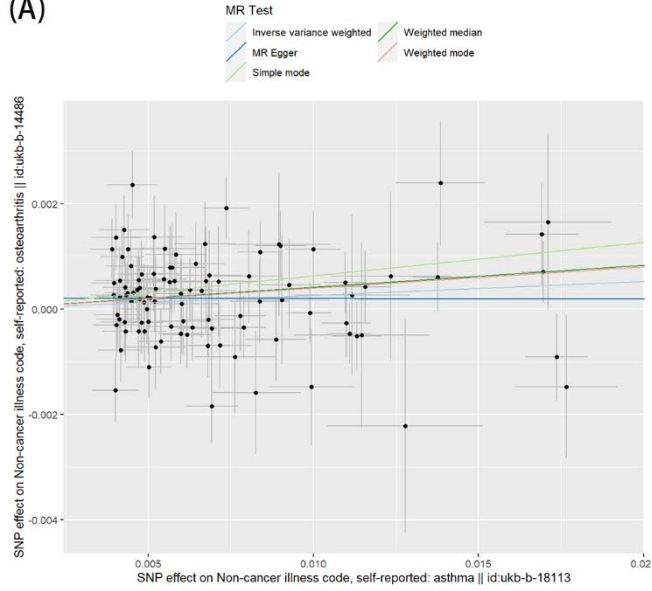


Supplementary Figure 3. Funnel plot of single SNP analysis of exposure (asthma) by Inverse Variance Weighting and MR EGGER on overall OA, knee OA, and hip OA. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

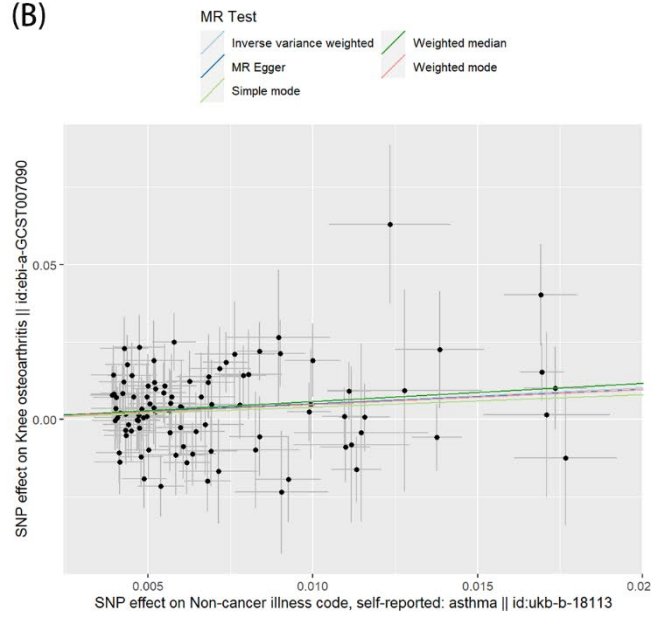


Supplementary Figure 4. Funnel plot of single SNP analysis of exposure (Overall OA, knee OA, and hip OA) by Inverse Variance Weighting and MR Egger on asthma. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

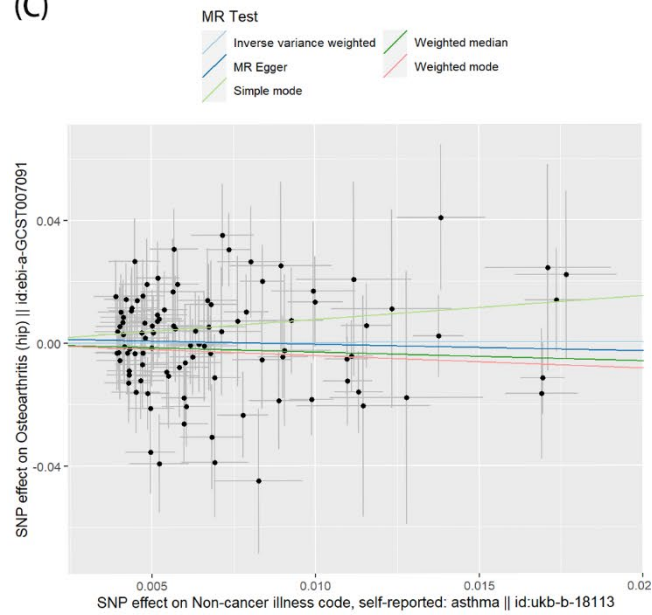
(A)



(B)

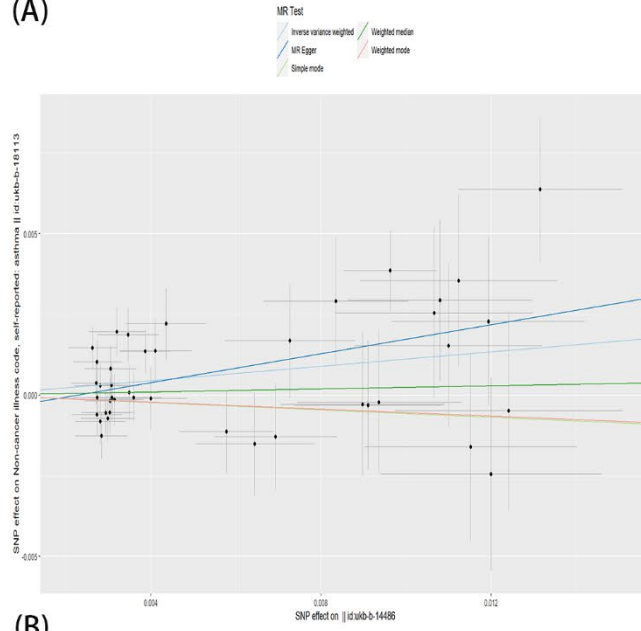


(C)

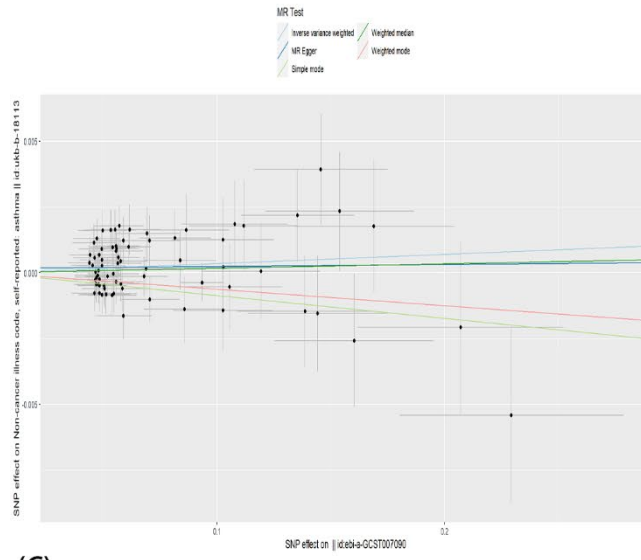


Supplementary Figure 5. Scatter plots of causal estimates of exposure (asthma) on overall OA, knee OA, and hip OA. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

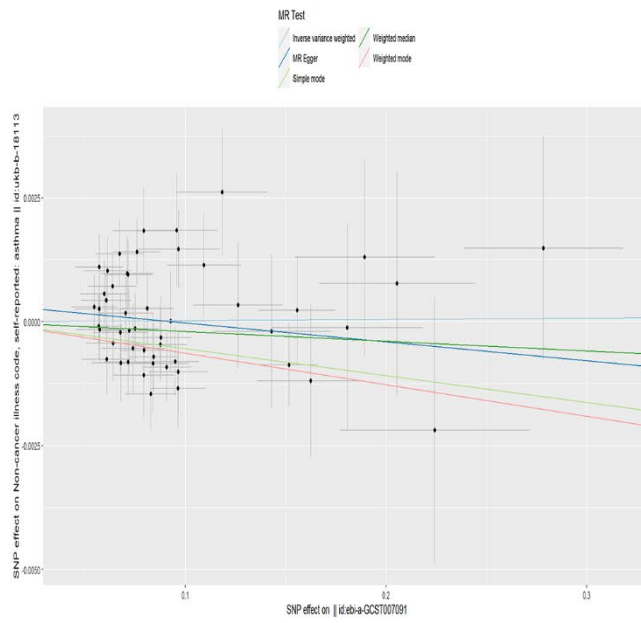
(A)



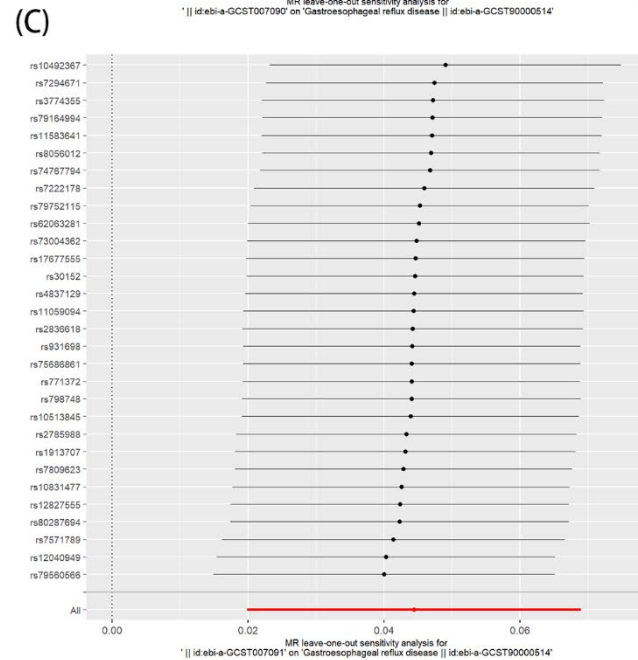
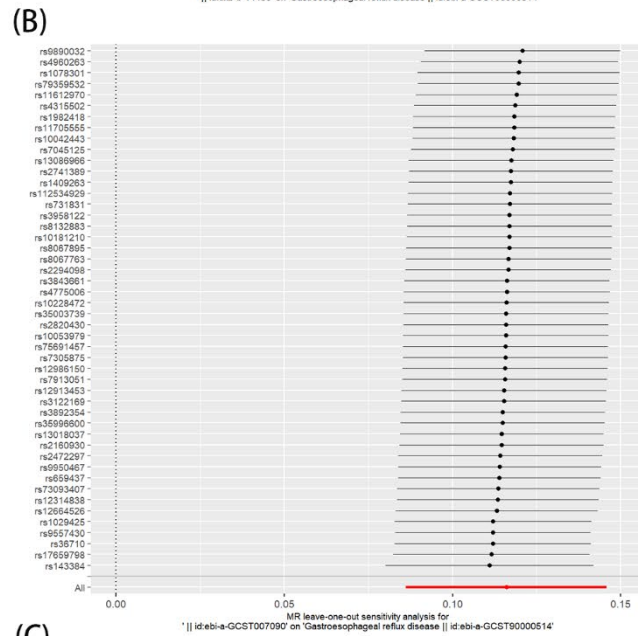
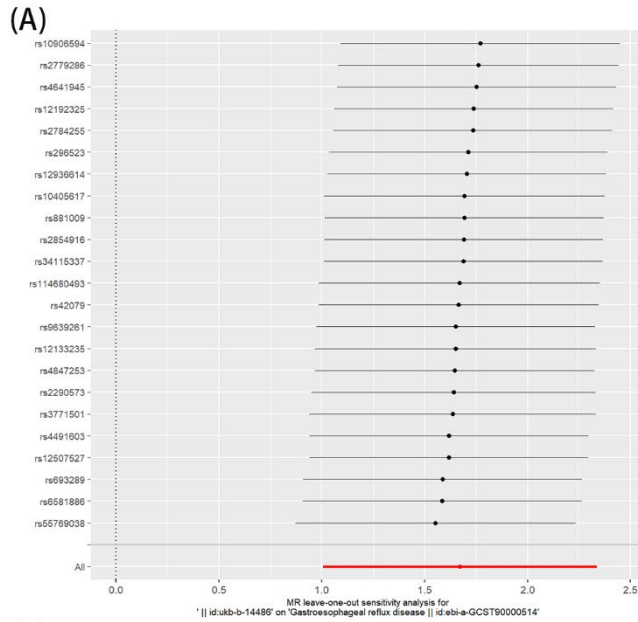
(B)



(C)

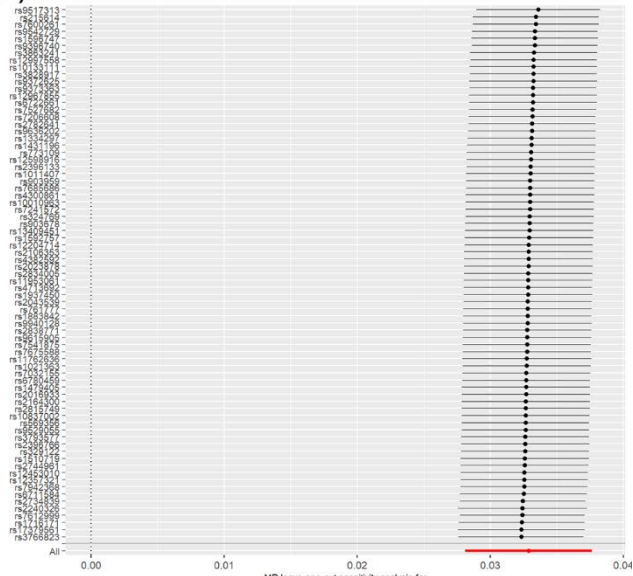


Supplementary Figure 6. Scatter plots of causal estimates of exposure (Overall OA, knee OA, and hip OA) on asthma. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: A: Overall OA; B: Knee OA; C: Hip OA.

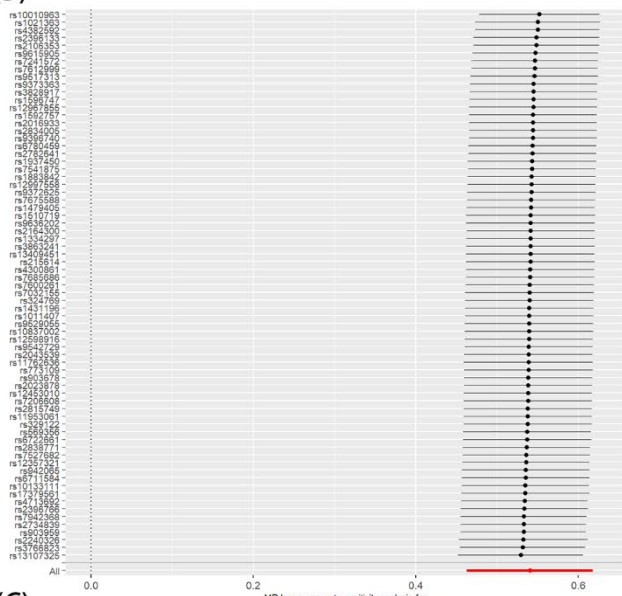


Supplementary Figure 7. Leave-one-out stability tests causal estimates of exposure (GERD) on overall OA, knee OA, and hip OA. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

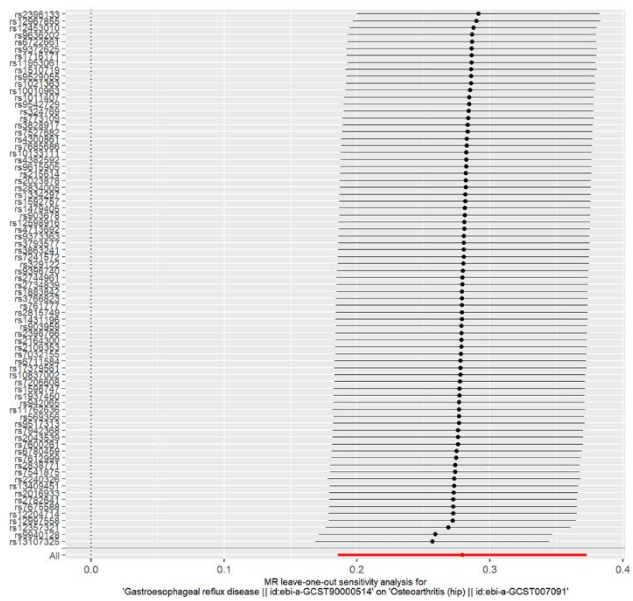
(A)



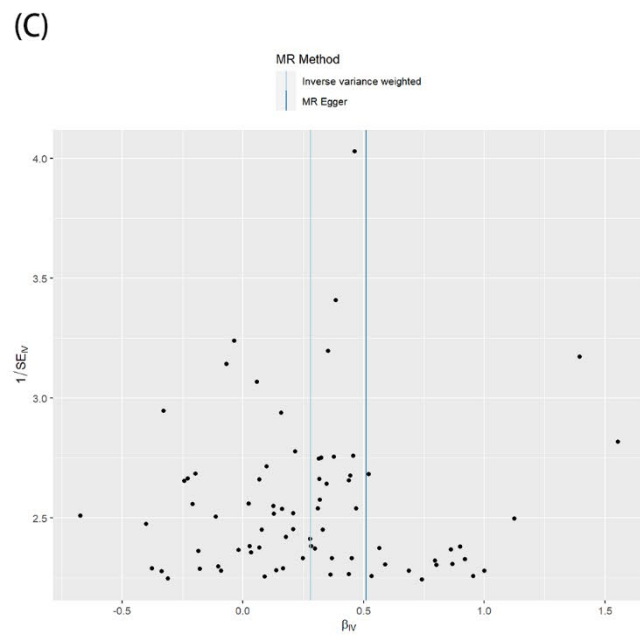
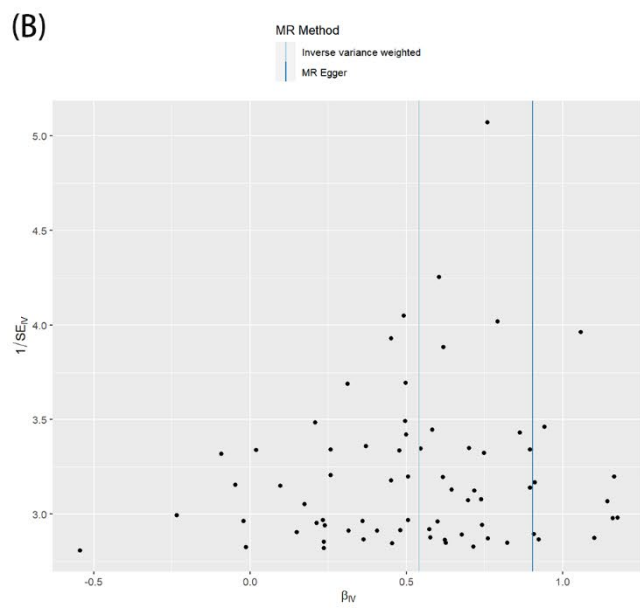
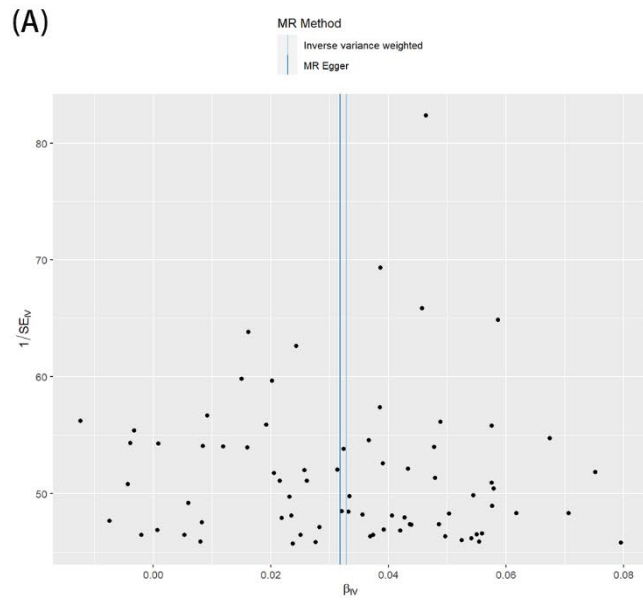
(B)



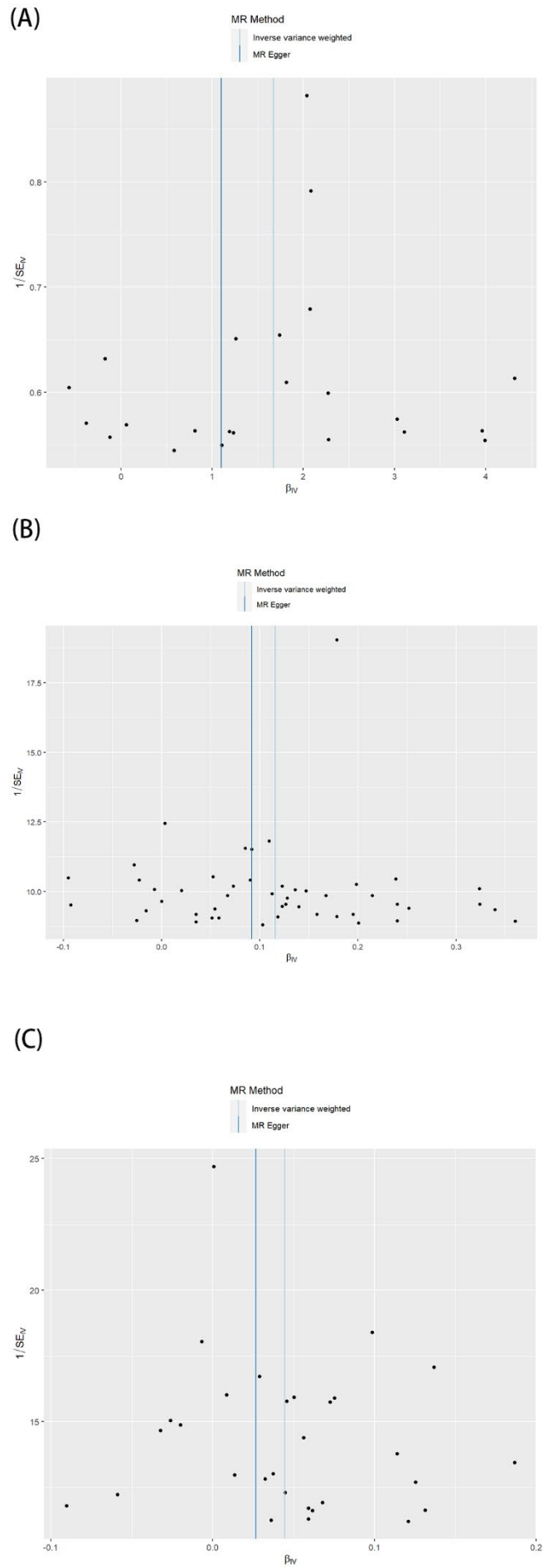
(C)



Supplementary Figure 8. Leave-one-out stability tests causal estimates of exposure (Overall OA, knee OA, and hip OA) on GERD. Calculate the MR results of the remaining IVs after removing the IVs one by one. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

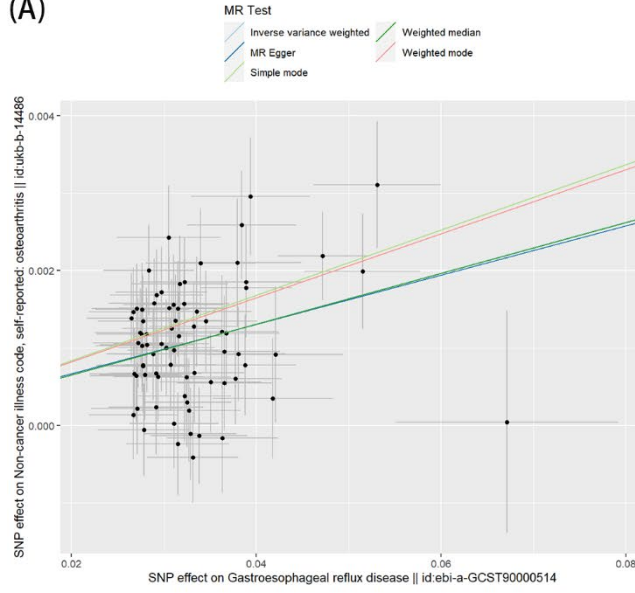


Supplementary Figure 9. Funnel plot of single SNP analysis of exposure (GERD) by Inverse Variance Weighting and MR EGGER on overall OA, knee OA, and hip OA. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

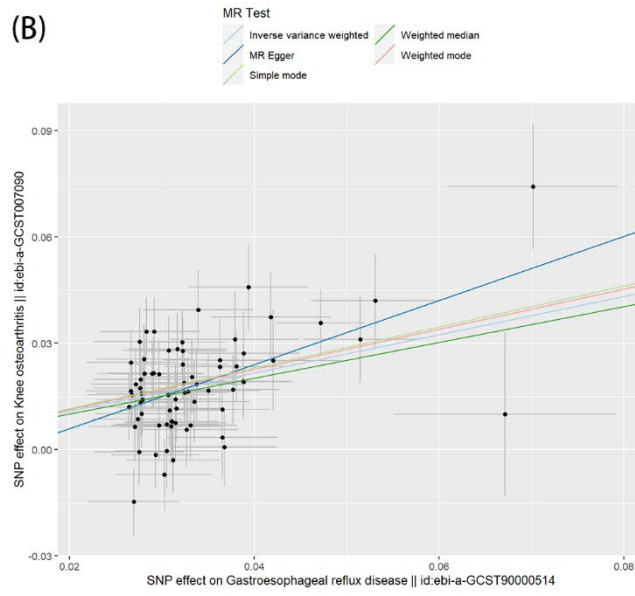


Supplementary Figure 10. Funnel plot of single SNP analysis of exposure (Overall OA, knee OA, and hip OA) by Inverse Variance Weighting and MR EGGER on GERD. Effects of A: Overall OA; B: Knee OA; C: Hip OA.

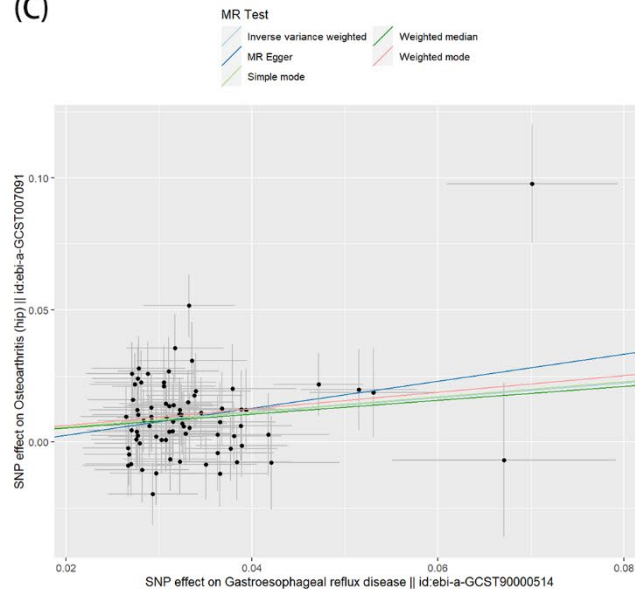
(A)



(B)

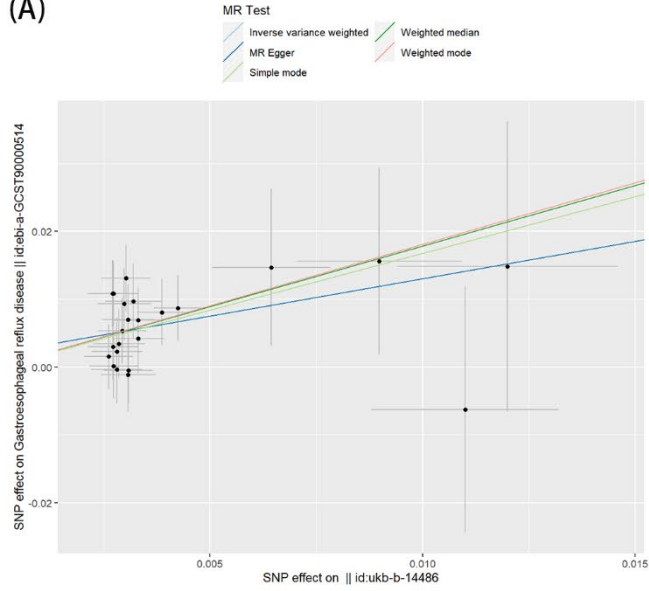


(C)

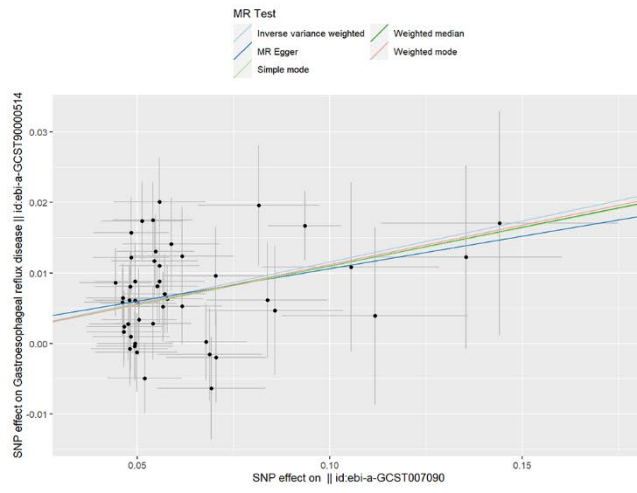


Supplementary Figure 11. Scatter plots of causal estimates of exposure (GERD) on overall OA, knee OA, and hip OA. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: Overall OA; B: Knee OA; C: Hip OA.

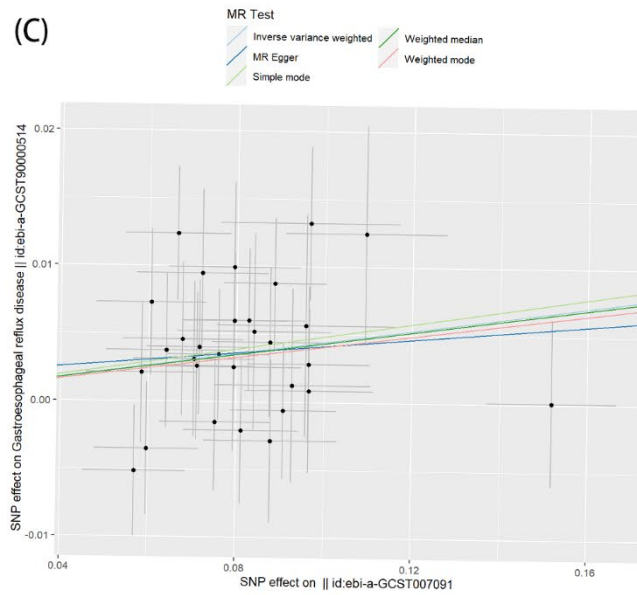
(A)



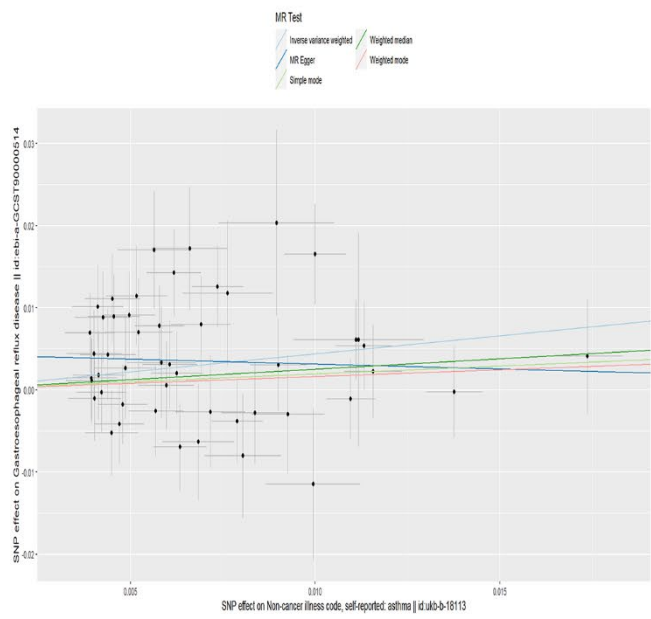
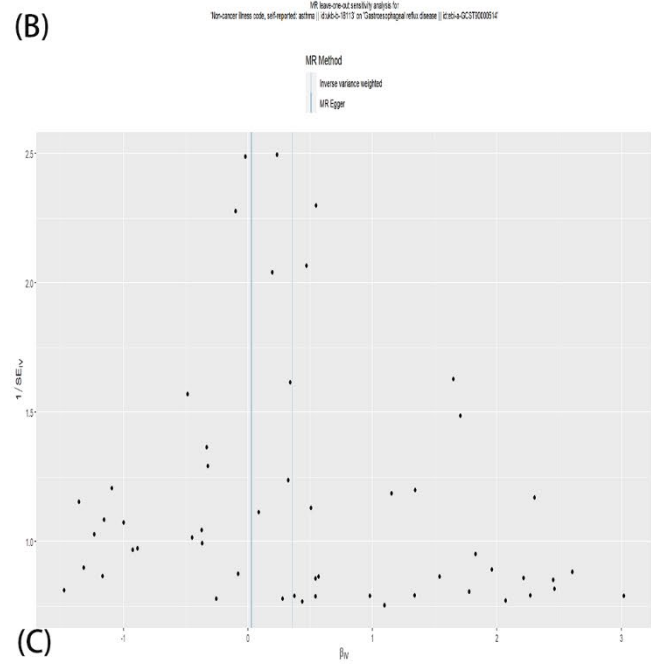
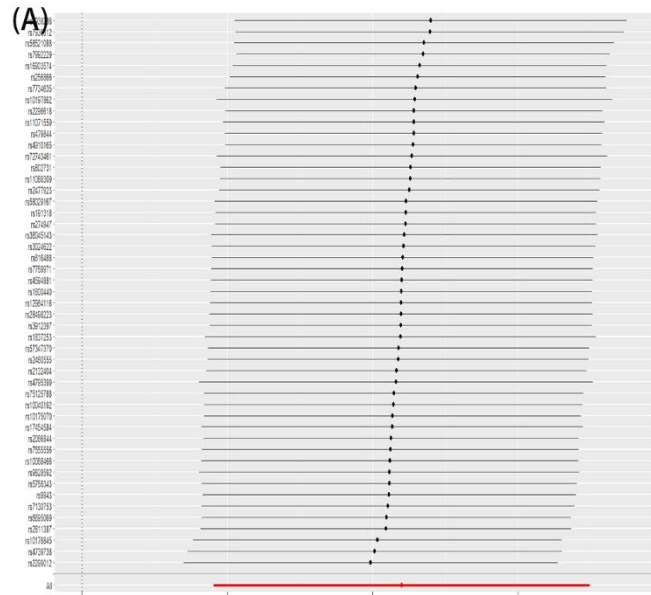
(B)



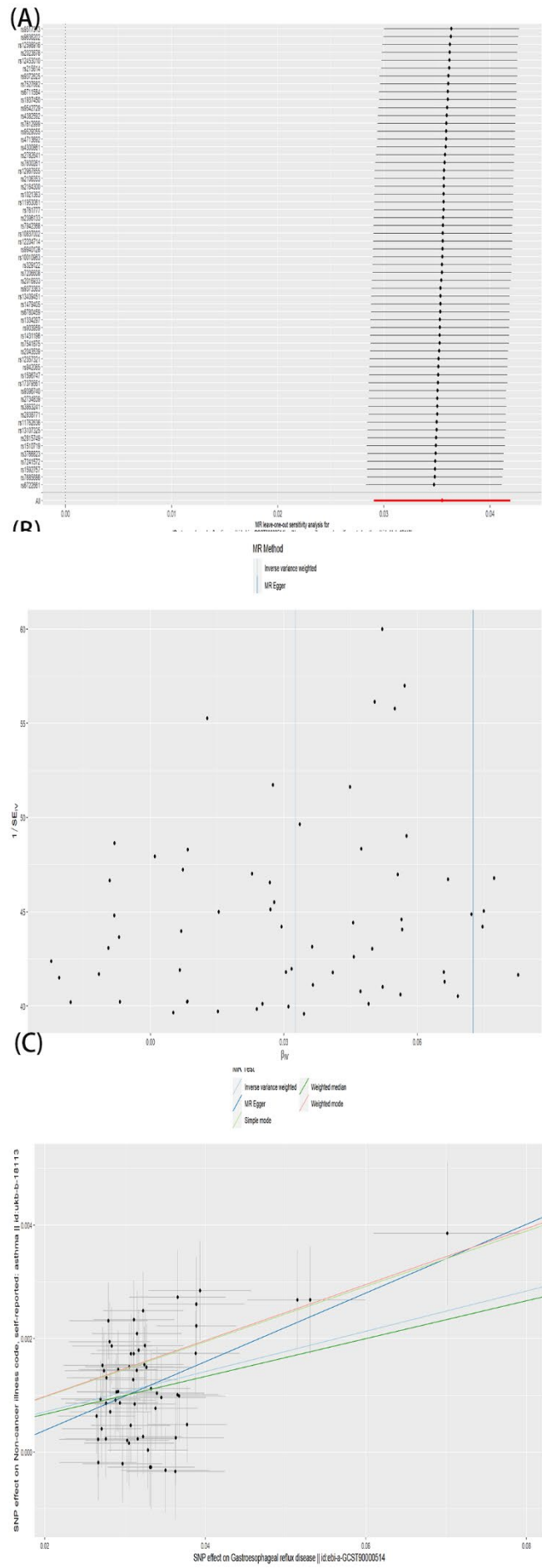
(C)



Supplementary Figure 12. Scatter plots of causal estimates of exposure (Overall OA, knee OA, and hip OA) on GERD. The slope of each line corresponds to the estimated MR effect in different models, including the conventional Inverse Variance Weighted, MR Egger, Simple Mode, Weighted Mode, and Weighted Median. The effect of A: A: Overall OA; B: Knee OA; C: Hip OA.



Supplementary Figure 13. Mendelian Randomization Analysis of the Causal Relationship between Exposure (Asthma) and Outcome (GERD). A: Leave-one-out stability tests; B: Funnel plot; C: Scatter plot.



Supplementary Figure 14. Mendelian Randomization Analysis of the Causal Relationship between Exposure (GERD) and Outcome (Asthma). A: Leave-one-out stability tests; B: Funnel plot; C: Scatter plot.

