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The Causal Effects between Mood Swings and Gastrointestinal Diseases: A Mendelian Randomization Study

ABSTRACT

Background: Numerous studies have examined the links between mental disorders such as depression and bipolar disorder, and gastrointestinal (GI) diseases. However, few studies have investigated the link between mood swings and GI diseases. Given the impact of mood swings on various conditions and the growing comprehension of the gut-brain axis, this study aims to explore their causal relationship using Mendelian randomization (MR) methods.

Methods: Single-nucleotide polymorphisms (SNPs) associated with mood swings were obtained from a recent study. SNPs associated with GI diseases were identified from the FinnGen project. We conducted two-sample bidirectional MR analyses using three methods, primarily the inverse variance weighting (IVW) method. Furthermore, we performed sensitivity analyses and false discovery rate (FDR) analysis to validate the accuracy and robustness of the results.

Results: Bidirectional MR analysis revealed significant causal effects between mood swings and GI diseases according to the IVW method (odds ratio (OR): 1.213; 95% confidence interval (CI): 1.118-1.316; $P = 3.490e{-}6$; $P_{FDR} = 8.730e{-}5$). Mood swings were linked to an increased risk for 11 of 24 diseases, including five upper GI diseases (gastroesophageal reflux disease (GERD), acute gastritis, gastroduodenal ulcer, duodenal ulcer, and functional dyspepsia), two lower GI diseases (diverticular disease of the intestine and irritable bowel syndrome (IBS)) and four hepatobiliary and pancreatic diseases (nonalcoholic fatty liver disease (NAFLD), chronic pancreatitis, acute pancreatitis, and pancreatic cancer). Inverse MR analysis showed no causal relationship between 24 GI diseases and mood swings.

Conclusions: This comprehensive MR analysis suggests that genetically predicted mood swings may be a risk factor in the development of GI diseases. Interventions for mood swings may help to treat GI diseases.

Keywords: Mendelian randomization, mood swings, gastrointestinal diseases

Introduction

It is well known that emotions are closely related to almost all diseases, such as cardiovascular and cerebrovascular diseases, mental diseases, digestive diseases, and endocrine diseases. Numerous studies[1-3] have explored the intricate interplay between gastrointestinal (GI) diseases and various psychological factors. For example, up to one-third of people with irritable bowel syndrome (IBS) also experience anxiety or depression.[4] The discovery of the gut-brain axis has prompted many researchers to focus on the link between GI diseases and the psychophysiological aspects of the brain.[5,6] However, while the association between psychotic illness and GI diseases such as inflammatory bowel disease (IBD) and IBS has been extensively documented, evidence on the relationship between personality traits, such as mood swings, and these diseases are limited.

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Mood instability is a common personality trait characterized by frequent, sudden, and unpredictable emotional changes.[7] Numerous studies have shown a strong association between mood instability and mental illnesses, including bipolar disorder, schizophrenia, major depressive disorder, and anxiety disorders.[7-9] A common symptom of individuals with mood instability is mood swings.[10] In the UK-Biobank, mood swings are defined by the answer to the question, "Does your mood often go up and down?"[11] Obvious mood swings, defined as high mood instability, are considered a key risk factor in psychopathology.[12] Therefore, mood swings may be associated with an increased risk of diseases in patients with mood instability. It is worth noting that several studies have shown that mood swings may be a risk factor for cardiovascular diseases and cerebrovascular diseases.[13-15] However, very few studies have focused on the relationship between mood swings and GI diseases. A Mendelian randomization (MR) study suggested that mood swings, high tension, and anxious feelings, are causally related to an increased risk of developing gastroesophageal reflux disease (GERD).[16] IBS patients are commonly reported to have mood swings.[17] Overall, mood swings are a relatively new field in GI disease research, with limited studies.

MR is an analytical method for assessing causal relationships between exposures and clinical outcomes. MR studies can use genetic variation to explore causality when randomized controlled trials cannot test for causality, or when observational studies are susceptible to confounding or reverse causality. Single-nucleotide polymorphisms (SNPs) are a type of genetic variation that is known to be valuable. In this study, SNPs were used as instrumental variables (IVs). Given that previous studies have focused on IBS, GERD, and IBD, our bidirectional MR analysis mainly focused on exploring the causal association between mood swings and GERD as well as IBS. At the same time, the relationships between mood swings and other GI diseases were also examined, with the aim of better understanding the causal relationship between mood swings and full-blown GI diseases and to provide sound recommendations for public health programs.

MAIN POINTS

- *This study is the first to explore the bidirectional causal association between mood swings and gastrointestinal (GI) diseases. The advantage of utilizing the Mendelian randomization design is its capability to directly detect causality, which is superior to observational studies as it helps to avoid confounders and reverse causality.*
- *Almost all common systemic GI diseases were included in this study. This approach provides the most systematic risk assessment of mood swings with 24 GI diseases.*
- *We performed false discovery rate correction to ensure the reliability of the results.*
- *Our findings suggest that mood swings could increase the risk of developing various GI diseases, including gastroesophageal reflux disease, acute gastritis, chronic gastritis, gastroduodenal ulcer, gastric ulcer, duodenal ulcer, diverticular disease of the intestine, nonalcoholic fatty liver disease, chronic pancreatitis, acute pancreatitis, irritable bowel syndrome, pancreatic cancer, and functional dyspepsia. Our results offer insights for the early screening of GI diseases and the potential development of new treatments.*

Materials and Methods

Study Design

In MR research, the IVs must meet three fundamental assumptions: (1) IVs must be directly associated with exposure factors, (2) IVs are not affected by any potential confounding factors, and (3) IVs do not influence the outcomes other than exposure pathways that affect outcomes (Figure 1).[18] The mood swings sample information was sourced from the UK Biobank. The GI disease sample information was sourced from the FinnGen project. The outcomes in this study were total GI diseases and 24 GI subtypes, including 10 upper GI diseases, five lower GI diseases, eight hepatobiliary and pancreatic diseases, and other diseases such as acute appendicitis.

Data Sources for Mood Swings

Candidate gene tools for mood swings were obtained from the most recent genome-wide association study (GWAS), which included 445 274 participants from the UK Biobank (201 373 cases and 243 901 controls).[19] GWAS summary statistics can be downloaded from the GWAS Catalog at https://www.ebi.ac.uk. The UK Biobank study is an ongoing cohort study initiated by recruiting approximately 500 000 adults aged between 40 and 69 from 2006 to 2010. It is a large-scale open database containing hundreds of thousands of individuals' genotype data paired with electronic health records and survey measures.[11] Mood swings are defined as answering yes to the question "Does your mood often go up and down?". Detailed information is shown in Table 1 and Supplementary Table S1.

Data Sources for GI Diseases

We selected European samples in all cases to avoid multiplicity bias across geographical regions. In addition, the FinnGen project (https://www.finngen.fi/en)[20] was chosen for the GI disease samples. This choice was made because the exposure SNPs were sourced from the UK Biobank, thus preventing any overlap with the samples. The FinnGen study is a large-scale genomics initiative that has analyzed over 500 000 Finnish biobank samples. It correlates genetic variation with health data to understand disease mechanisms and predispositions. The project is a collaboration between research organizations and biobanks within Finland and international industry partners (https://www.finngen.fi/en).[20] Detailed information is shown in Table 1 and Supplementary Table S1.

Selection of Instrumental Variables

The screening criteria for candidate IVs were as follows: (1) genome-wide significant SNPs were extracted from the GWAS pooled data ($P < 5e{-}8$), and SNPs with long physical distances (≥10 000 kb) and low probability of linkage disequilibrium ($R^2 < 0.001$) were reserved; (2) we chose robust IVs with *F*-statistics greater than 10.[21] The *F*-statistic was calculated as $F = \beta^2/SE^2$ (Supplementary Table S2 and Supplementary Table S7)[22]; (3) SNPs with minor allele frequencies (MAF ≥ 0.01) were excluded; (4) we removed the palindrome sequence from the tool variable; and (5) we excluded SNPs directly associated with GI diseases and some of the recognized confounders associated with GI disease such as smoking,[23] drinking,[23] depression,[24] and body mass index (BMI),[25] based on LD trait (https://ldlink.nci.nih.gov/?tab=ldtrait).[26] The specific excluded SNPs and their associated traits are detailed in Supplementary Table S3. Finally, before each MR analysis, outliers were removed using the MR-PRESSO test.

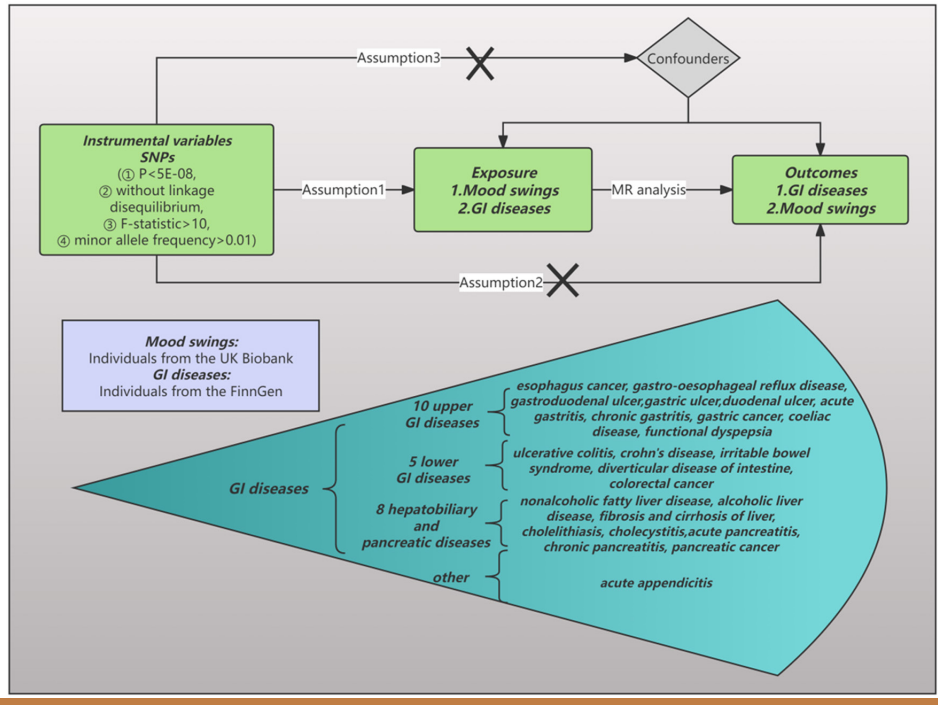

Figure 1. Schematic diagram of the Mendelian randomization design to examine the causal association between mood swings and gastrointestinal diseases. GI, gastrointestinal; MR, Mendelian randomization; SNPs, single-nucleotide polymorphisms.

MR Analysis

In this study, we utilized the inverse variance weighting (IVW) method as the primary method for estimating causal effects. The IVW model is considered the most powerful method for detecting causality in two-sample MR analysis.[27] The MR-Egger and weighted median methods were used to support and complement the findings obtained through the IVW results. Cochran's *Q*-test was performed to evaluate the heterogeneity of the IVW model. Cochran's *Q*-test of $P < .05$ indicates heterogeneity.[28] If no heterogeneity was present, a fixed-effects model was used. Otherwise, a random effects model was used.[29] The MR-Egger intercept test was performed to assess whether the included SNPs were potentially horizontally pleiotropic, and a *P*-value of <.05 indicated the presence of pleiotropy.[30] The leave-one-out sensitivity test was used to eliminate SNPs to determine the sensitivity of individual SNPs in this MR study. This study also used scatter, forest, and funnel plots for visualization and analysis.[31] Finally, to fully and accurately represent the causal relationship between mood swings and GI diseases, we applied FDR correction to refine the causal relationship. $P < .05$ was considered statistically significant (two-sided). Odds ratio (OR) and 95% confidence interval (CI) were used to describe the relative risk between mood swings and GI diseases.

The above analyses were performed in R version 4.3.1. The "TwoSampleMR" (https://mrcieu.github.io/TwoSampleMR/) and "MR-PRESSO" (https://github.com/rondolab/MR-PRESSO) packages were used. TwoSampleMR, which includes various analysis methods, is a package used for conducting MR with GWAS summary data. There are three uses for MR-PRESSO: (1) detecting cross-sectional multicollinearity, (2) correcting for cross-sectional multicollinearity by removing outliers, and (3) testing for significant differences in causal estimates before and after the removal of outliers.[32]

Results

MR Analysis Results between 24 GI Diseases and Mood Swings

The exposure sample information was from the UK-Biobank (201 373 cases and 243 901 controls),[19] and the GI diseases sample information was from the FinnGen project.[20] A *P*-value of <5e−8 was chosen as the screening criterion for mood swing-associated SNPs. After a rigorous IV selection process of removing SNPs with linkage disequilibrium and unsatisfactory MAFs (MAF < 0.01), 56 strong IVs were finally chosen, all of which had *F*-statistics exceeding 10 (Supplementary Table S2).

After FDR correction, we found a significant causal association between mood swings and GI diseases (OR = 1.213, 95% CI = 1.118-1.316, $P = 3.490e{-}06$, $P_{FDR} = 8.730e{-}05$). When subtypes of GI diseases were taken into account, mood swings were significantly causally positively associated with 11 GI diseases (Figure 2 and Supplementary Table S4). In detail, mood swings were a significant risk factor for GERD (OR = 1.294, 95% CI = 1.145-1.463, $P = 3.870e{-}05$, $P_{FDR} = 4.838e{-}04$), acute gastritis (OR = 1.664, 95% CI = 1.242-2.229, $P = 6.406e{-}04$, $P_{FDR} = 5.339e{-}03$), gastroduodenal ulcer (OR = 1.303, 95% CI = 1.113-1.524, $P = 9.771e{-}04$, $P_{FDR} = 4.071e{-}03$), duodenal ulcer (OR = 1.435, 95% CI = 1.116-1.846, $P = 4.896e{-}03$, $P_{FDR} = 1.360e{-}02$), diverticular disease of the intestine (OR = 1.190, 95% CI = 1.030-1.374, $P = 1.791e{-}02$, $P_{FDR} = 4.071e{-}02$), nonalcoholic fatty liver disease (NAFLD; OR = 1.507, 95% CI = 1.107-2.050, $P = 9.088e{-}03$, $P_{FDR} = 2.272e{-}02$), chronic pancreatitis (OR = 1.541, 95% CI = 1.194-1.988, $P = 8.787e{-}04$, $P_{FDR} = 5.492e{-}03$), acute pancreatitis (OR = 1.368, 95% CI = 1.133-1.651, $P = 1.096e{-}03$, $P_{FDR} = 3.914e{-}03$), IBS(OR = 1.375, 95% CI = 1.139-1.661, $P = 9.414e{-}04$, $P_{FDR} = 4.707e{-}03$), pancreatic cancer (OR = 1.553, 95% CI = 1.078-2.236, $P = 1.810e{-}02$, $P_{FDR} = 3.770e{-}02$), and functional dyspepsia (OR = 1.327, 95% CI = 1.114-1.582,

Table 1. Genome-Wide Association Study Summary Data Details

Phenotypes	Data sources	Sample size	Population
Mood swings	GWAS catalog	201 373 cases and 243 901 controls	European
Gastrointestinal diseases	FinnGen (R7)	159 111 cases and 150 043 controls	European
Gastro-esophageal reflux disease	FinnGen (R10)	28 859 cases and 350 064 controls	European
Acute gastritis	FinnGen (R10)	2558 cases and 350 064 controls	European
Chronic gastritis	FinnGen (R10)	3875 cases and 361 641 controls	European
Gastric ulcer	FinnGen (R10)	6459 cases and 350 064 controls	European
Duodenal ulcer	FinnGen (R10)	3795 cases and 350 064 controls	European
Gastroduodenal ulcer	FinnGen (R10)	10 021 cases and 350 064 controls	European
Crohn's disease	FinnGen (R10)	2033 cases and 409 940 controls	European
Ulcerative colitis	FinnGen (R10)	5931 cases and 405 386 controls	European
Diverticular disease of intestine	FinnGen (R10)	33 619 cases and 329 381 controls	European
Acute pancreatitis	FinnGen (R10)	6787 cases and 361 641 controls	European
Chronic pancreatitis	FinnGen (R10)	3875 cases and 361 641 controls	European
Irritable bowel syndrome	FinnGen (R10)	10 329 cases and 329 381 controls	European
Functional dyspepsia	FinnGen (R10)	9680 cases and 3 500 641 controls	European
Coeliac disease	FinnGen (R10)	4115 cases and 394 391 controls	European
Acute appendicitis	FinnGen (R10)	31 628 cases and 378 082 controls	European
Alcoholic liver disease	FinnGen (R10)	3047 cases and 400 247 controls	European
Nonalcoholic fatty liver disease	FinnGen (R10)	2568 cases and 409 613 controls	European
Fibrosis and cirrhosis of liver	FinnGen (R10)	2017 cases and 400 247 controls	European
Cholelithiasis	FinnGen (R10)	40 191 cases and 361 641 controls	European
Cholecystitis	FinnGen (R10)	46 971 cases and 361 641 controls	European
Esophagus cancer	FinnGen (R10)	619 cases and 314 193 controls	European
Gastric cancer	FinnGen (R10)	1423 cases and 314 193 controls	European
Colorectal cancer	FinnGen (R10)	6847 cases and 314 193 controls	European
Pancreatic cancer	FinnGen (R10)	1626 cases and 314 193 controls	European

GWAS, genome-wide association study.

P=1.555e−03, P_{FDR}=4.860e−03). Moreover, there was a potential causal association between mood swings and gastric ulcer (OR=1.231, 95% CI=1.015-1.494, P=3.509e−02, P_{FDR}=6.265e−02) and chronic gastritis (OR=1.182, 95% CI=1.013-1.379, P=3.378e−02, P_{FDR}=6.497e−02). No causal relationship was found with the other 13 GI diseases. Sensitivity analyses showed that there was no pleiotropy in any of the associations between mood swings and the above 10 GI diseases (Table 2 and Supplementary Table S5). Furthermore, although there was heterogeneity in associations (Table 2 and Supplementary Table S6) between mood swings and GERD ($P_{heterogeneity}$=2.277e−03 < .05), diverticular disease of the intestine ($P_{heterogeneity}$=1.061e−07 < .05), IBS ($P_{heterogeneity}$=1.379e−02 < .05), and functional dyspepsia ($P_{heterogeneity}$=4.882e−02 < .05), this did not affect the results. Leave-one-out analysis showed similar results (Supplementary Figures). Scatterplots and funnel plots also showed the stability of the results (Supplementary Figures).

Reverse MR Analysis Results between 24 GI Diseases and Mood Swings

The *P*-value of <5e-8 was selected as the screening criterion for SNPs related to GI diseases. All SNPs included in the analysis were powerful IVs (*F*-statistics > 10). Four GI diseases (acute gastritis, gastroduodenal ulcer, esophageal cancer, and IBS) were excluded from the reverse MR analysis because no SNPs were screened. After applying FDR correction, the reverse MR results (Figure 3 and Supplementary Table S8) indicated no causal association between the other 20 GI diseases and mood swings (all P_{FDR} > .05). Horizontal pleiotropy (Supplementary Table S9) was detected in individuals with ulcerative colitis and mood swings ($P_{pleiotropy}$=.005 < .05). Additionally, although there was heterogeneity (Supplementary Table S10) shown by reverse MR analysis between six GI diseases (cholecystitis, cholelithiasis, coeliac disease, diverticular disease of the intestine, functional dyspepsia, and gastric cancer) and mood swings (IVW method, P < .05), this did not affect the results.

Discussion

This bidirectional MR study used the large-scale, publicly available GWAS summary statistics to explore the causal relationship between mood swings and common GI diseases for the first time. Using forward MR analysis (Figure 2), we demonstrated that genetically predicted mood swings could elevate the risk of developing eleven GI diseases, including GERD, acute gastritis, gastroduodenal ulcer, gastric ulcer, duodenal ulcer, diverticular disease of the intestine, NAFLD, chronic pancreatitis, acute pancreatitis, IBS, pancreatic cancer, and functional dyspepsia. Using reverse MR analysis (Figure 3), no causal relationships were detected between these eleven GI diseases and mood swings. In general, our bidirectional MR results imply that mood swings may elevate the risk of developing GI diseases such as GERD, acute gastritis, gastroduodenal ulcer, gastric ulcer, duodenal ulcer, diverticular disease of the intestine, NAFLD, chronic pancreatitis, acute pancreatitis, IBS, pancreatic cancer, and functional dyspepsia, thus providing insights for the early screening for GI diseases and the potential development of new treatments.

Personality traits, especially mood swings, have enduring effects from birth, yet limited research has been conducted to investigate their causal relationship with different diseases. Almost all the literature focuses on the association between mental disorders, such as depression and bipolar disorder. Many clinical observational studies have identified the coexistence and interaction between mental illness and various GI diseases. An increased risk of GI diseases was strongly associated with neurocognitive and psychiatric disorders,[33] such as autism,[34] dementia,[35,36] schizophrenia,[37] depression, and anxiety.[38] The current MR analysis confirmed the findings

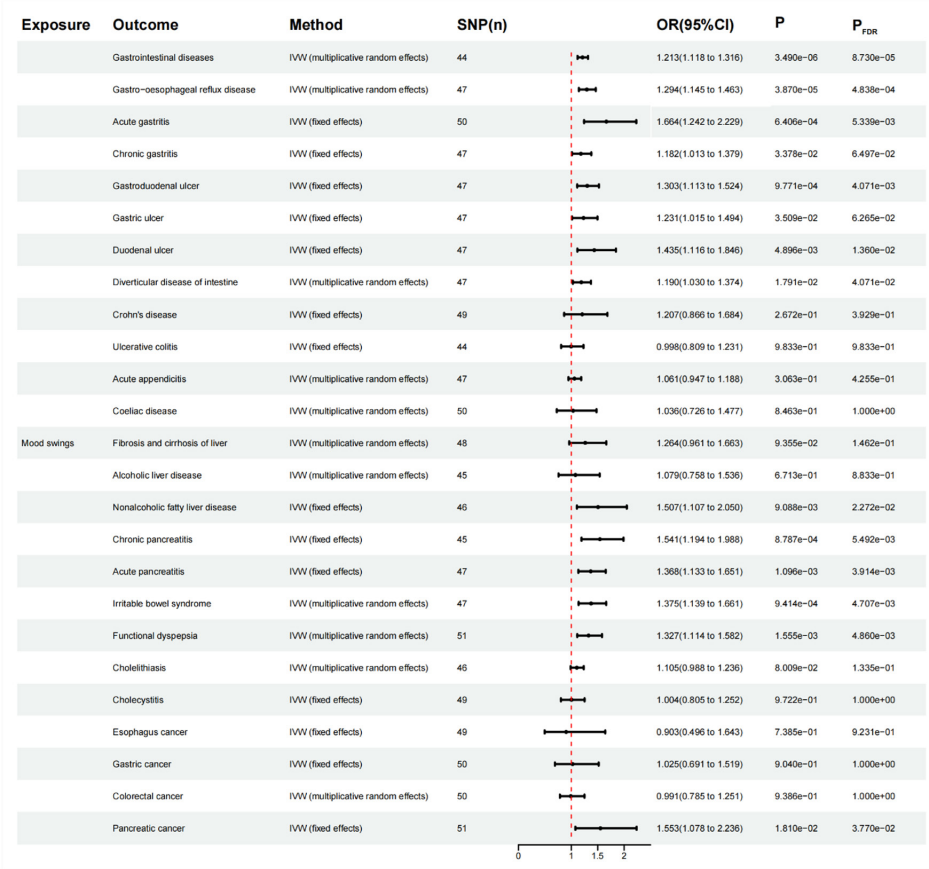

Figure 2. Forest plots of the association between mood swings and GI diseases and final causality. OR, odds ratio; CI, confidence interval; nsnp, number of SNPs; P_{FDR}, *P* value corrected by false discovery rate (FDR); IVW, inverse variance weighting.

of previous epidemiological studies that depression could increase the risk of IBS,[39] NAFLD,[40] GERD,[41] gastric ulcer, and duodenal ulcer.[42] However, very few studies have focused on mood swings. An MR study concluded that mood swings and anxious feelings are associated with an increased risk of GERD.[16] Given the growing body of evidence linking mood swings to mental functioning and the fact that mood swings have been recognized as an important factor in understanding clinical and non-clinical emotional states and characteristics,[43] we call for more research on mood swings. To our knowledge, our study is the first to examine the causal relationship between mood swings and different GI diseases, which will contribute to a novel perspective on the connection between personality traits and GI diseases.

It is worth noting that the impact of mood swings on the progression of GI disease remains unclear. However, there are some mechanisms that may explain this. First, it is acknowledged that mood swings can induce mental stress,[44] which may activate the body's defensive response. Consequently, some digestive changes might occur, such as decreased blood flow and increased inflammation,[45] ultimately damaging the gut lining, disrupting gut motility and secretion, and altering gut microbiota.[46-48] Additionally, psychological stress may influence the development of GI diseases through intermediate factors. For instance, stress-triggered GI damage is associated with impaired nutrient absorption.[49,50] Under psychological stress, individuals are more susceptible to diseases due to the decline in immunity.[51] All of these effects can lead to an increased risk of GI disease. In general, psychological stress can lead to the occurrence of GI diseases.

Considering that mood swings can be a precursor for psychiatric disorders, which are closely linked to GI diseases, early recognition and management of mood swings may decrease the incidence of GI diseases. For instance, it is essential to regularly evaluate mental health using validated questionnaires such as Mood Zoom.[52] Additionally, individuals experiencing mood swings are also encouraged to do some regular exercise.

A significant amount of effort was invested in preventing IVs from influencing the study results by accounting for confounding factors. We employed stringent criteria for screening SNPs. SNPs associated with GI diseases were excluded if associated with traits such as smoking, alcohol consumption, depression, and body mass index, using the LD trait website. The confounders associated with the diseases mentioned above are well recognized, so we excluded them to prevent unreliable results. Furthermore, we employed the MR-PRESSO method to identify and eliminate aberrant SNPs, Cochran's *Q*-test to detect heterogeneity, and the MR-Egger intercept test to identify the presence of horizontal pleiotropy. To further demonstrate the stability of our results, we employed the leave-one-out technique and other methods. Finally, we performed FDR to confirm the accuracy and robustness of the results. The methodologies mentioned above are primarily designed to mitigate potential bias and enhance the reliability of the outcomes.

Table 2. Sensitivity Analysis of Causal Associations Between Mood Swings and Gastrointestinal Diseases

Exposure	Outcome	Cochran *Q* Statistic	$P_{heterogeneity}$	$P_{pleiotropy}$
Mood swings	Gastrointestinal diseases	82.105	3.039e−04	9.652e−01
	Gastro-esophageal reflux disease	77.922	2.277e−03	7.328e−01
	Acute gastritis	33.706	9.529e−01	7.985e−01
	Chronic gastritis	46.827	4.383e−01	2.023e−01
	Gastroduodenal ulcer	40.988	6.817e−01	4.294e−01
	Gastric ulcer	43.636	5.718e−01	1.340e−01
	Duodenal ulcer	46.036	4.708e−01	9.919e−01
	Diverticular disease of intestine	114.020	1.061e−07	2.138e−01
	Crohn's disease	59.145	1.299e−01	1.992e−01
	Ulcerative colitis	56.111	8.667e−02	1.461e−01
	Acute appendicitis	73.050	6.760e−03	6.512e−01
	Coeliac disease	113.631	4.769e−07	1.342e−01
	Fibrosis and cirrhosis of liver	66.823	3.014e−02	7.400e−01
	Alcoholic liver disease	66.615	1.546e−02	3.039e−01
	Nonalcoholic fatty liver disease	52.375	2.095e−01	8.788e−01
	Chronic pancreatitis	43.760	4.818e−01	2.856e−01
	Acute pancreatitis	53.681	2.036e−01	9.245e−01
	Irritable bowel syndrome	69.638	1.379e−02	3.930e−01
	Functional dyspepsia	67.646	4.882e−02	5.000e−01
	Cholelithiasis	79.078	1.274e−03	9.158e−01
	Cholecystitis	43.009	6.771e−01	3.519e−02
	Esophagus cancer	58.311	1.464e−01	3.710e−01
	Gastric cancer	47.408	5.378e−01	6.646e−01
	Colorectal cancer	79.270	3.992e−03	2.941e−01
	Pancreatic cancer	39.164	8.655e−01	9.055e−01

Note: $P_{pleiotropy}$ >.05 indicates pleiotropy. $P_{heterogeneity}$ indicates heterogeneity.

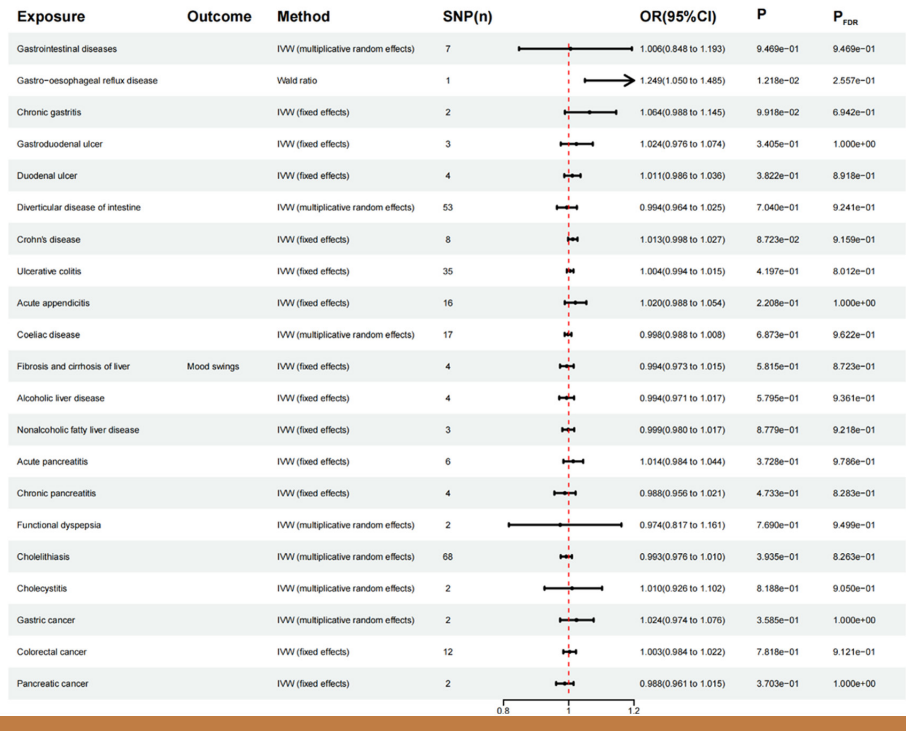

Figure 3. Forest plots of the association between GI diseases and mood swings and final causality. OR, odds ratio; CI, confidence interval; nsnp, number of SNPs; P_{FDR}, *P* value corrected by false discovery rate (FDR); IVW, inverse variance weighting.

Our study has several advantages. First, this study is the first to assess the causal correlation between mood swings and GI diseases, and the advantage of the MR design in directly detecting causality compared with observational studies is that it helps to avoid confounders and reverse causality. Second, almost all common systemic GI diseases were included in this study. This approach provides the most systematic risk assessment of mood swings in individuals with 24 GI diseases to date. Third, we performed FDR correction to ensure the reliability of the results.

However, there are some limitations to this study. First, the GWAS summary data used in this study were all from the European population, and the generalizability of the results to other populations is limited. To verify our results, further investigation of different populations is necessary. Second, in the UK Biobank cohort, mood swings were self-reported traits, which may have led to phenotypic errors. These factors should be considered in future studies.

Conclusions

This comprehensive MR analysis is the first to suggest that genetically predicted mood swings may be a risk factor in the development of GI diseases. Interventions for mood swings may help to treat GI diseases.

Availability of Data and Material: *The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.*

Ethics Committee Approval: *This MR research utilized only published or publicly available GWAS data.*

Informed Consent: *N/A.*

Peer-Review: *Externally peer-reviewed.*

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Author Contributions: *Concept – K.W., S.W.; Design – K.W., S.W., X.C.; Supervision – X.C.; Resources – K.W., S.W.; Materials – S.W.; Data Collection and/or Processing – S.W.; Analysis and/or Interpretation – K.W., S.W.; Literature Search – K.W.; Writing – K.W., S.W., X.C.; Critical Review – K.W., S.W., X.C.*

Conflicts of Interest: *The authors have no conflict of interest to declare.*

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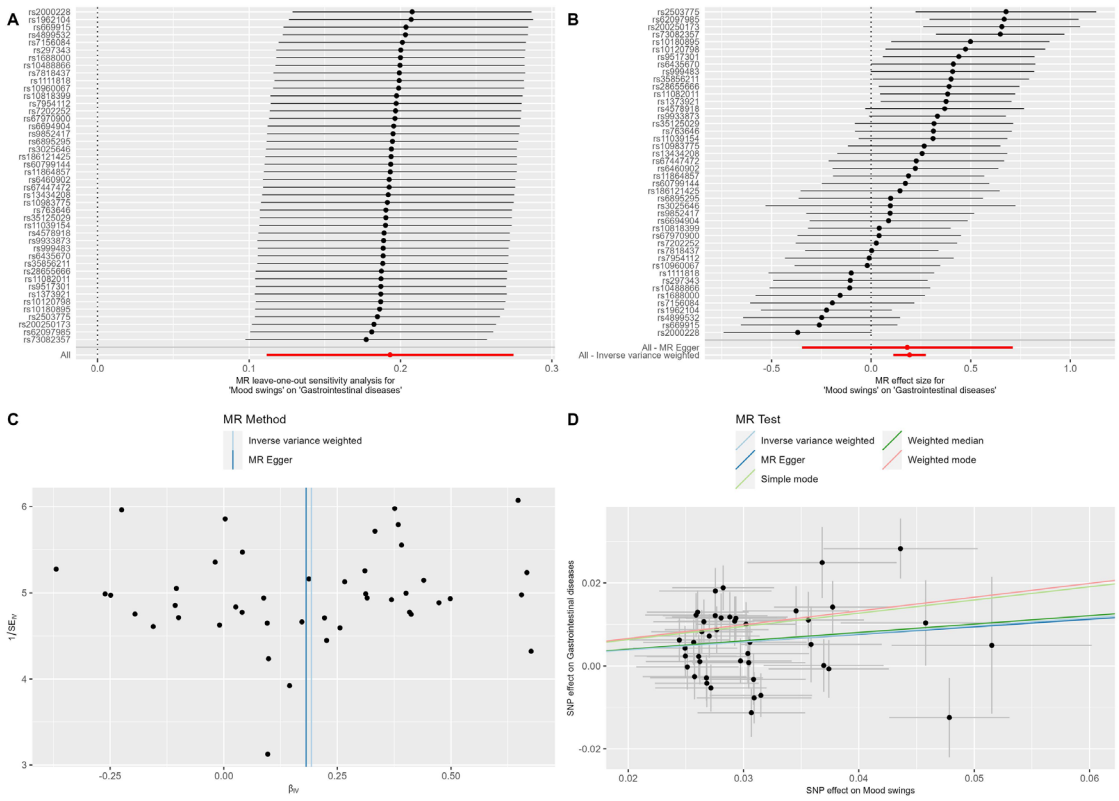
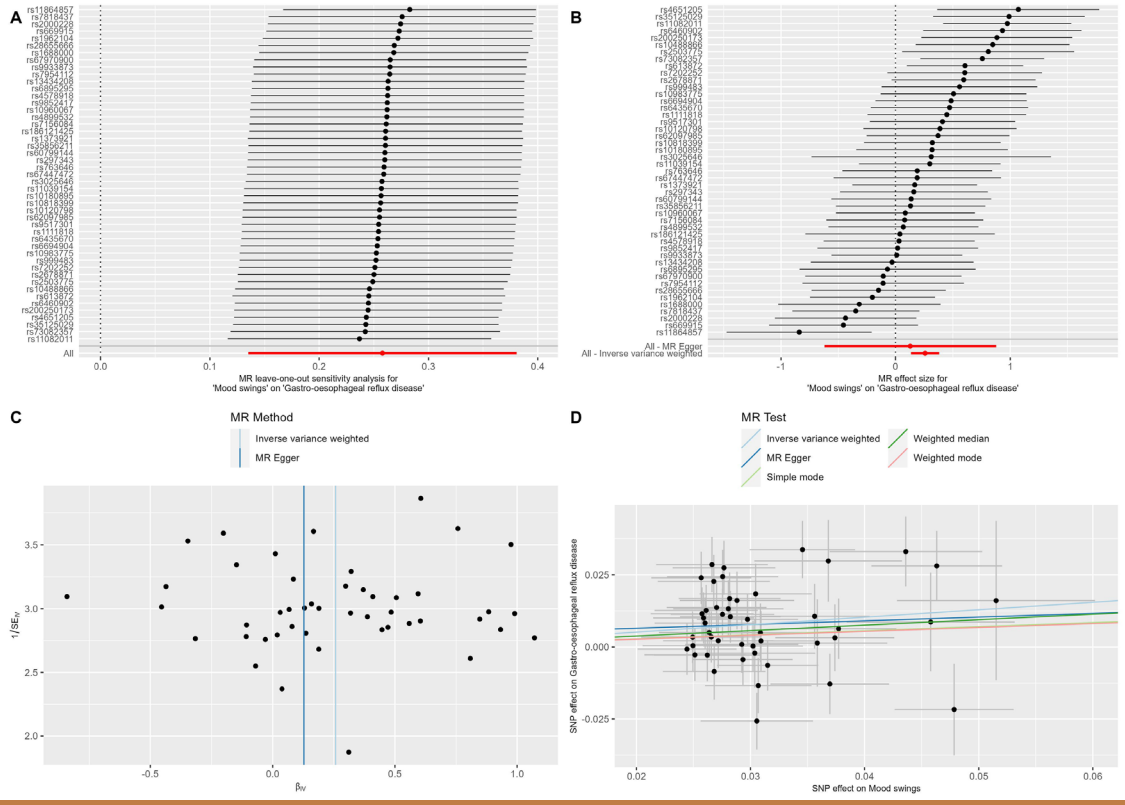
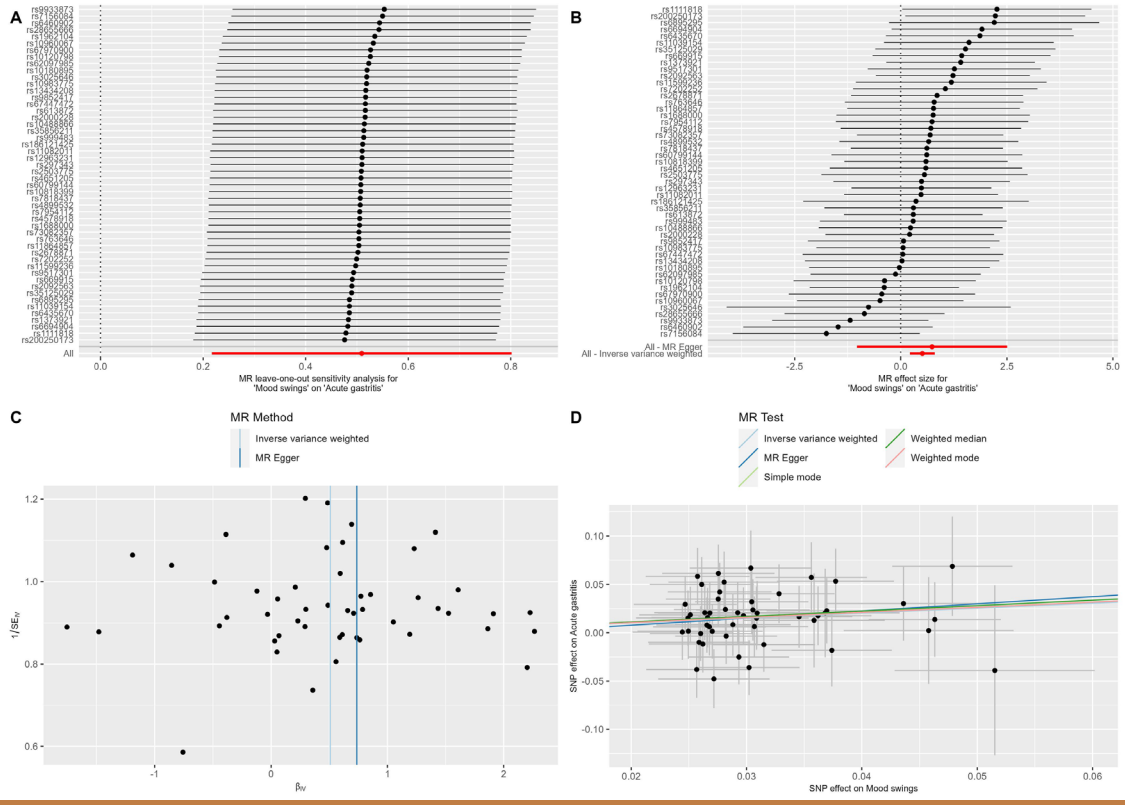


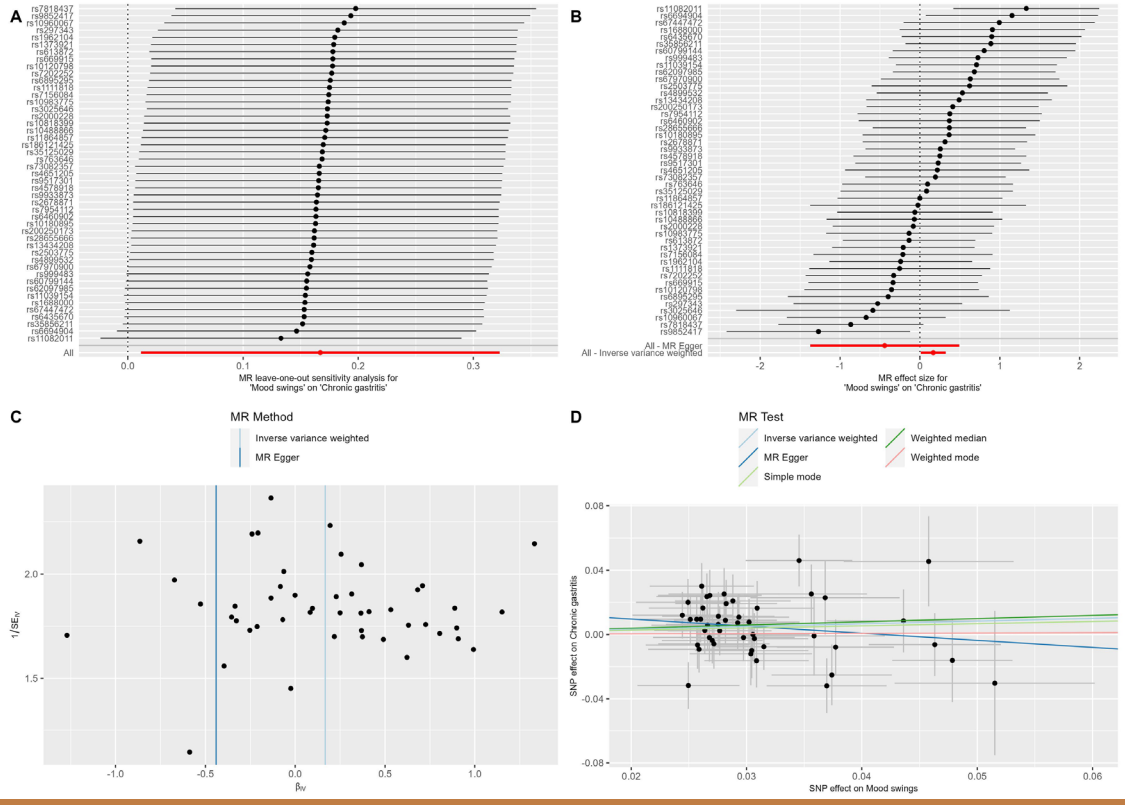
Supplementary Figure 1. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on gastrointestinal diseases.



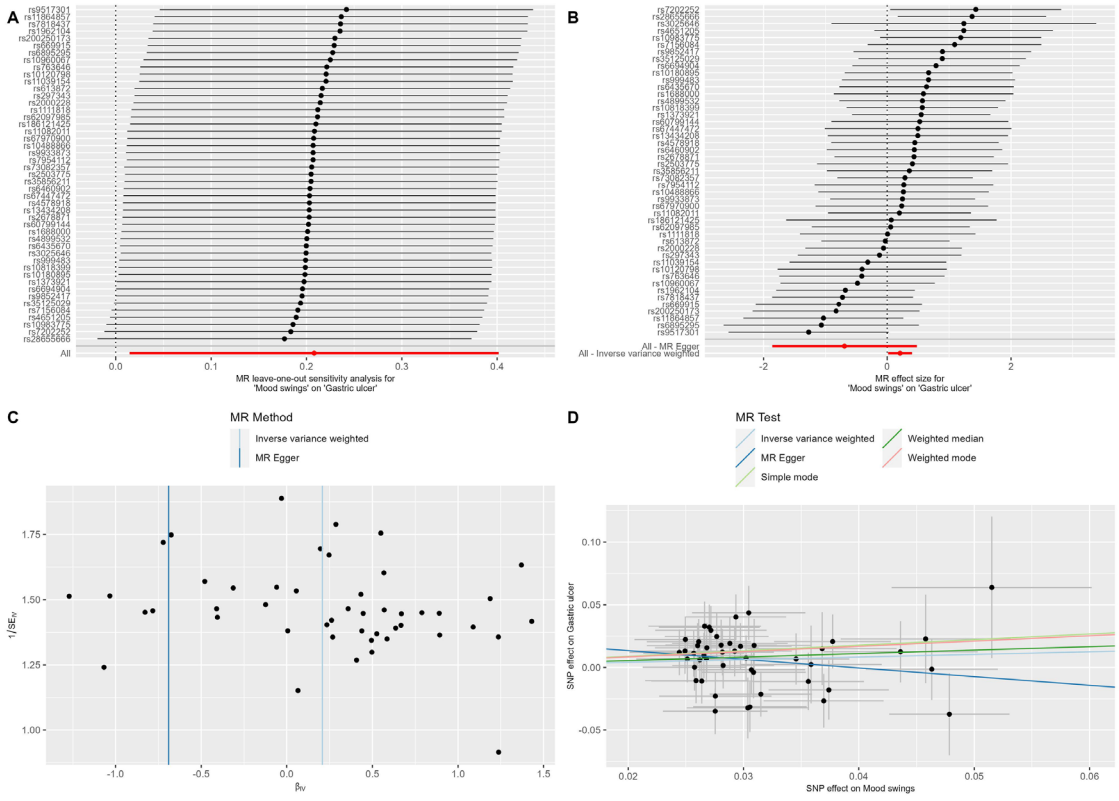
Supplementary Figure 2. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on gastro-esophagealreflux disease.



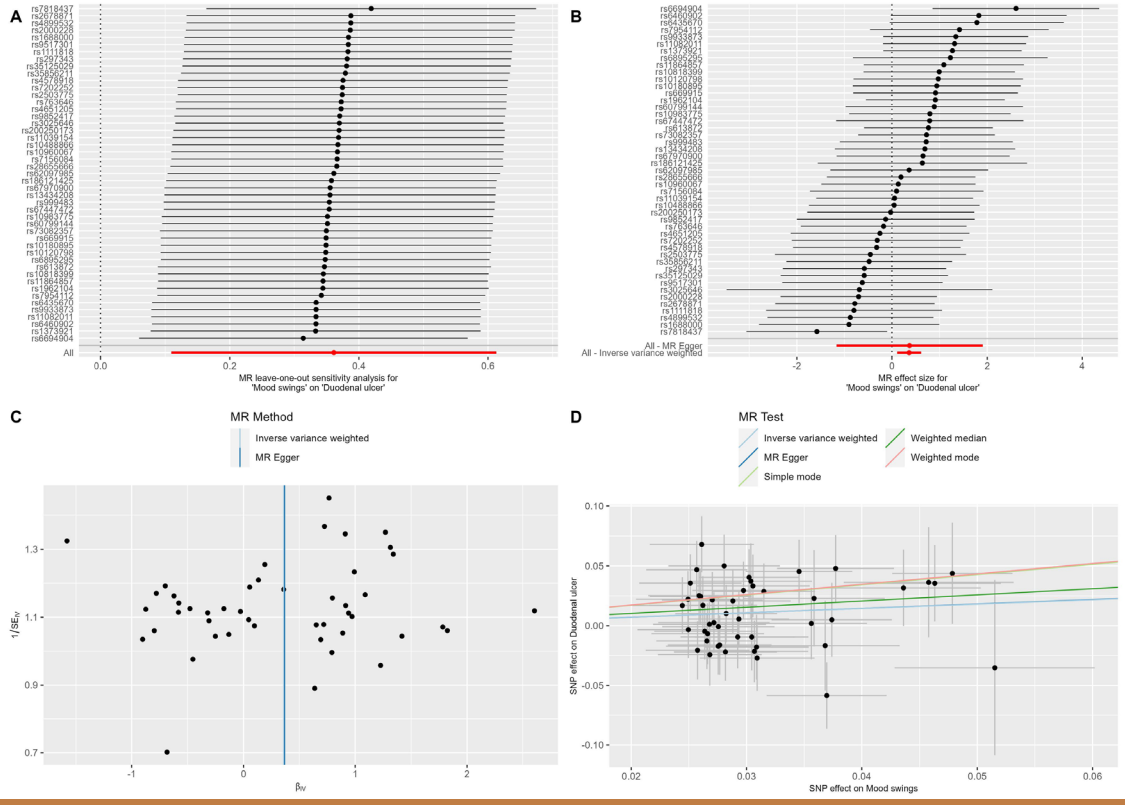
Supplementary Figure 3. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on acute gastritis.



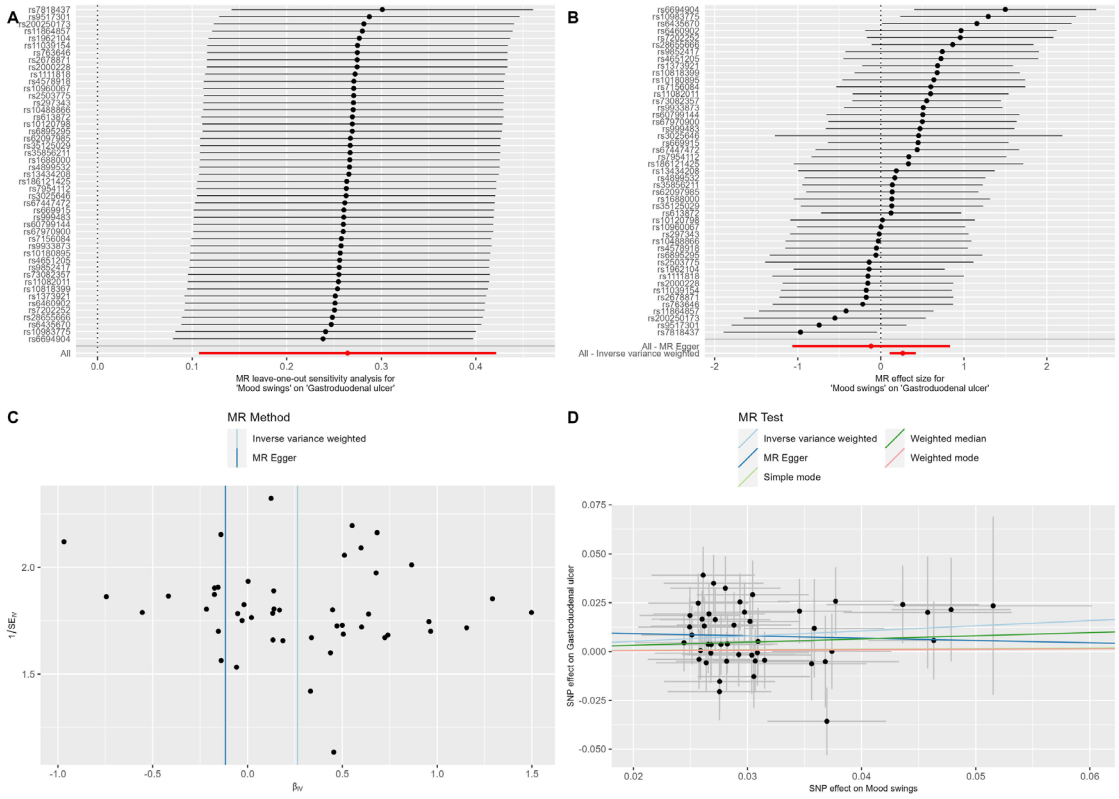
Supplementary Figure 4. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on chronic gastritis.



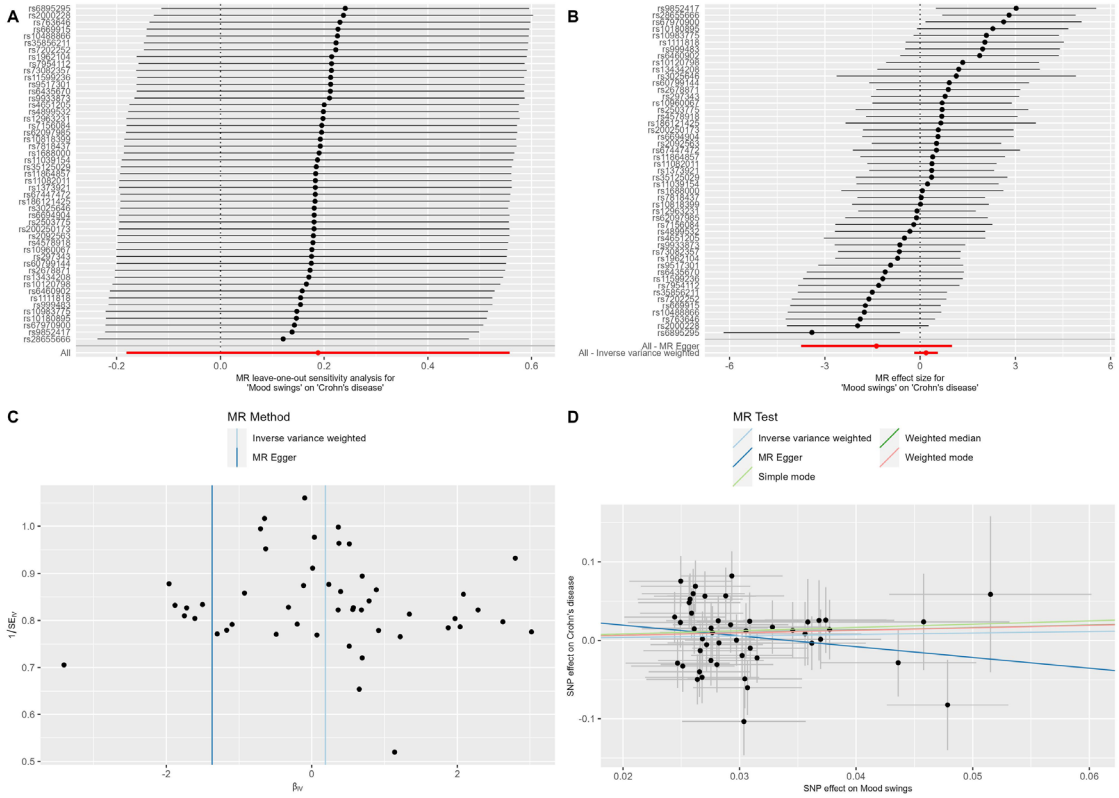
Supplementary Figure 5. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on gastric ulcer.



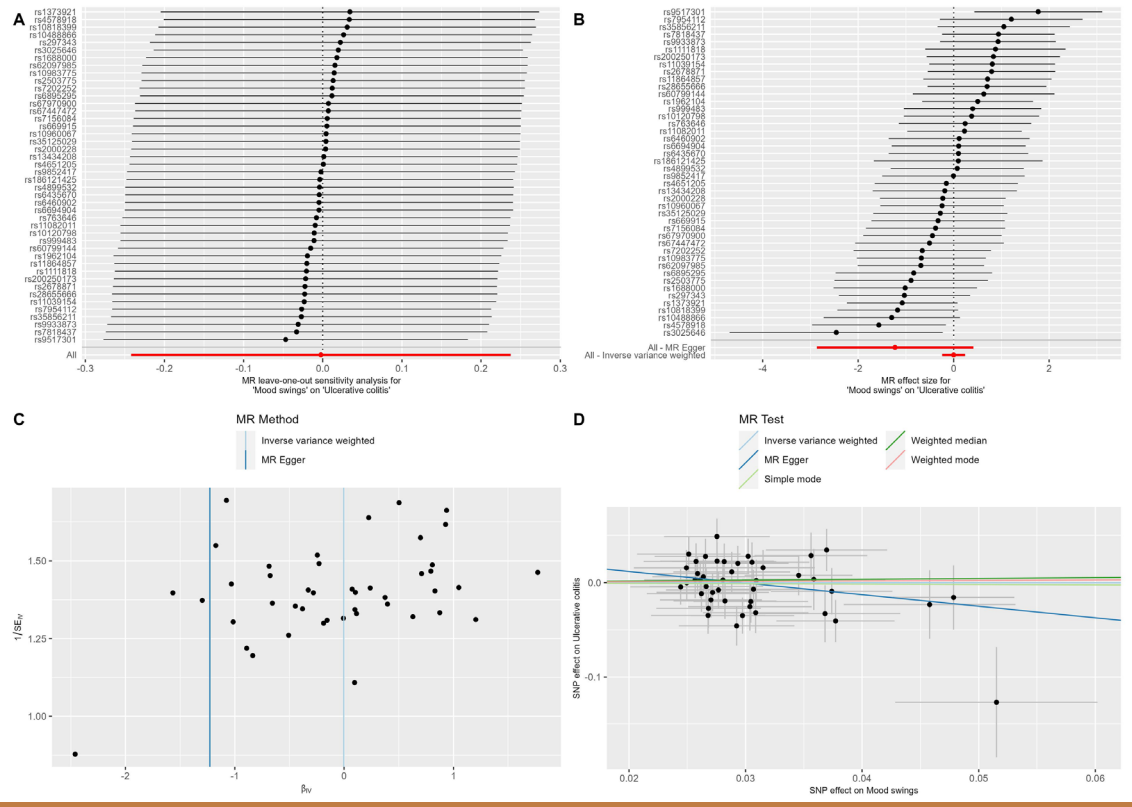
Supplementary Figure 6. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on duodenal ulcer.



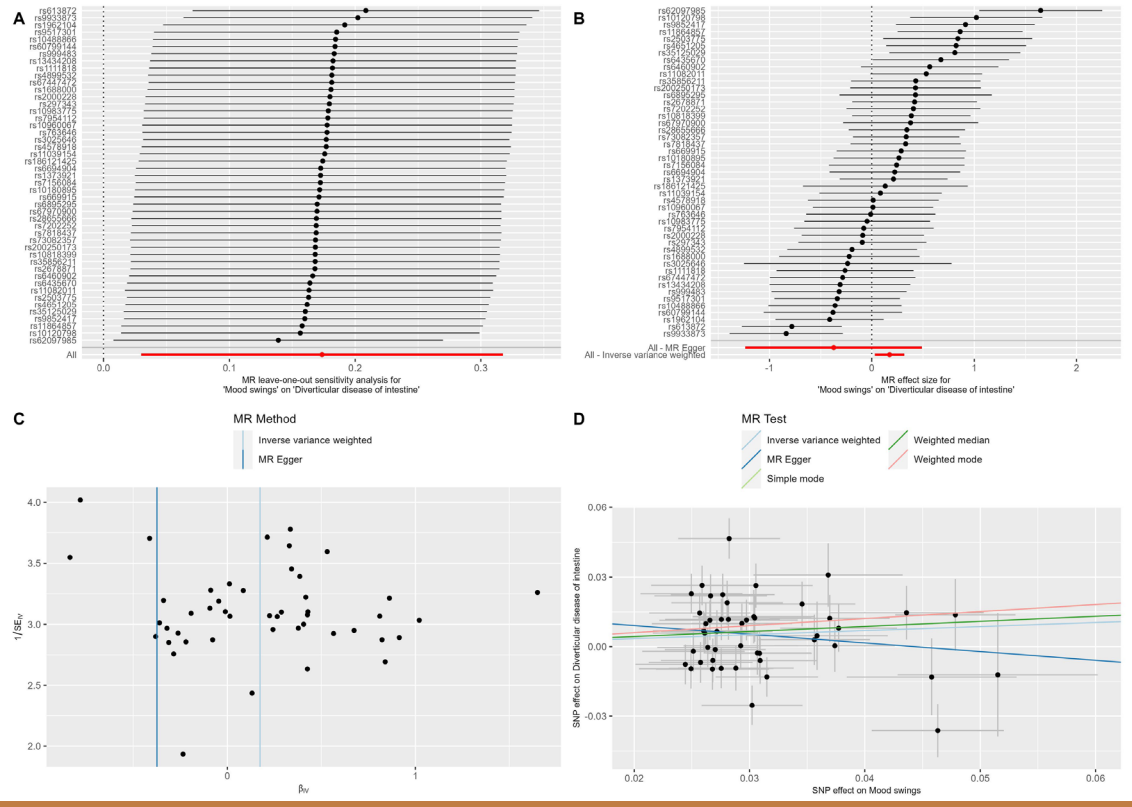
Supplementary Figure 7. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on gastroduodenal ulcer.



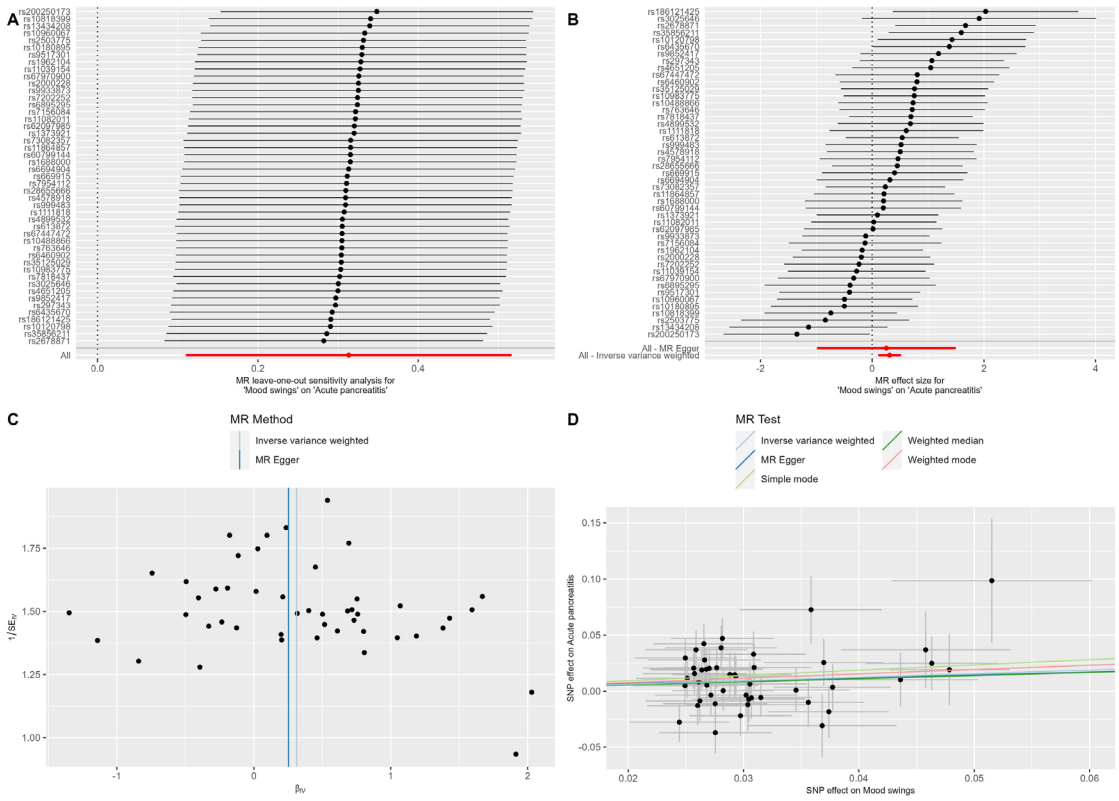
Supplementary Figure 8. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on crohn's disease.



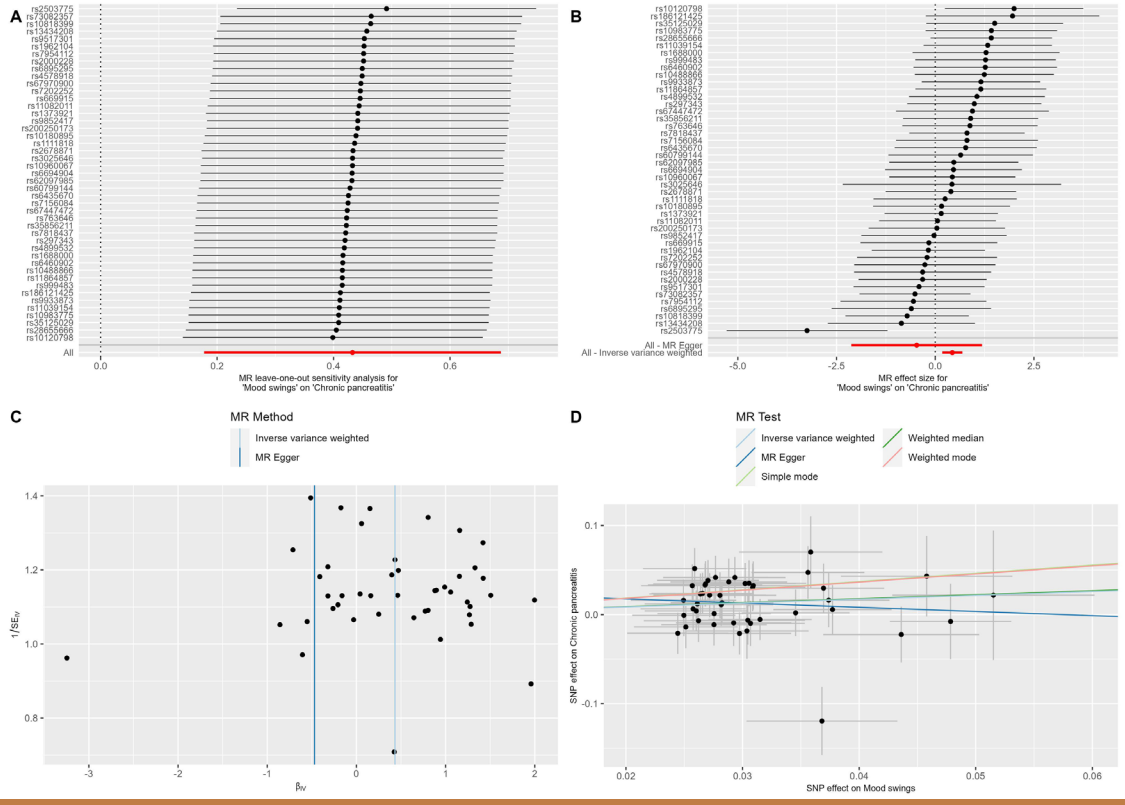
Supplementary Figure 9. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on ulcerative colitis.



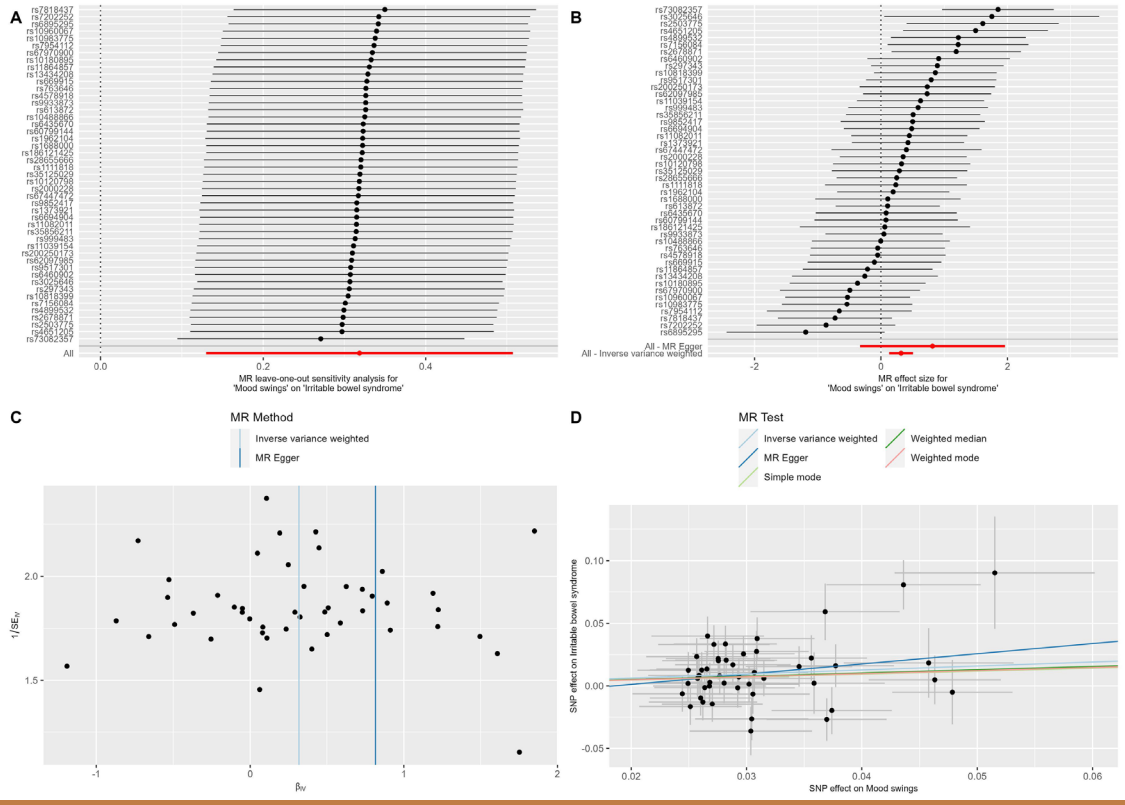
Supplementary Figure 10. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on diverticular disease of intestine.



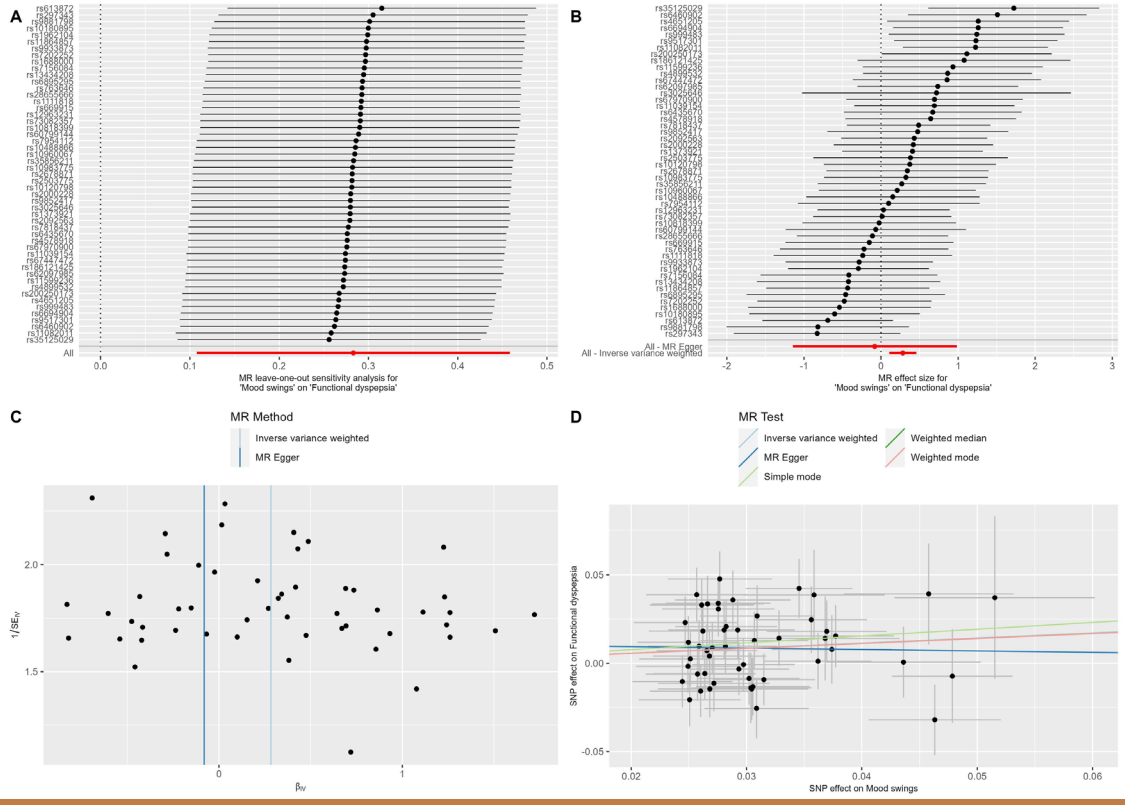
Supplementary Figure 11. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on acute pancreatitis.



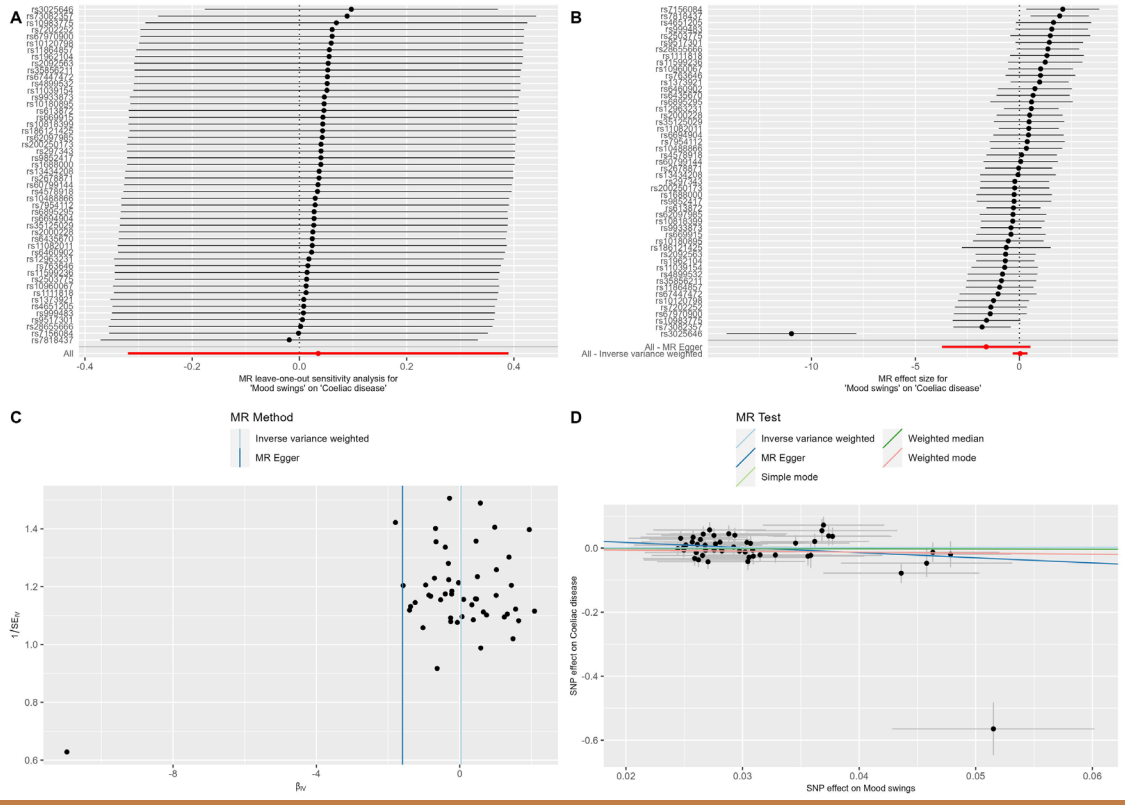
Supplementary Figure 12. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on chronic pancreatitis.



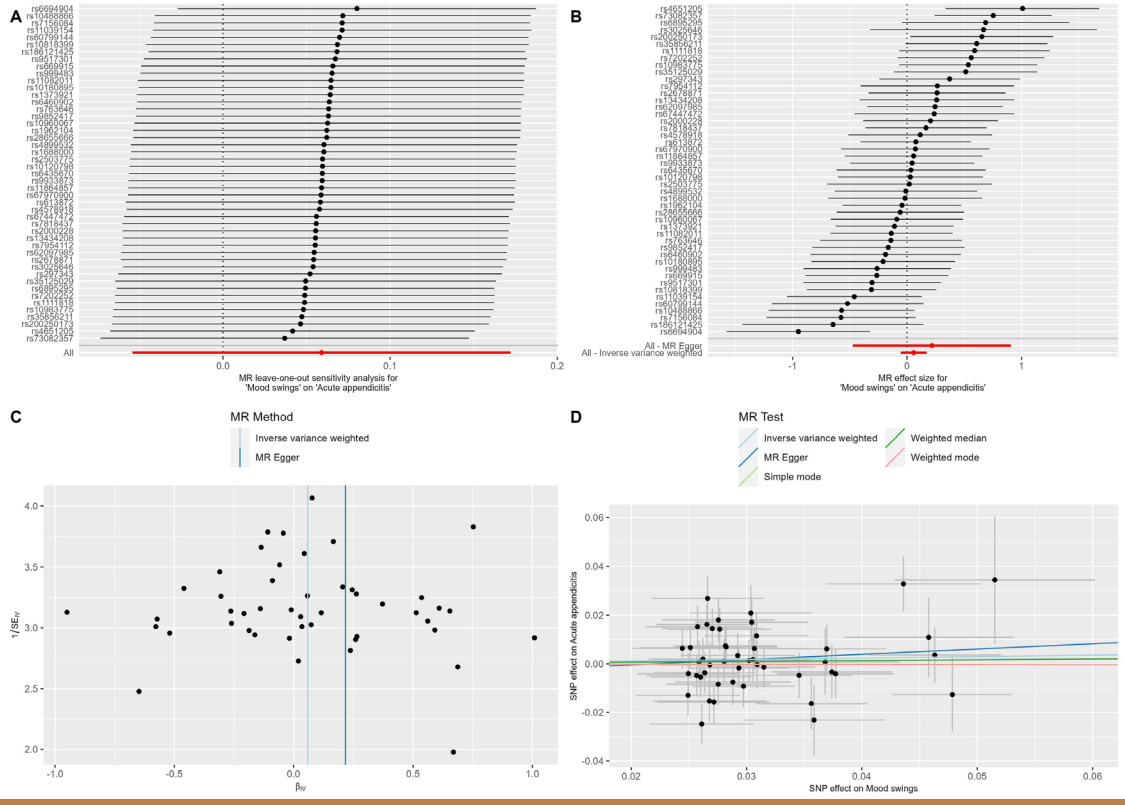
Supplementary Figure 13. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on irritable bowel syndrom.



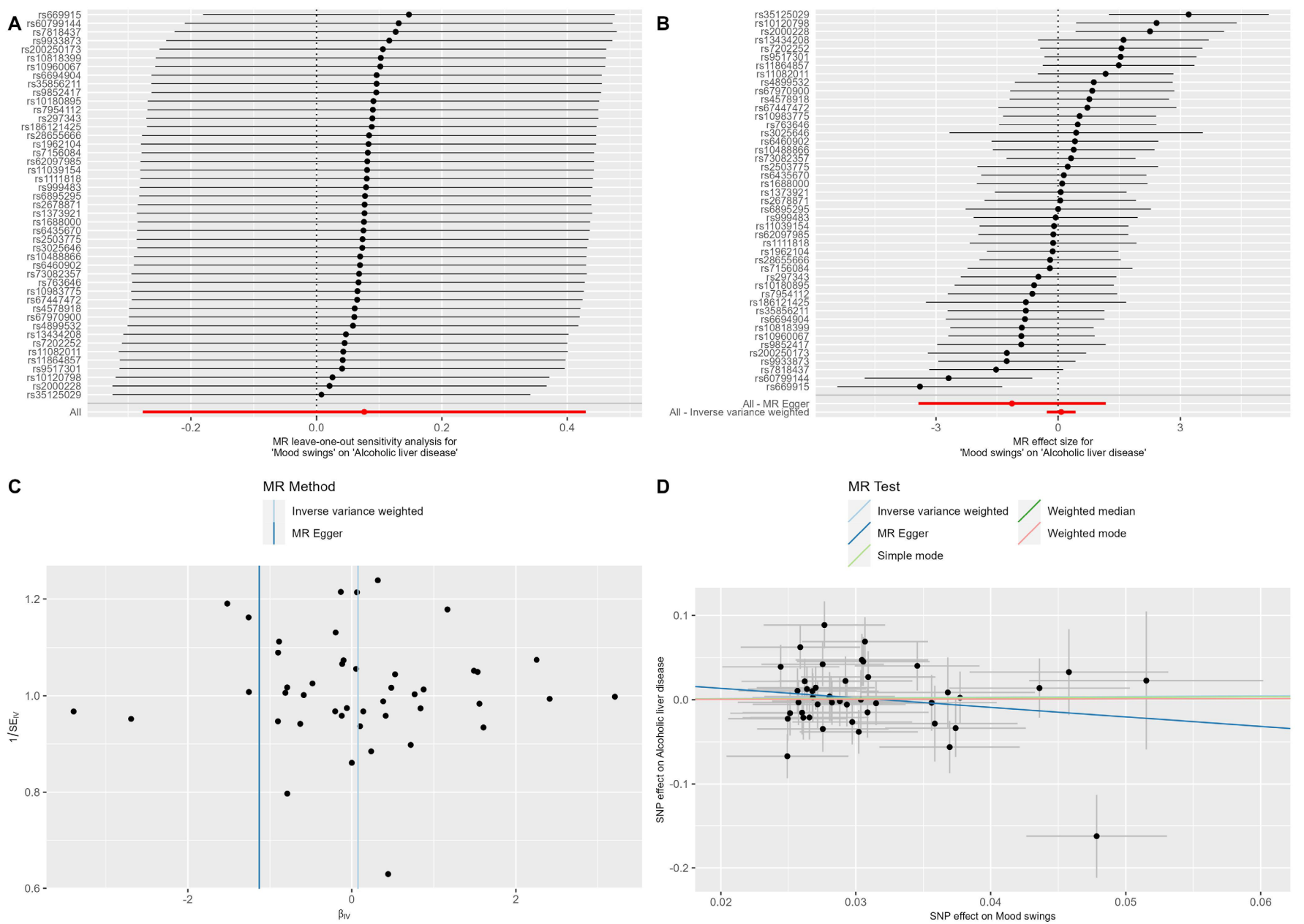
Supplementary Figure 14. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on functional dyspepsia.



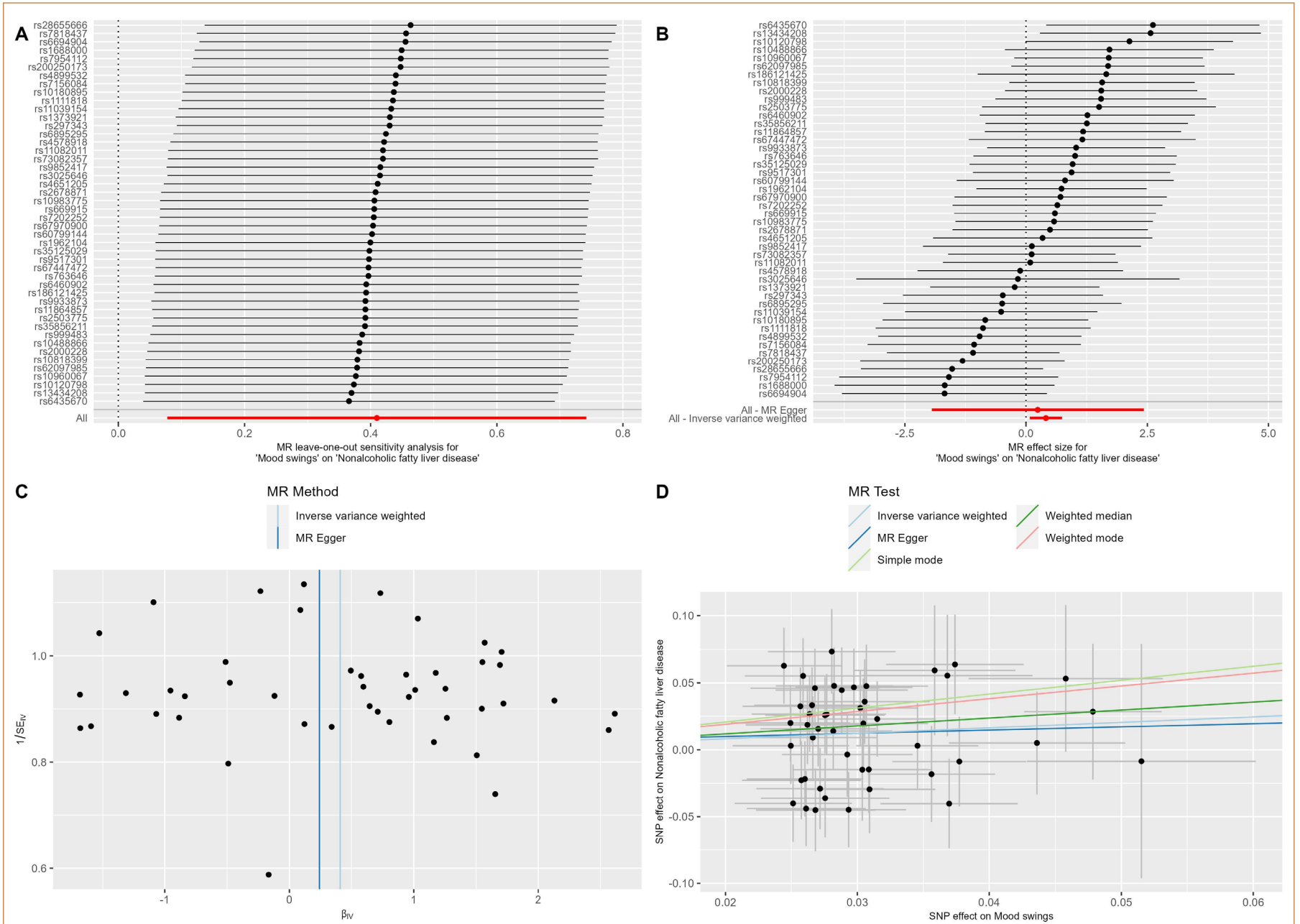
Supplementary Figure 15. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on coeliac disease.



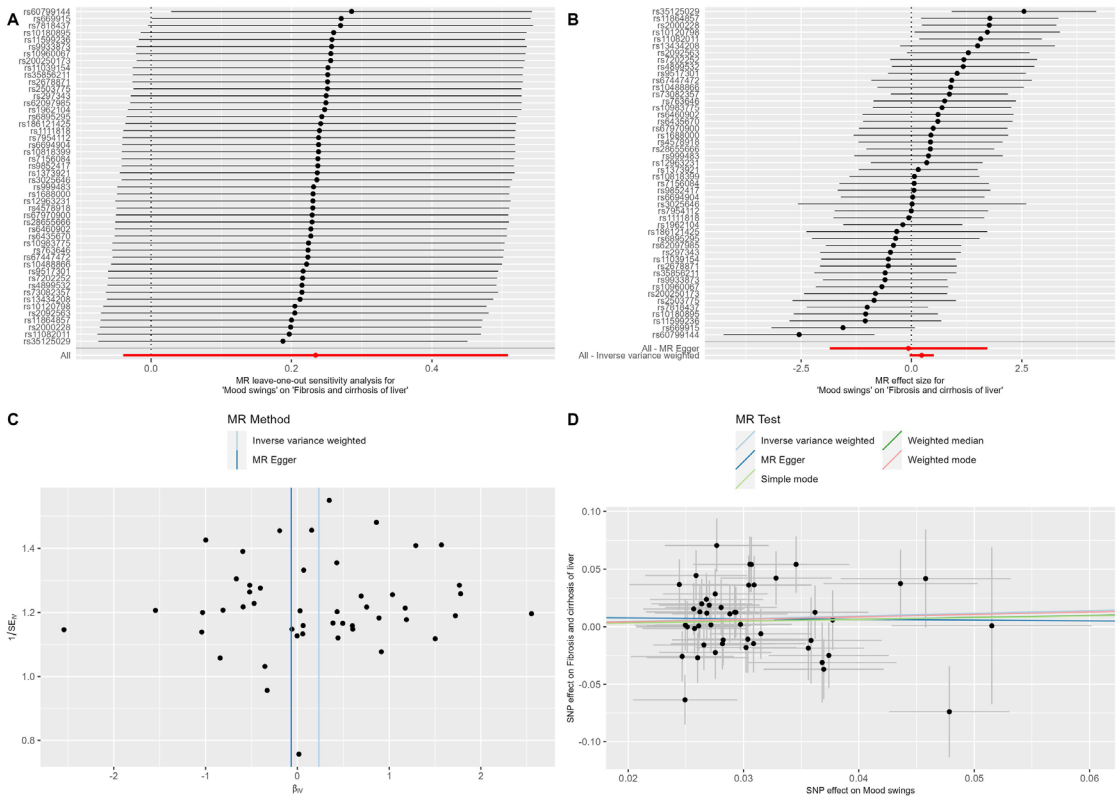
Supplementary Figure 16. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on acute appendicitis.



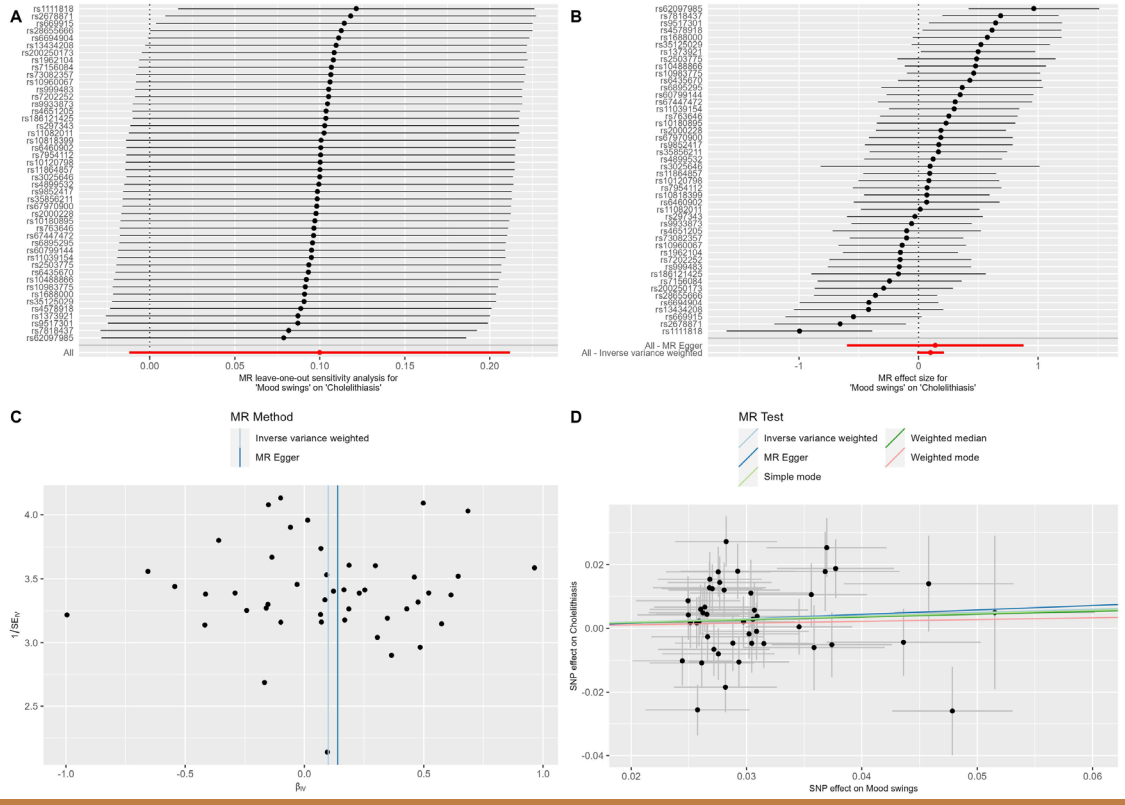
Supplementary Figure 17. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on alcoholic liver disease.



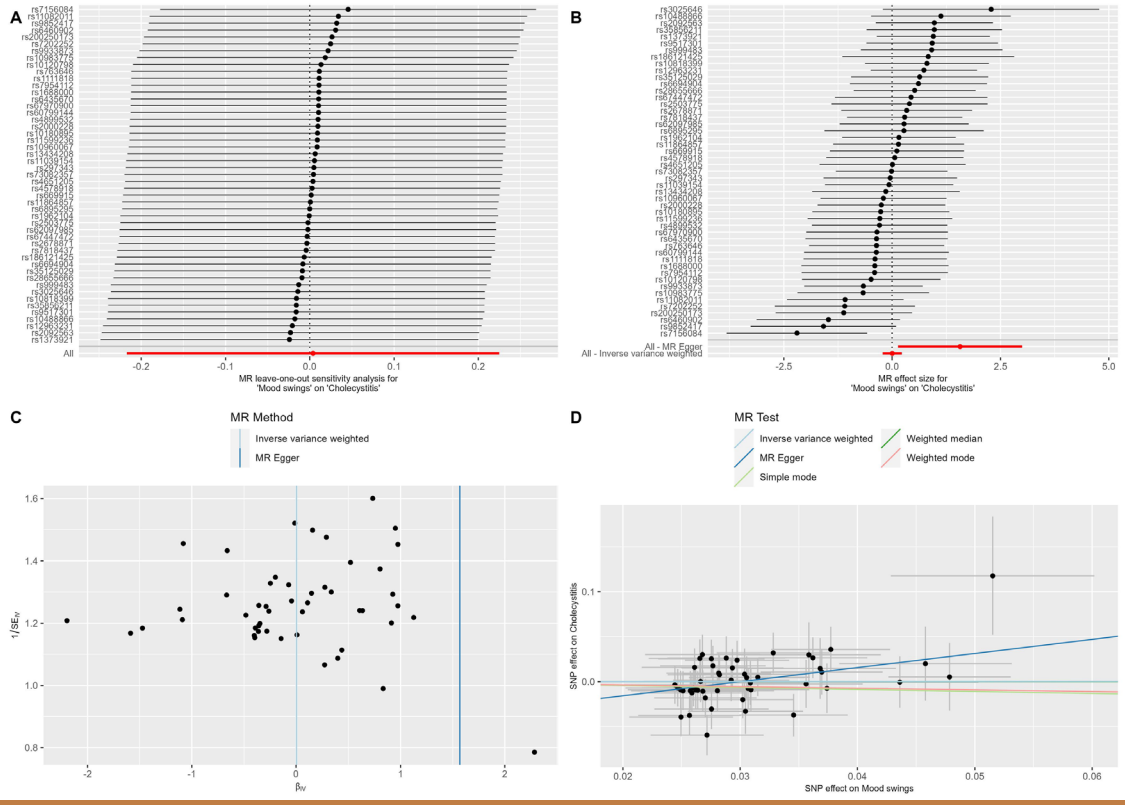
Supplementary Figure 18. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on nonalcoholic fatty liver disease.



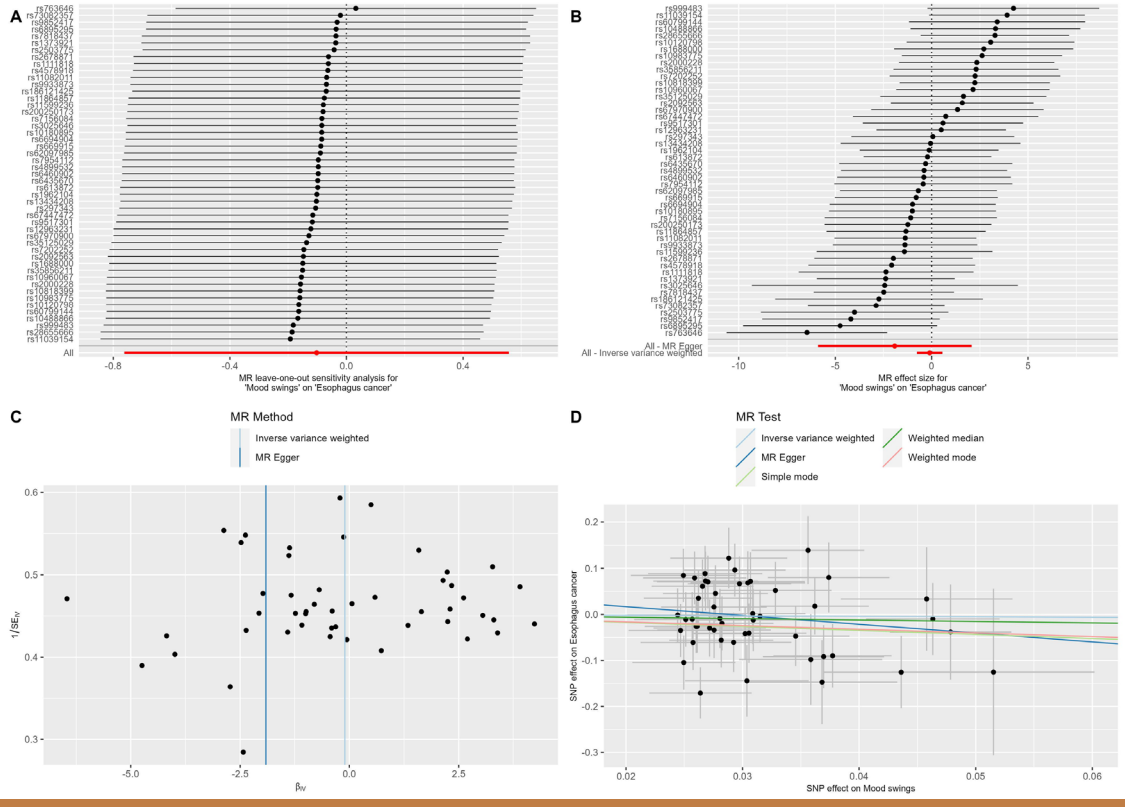
Supplementary Figure 19. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on fibrosis and cirrhosis of liver.



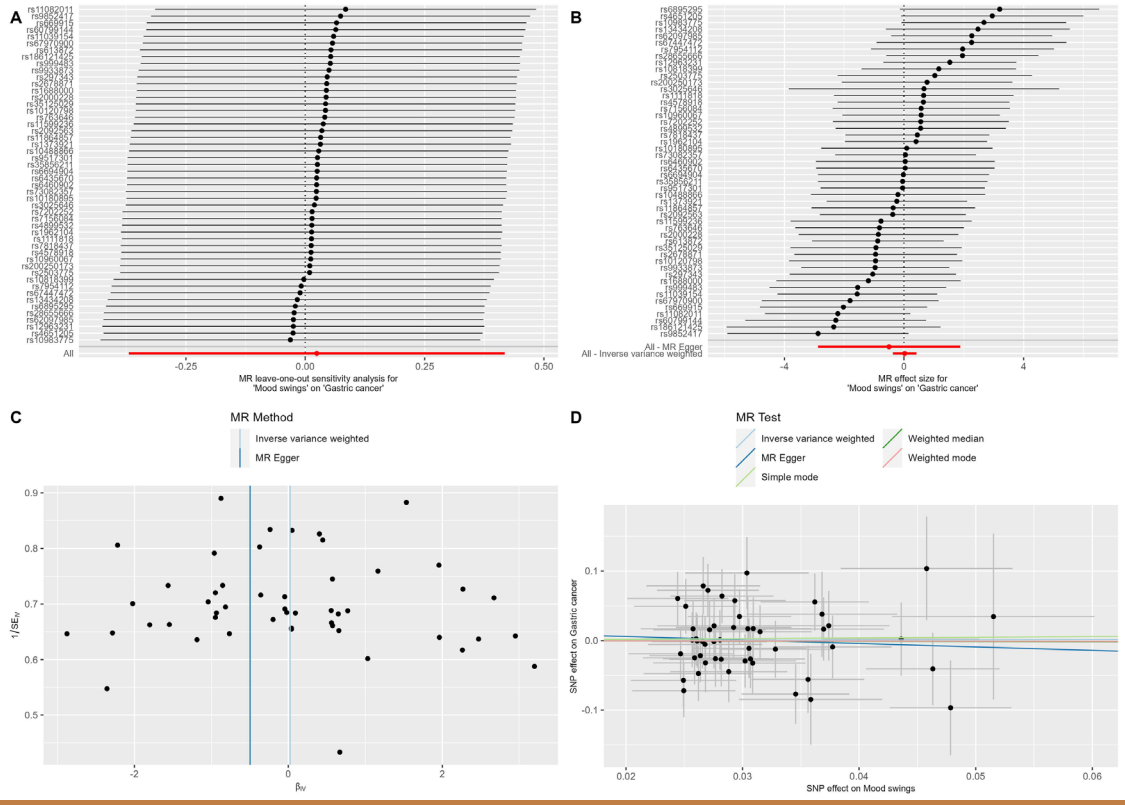
Supplementary Figure 20. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on cholelithiasis.



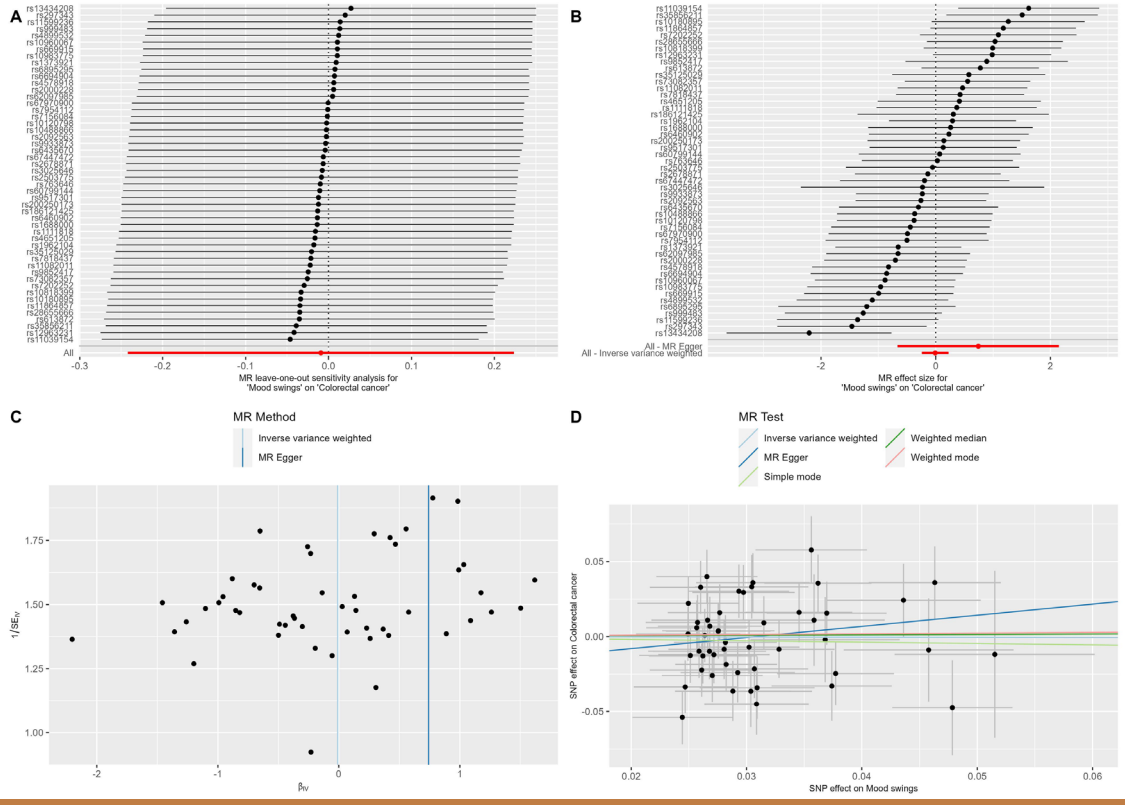
Supplementary Figure 21. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on cholecystitis.



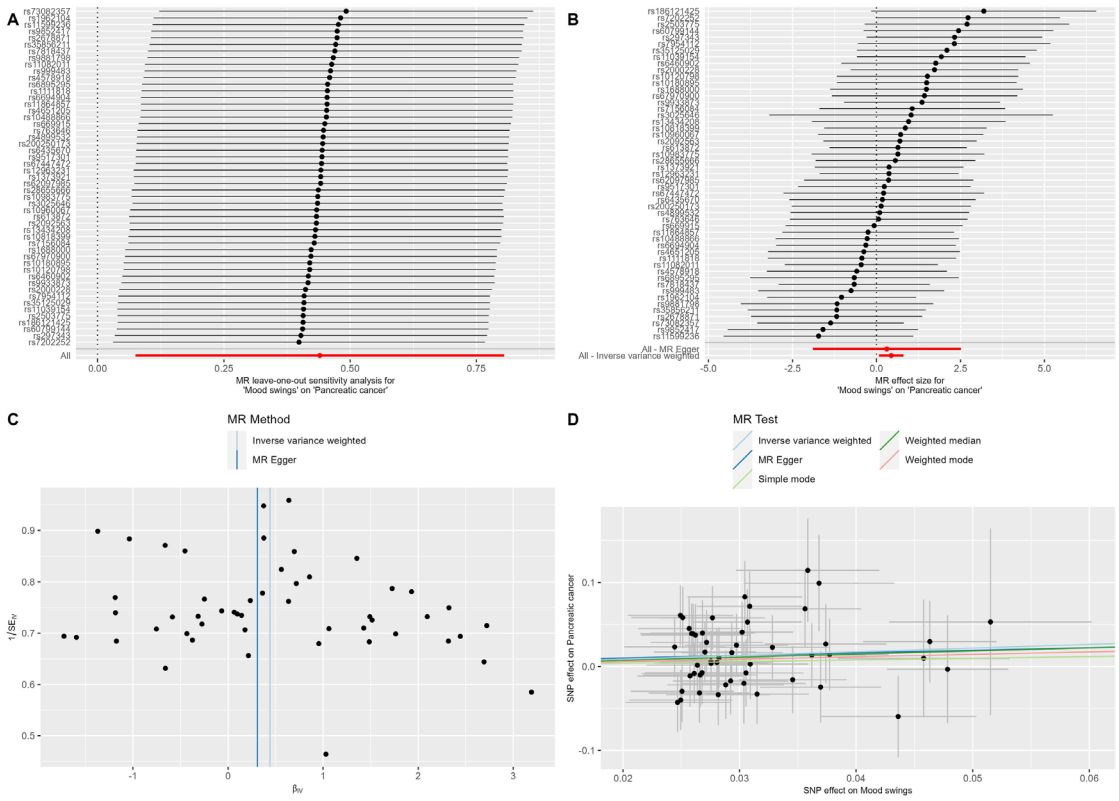
Supplementary Figure 22. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on esophagus cancer.



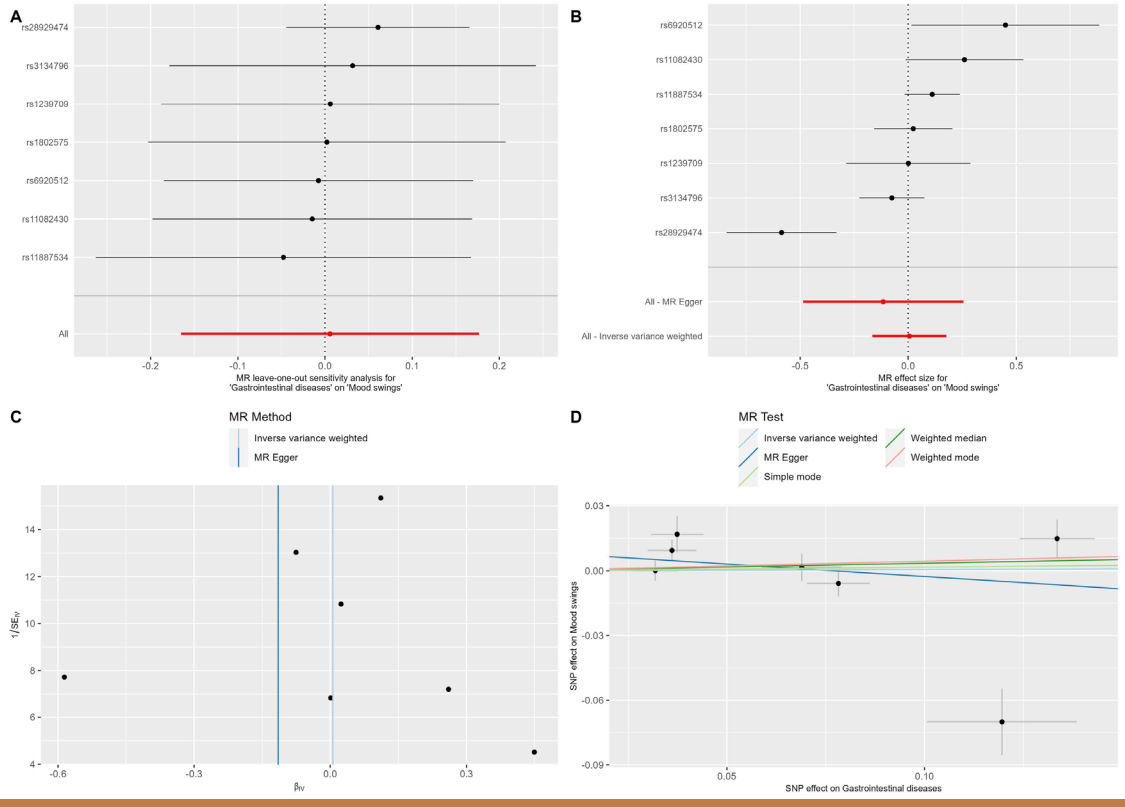
Supplementary Figure 23. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on gastric cancer.



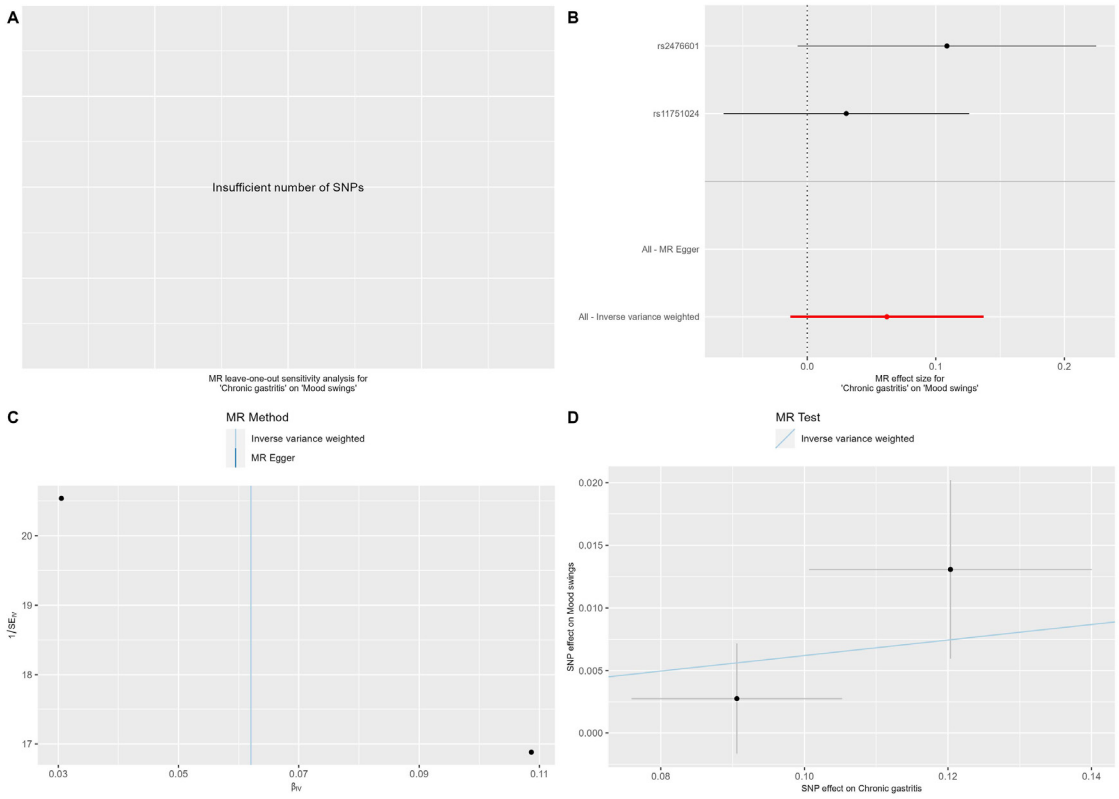
Supplementary Figure 24. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on colorectal cancer.



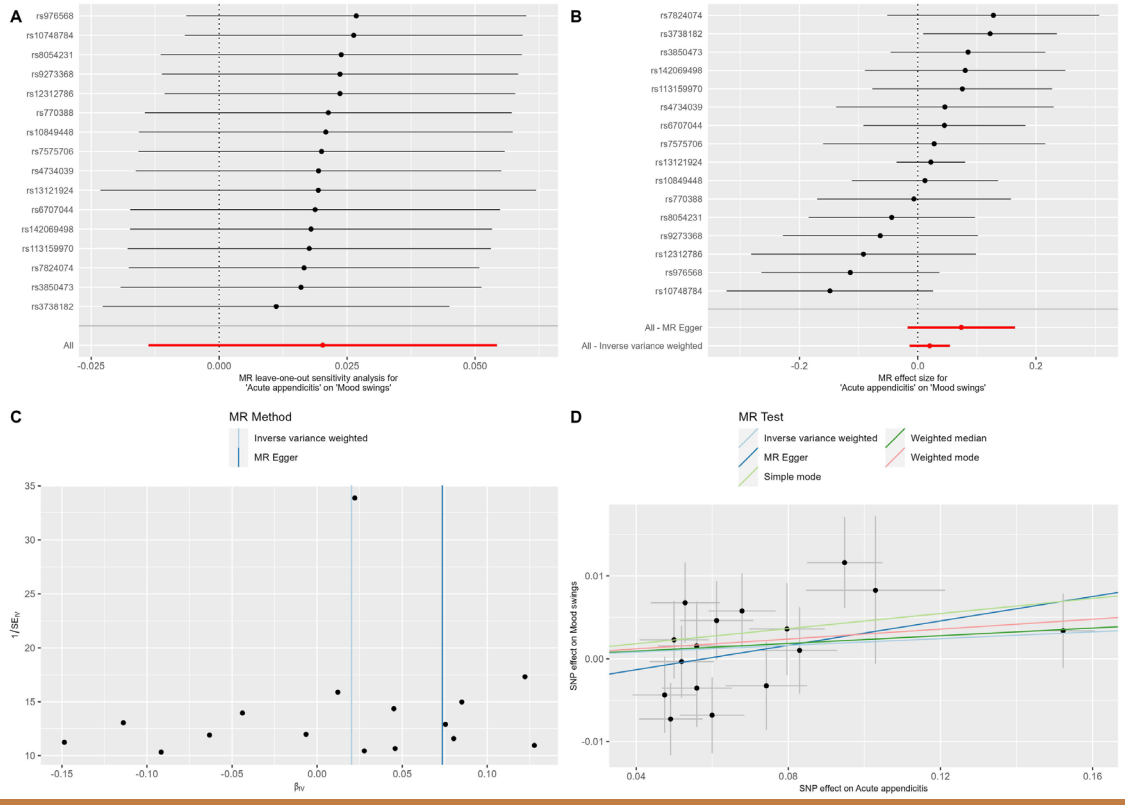
Supplementary Figure 25. Leave-one-out plots, scatter plots, funnel plots and forest plots for mood swings on pancreatic cancer.



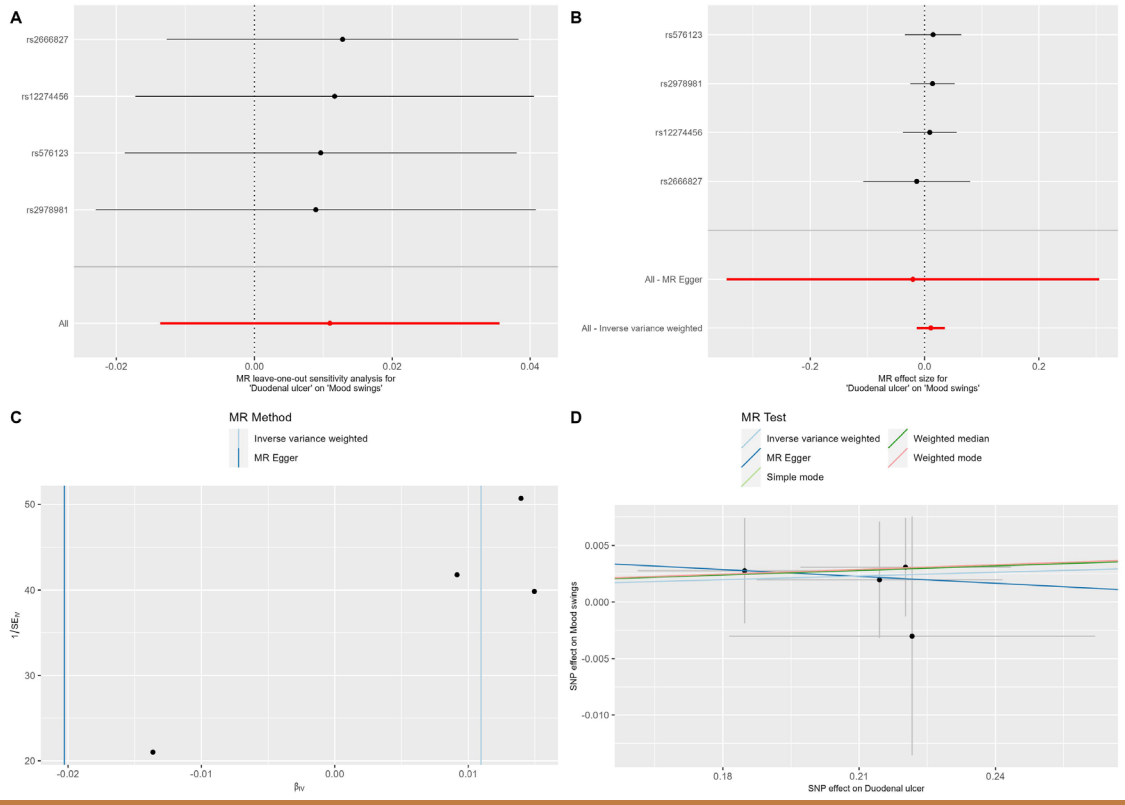
Supplementary Figure 26. Leave-one-out plots, scatter plots, funnel plots and forest plots for gastrointestinal diseases on mood swings.



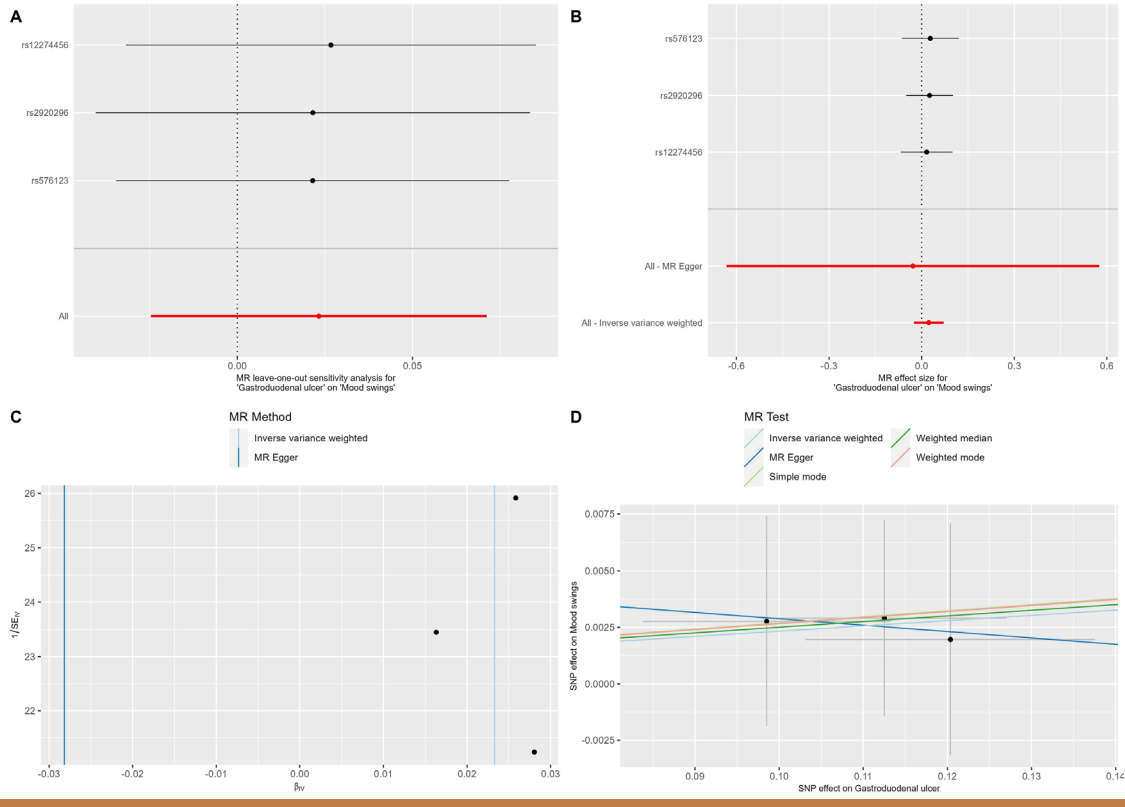
Supplementary Figure 27. Leave-one-out plots, scatter plots, funnel plots and forest plots for chronic gastritis on mood swings.



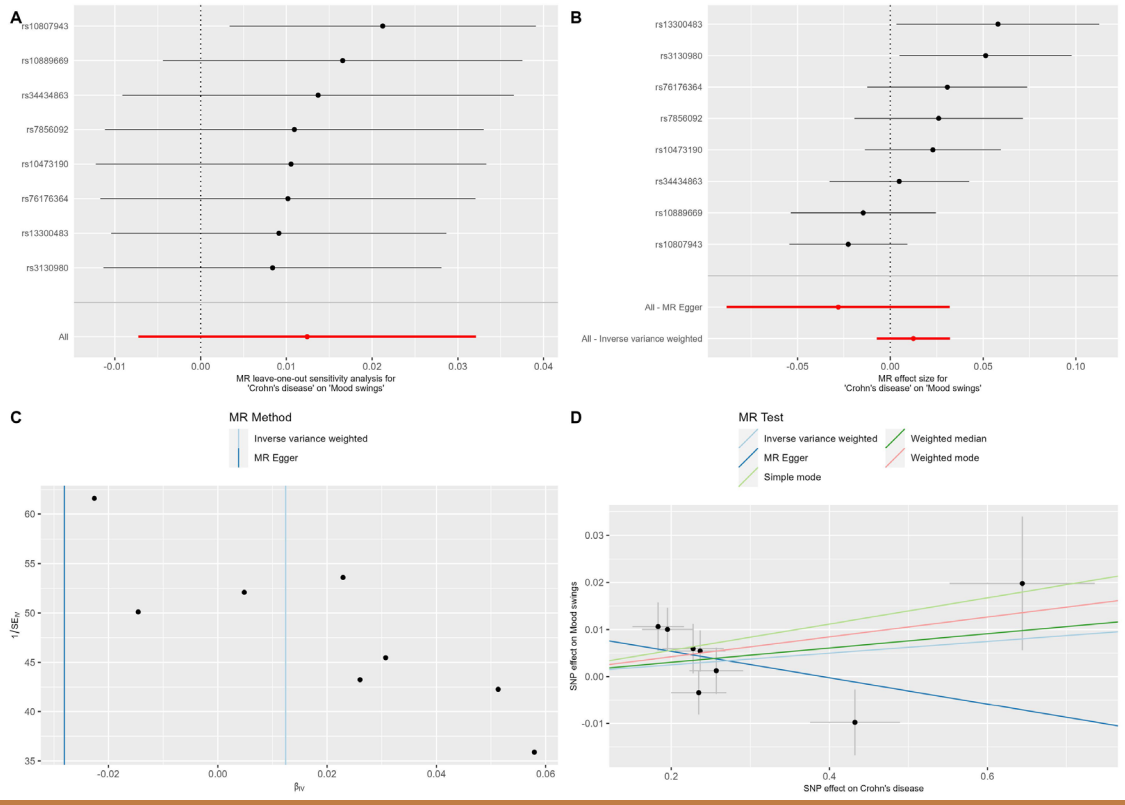
Supplementary Figure 28. Leave-one-out plots, scatter plots, funnel plots and forest plots for acute appendicitis on mood swings.



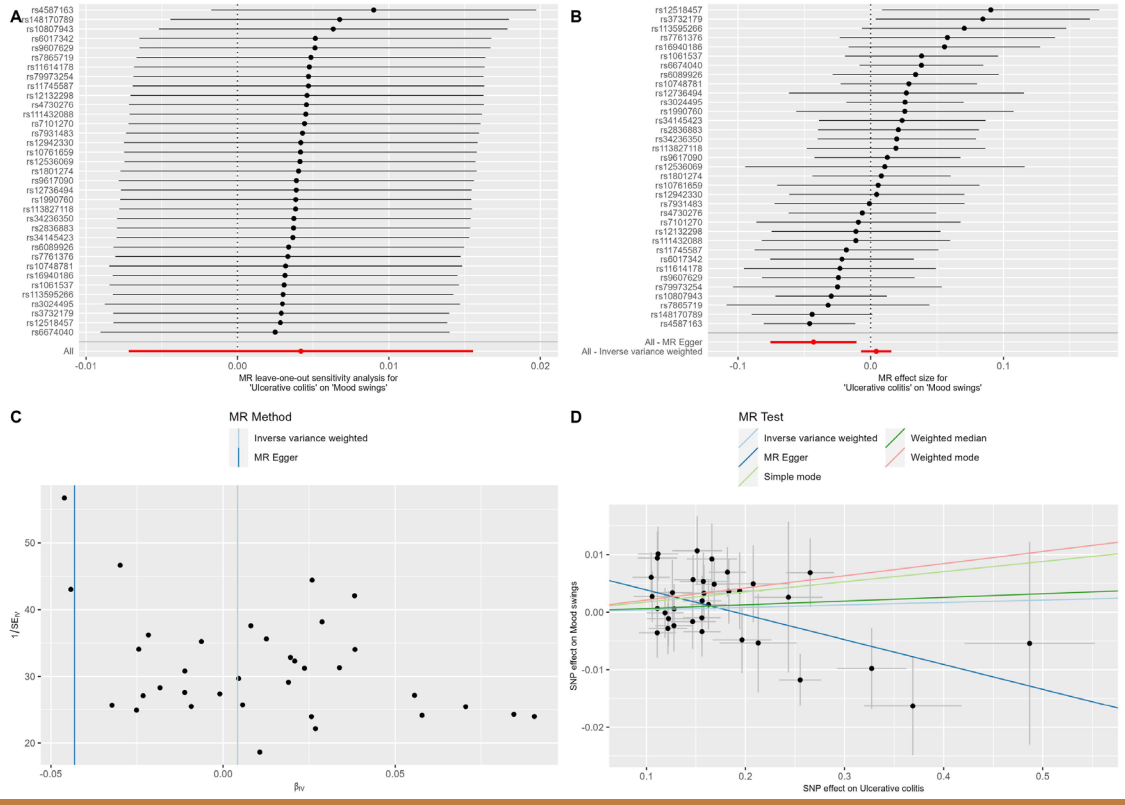
Supplementary Figure 29. Leave-one-out plots, scatter plots, funnel plots and forest plots for duodenal ulcer on mood swings.



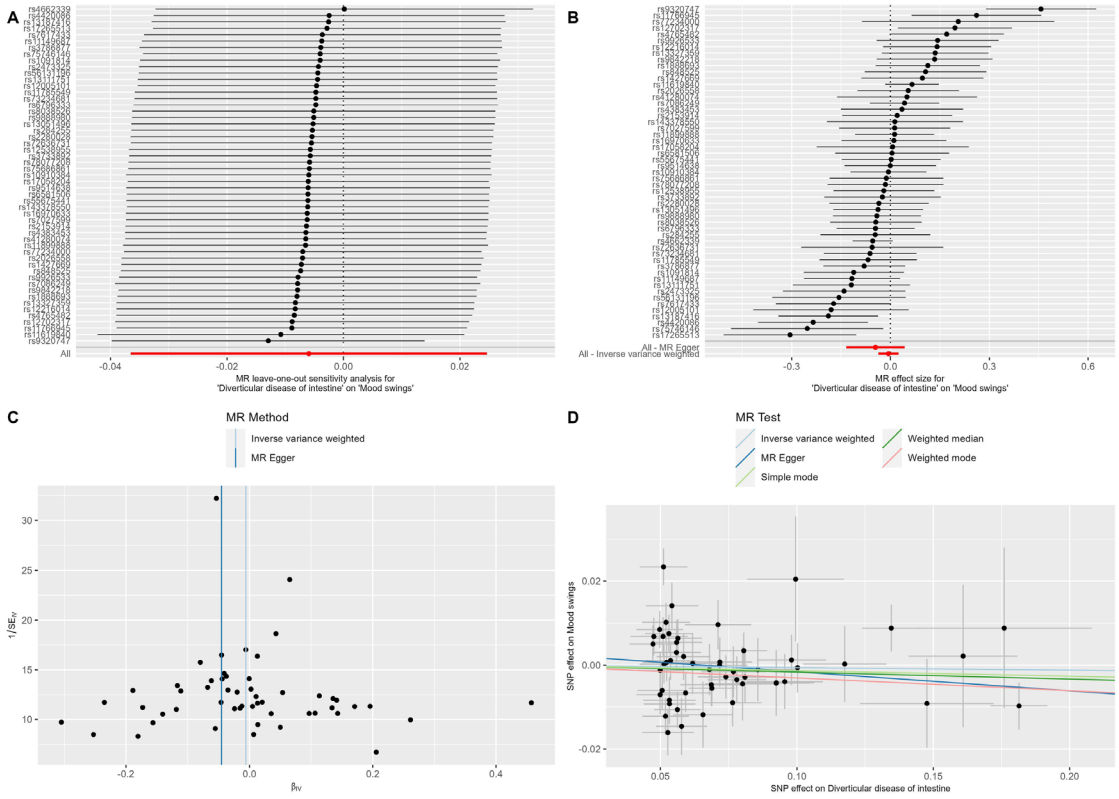
Supplementary Figure 30. Leave-one-out plots, scatter plots, funnel plots and forest plots for gastroduodenal ulcer on mood swings.



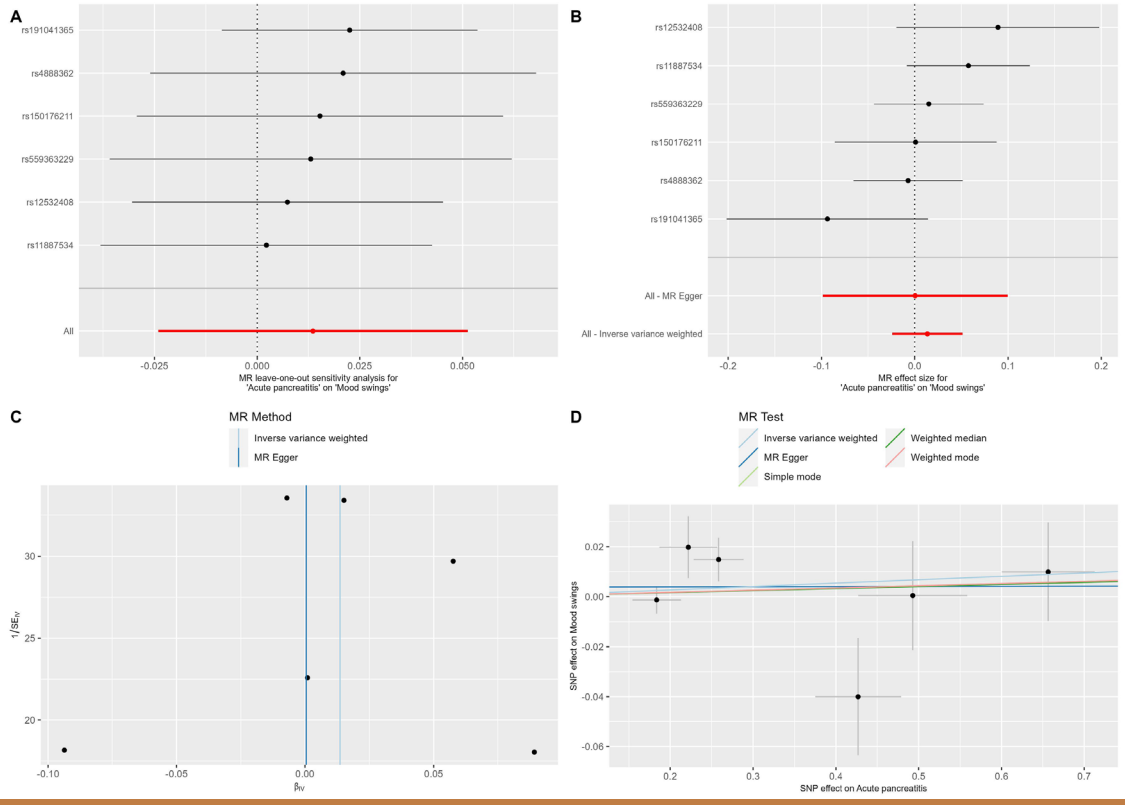
Supplementary Figure 31. Leave-one-out plots, scatter plots, funnel plots and forest plots for crohn's disease on mood swings.



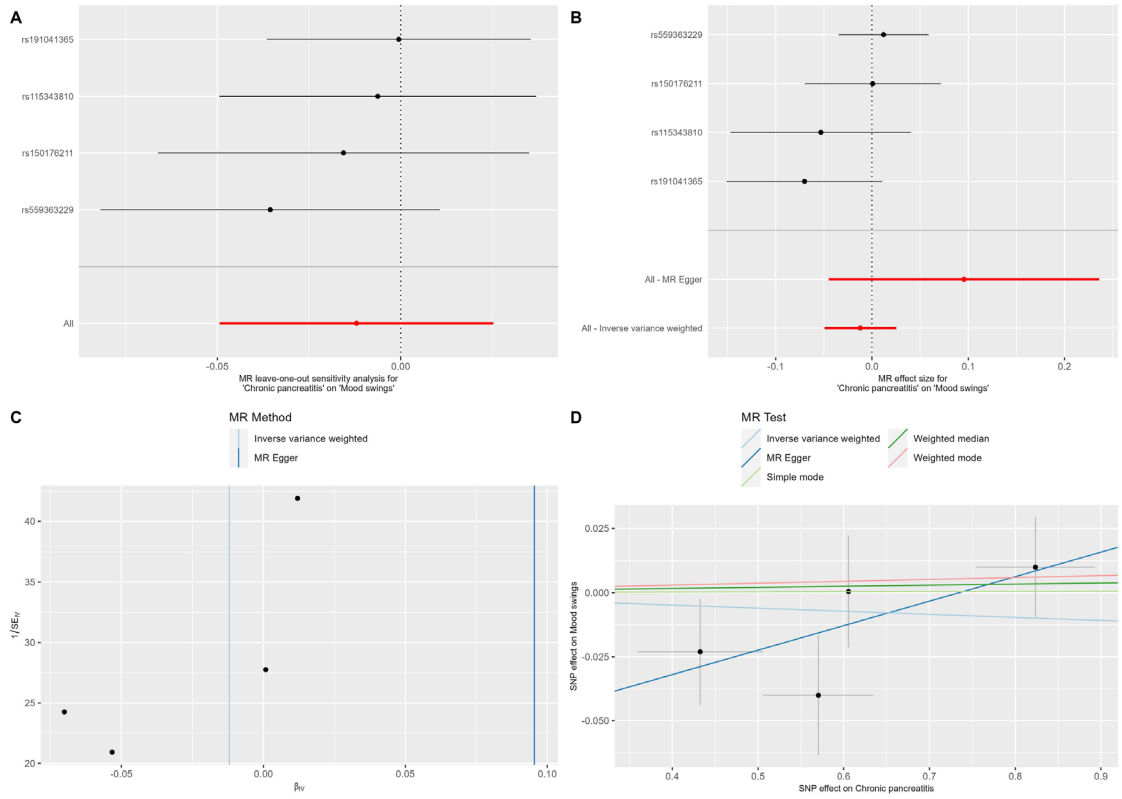
Supplementary Figure 32. Leave-one-out plots, scatter plots, funnel plots and forest plots for ulcerative colitis on mood swings.



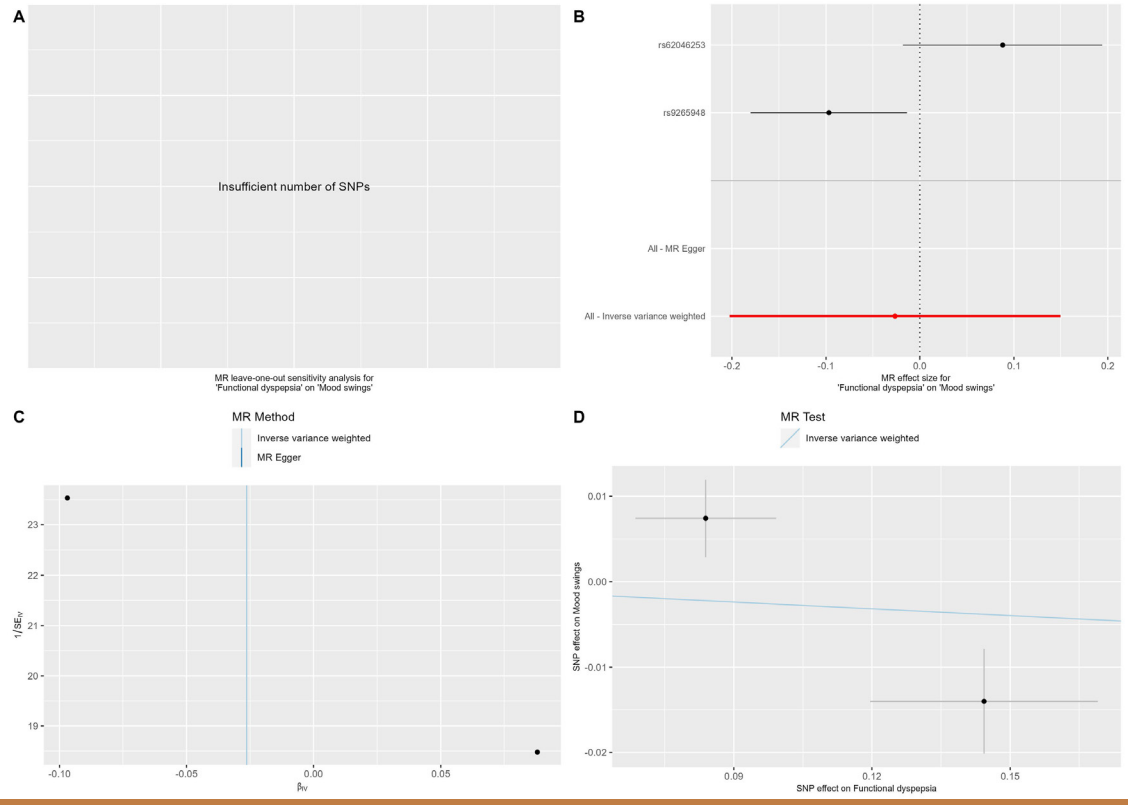
Supplementary Figure 33. Leave-one-out plots, scatter plots, funnel plots and forest plots for diverticular disease of intestine on mood swings.



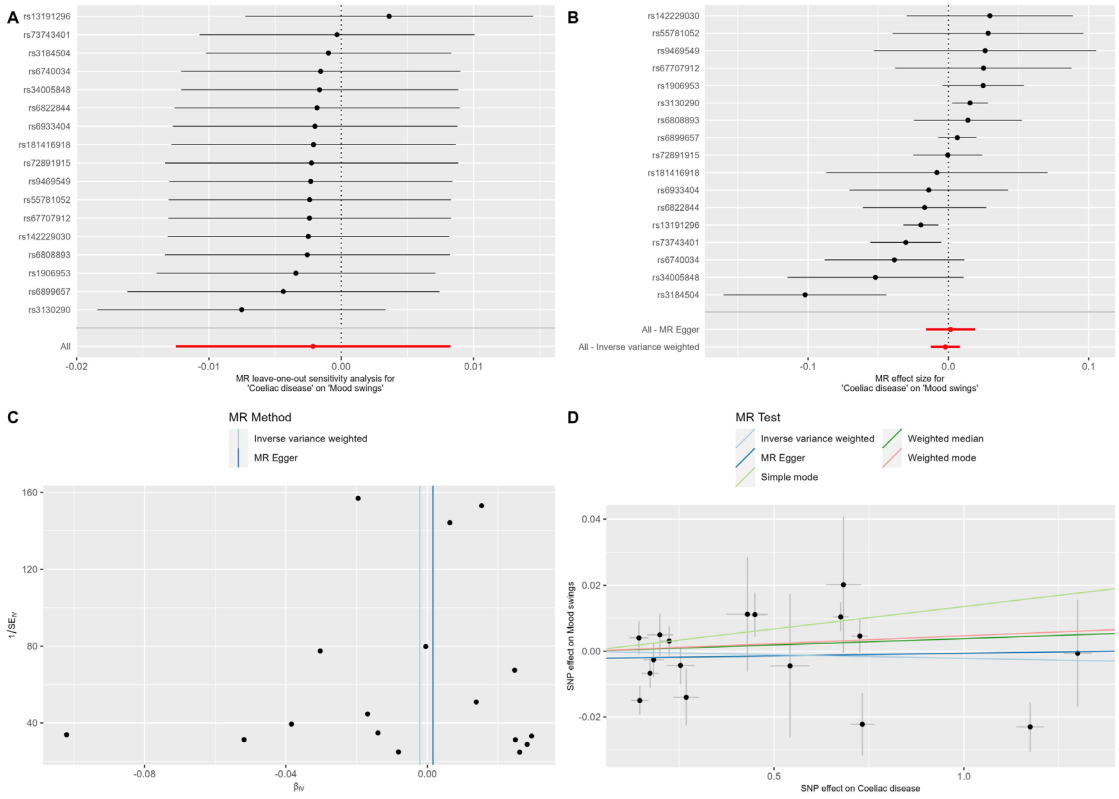
Supplementary Figure 34. Leave-one-out plots, scatter plots, funnel plots and forest plots for acute pancreatitis on mood swings.



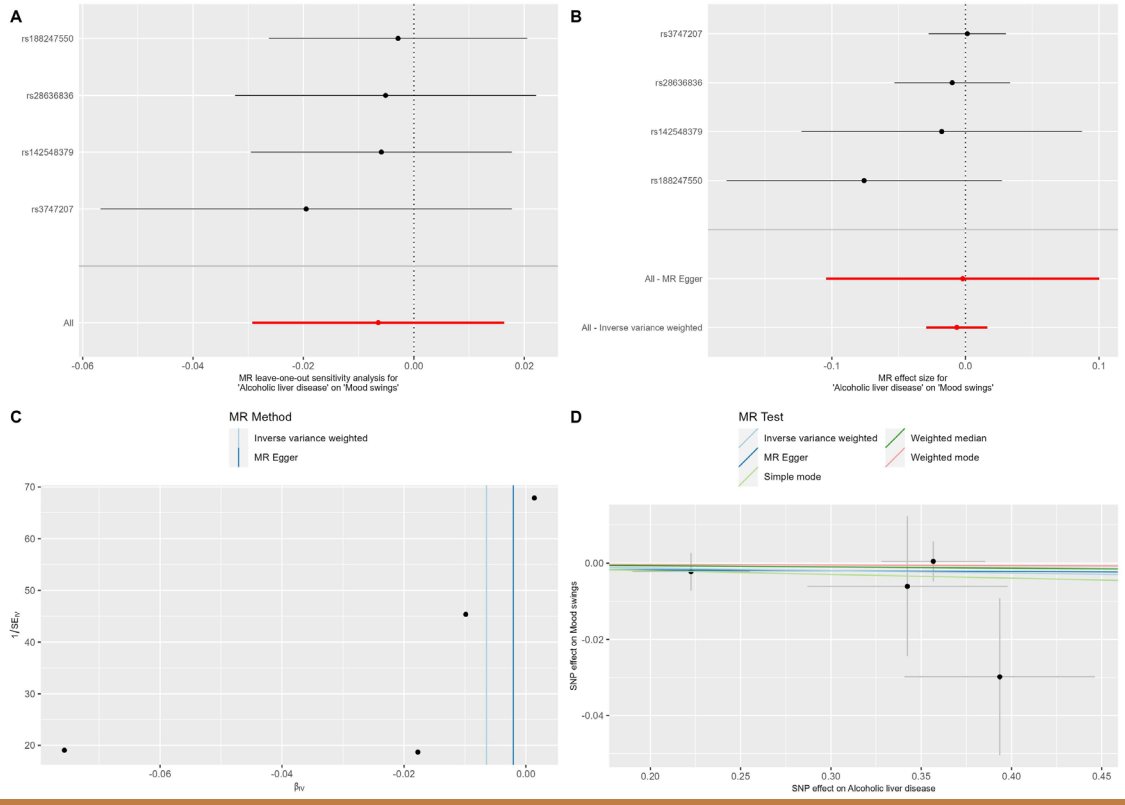
Supplementary Figure 35. Leave-one-out plots, scatter plots, funnel plots and forest plots for chronic pancreatitis on mood swings.



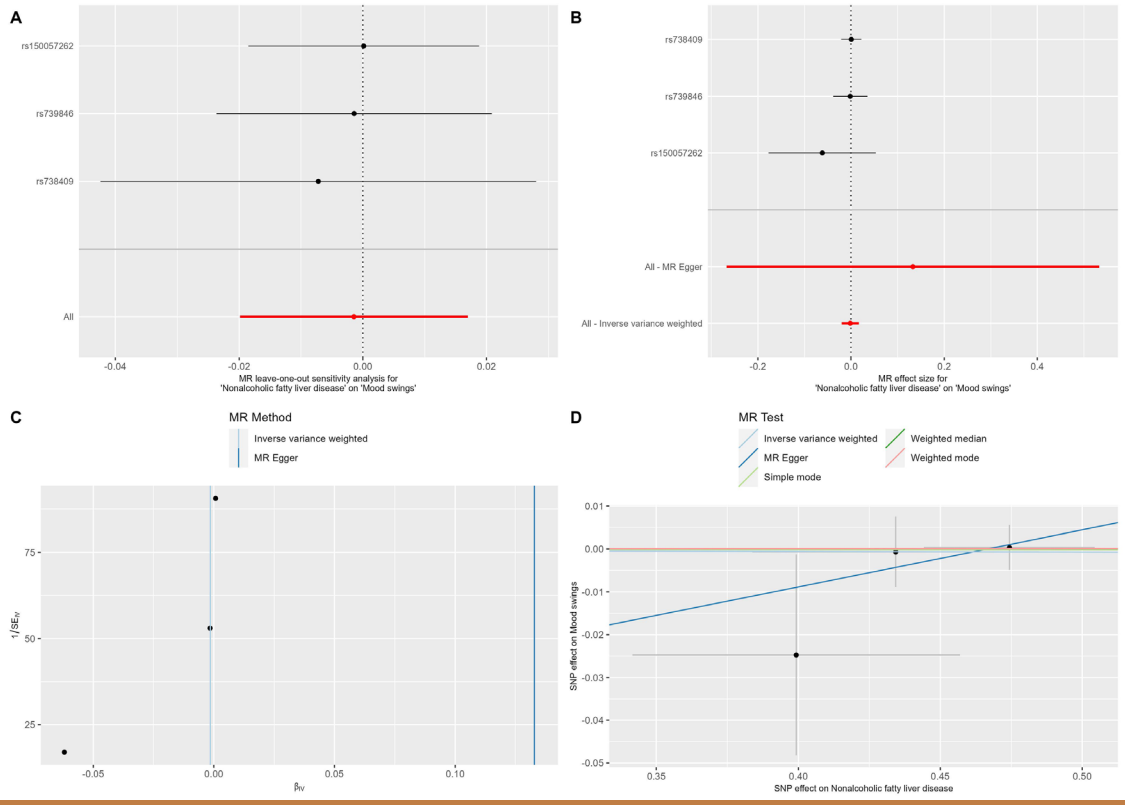
Supplementary Figure 36. Leave-one-out plots, scatter plots, funnel plots and forest plots for functional dyspepsia on mood swings.



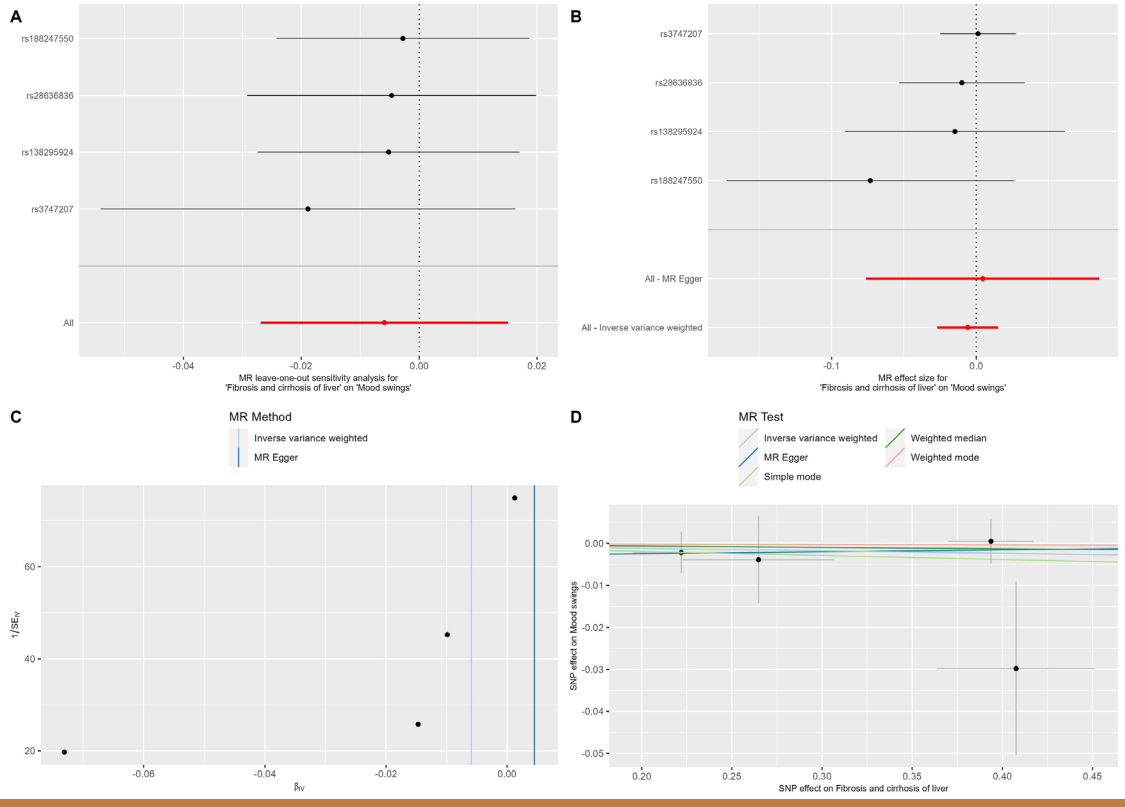
Supplementary Figure 37. Leave-one-out plots, scatter plots, funnel plots and forest plots for coeliac disease on mood swings.



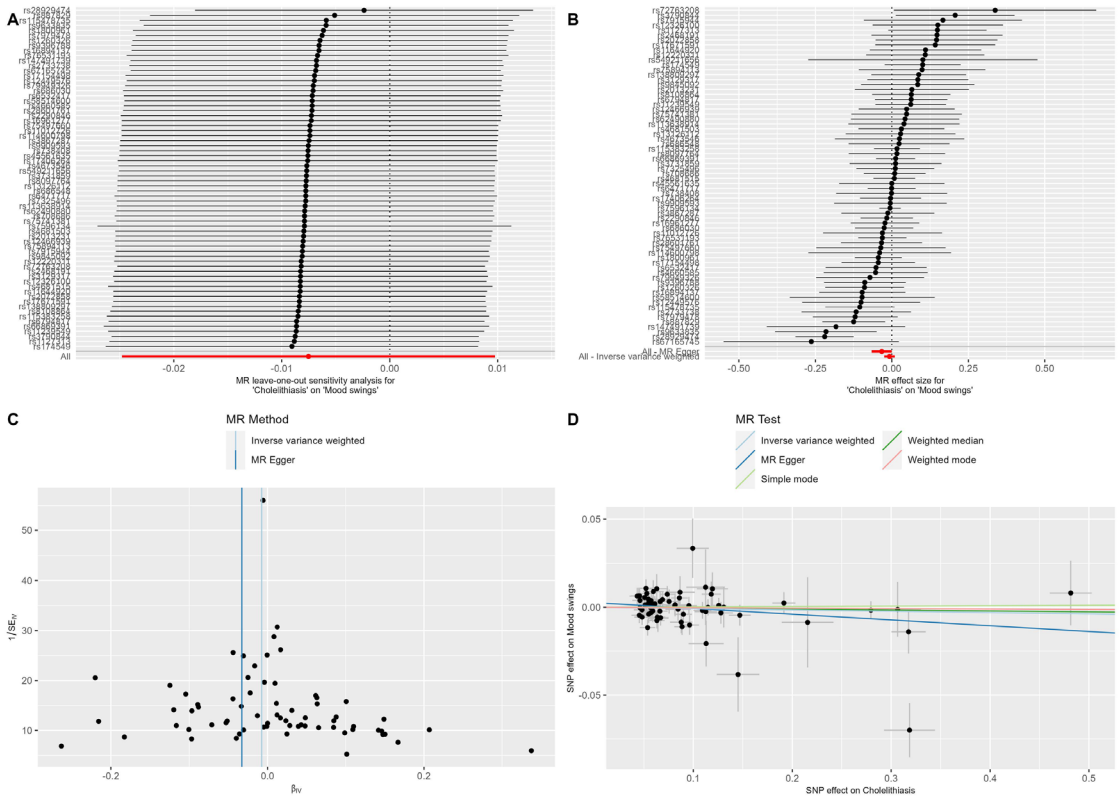
Supplementary Figure 38. Leave-one-out plots, scatter plots, funnel plots and forest plots for alcoholic liver disease on mood swings.



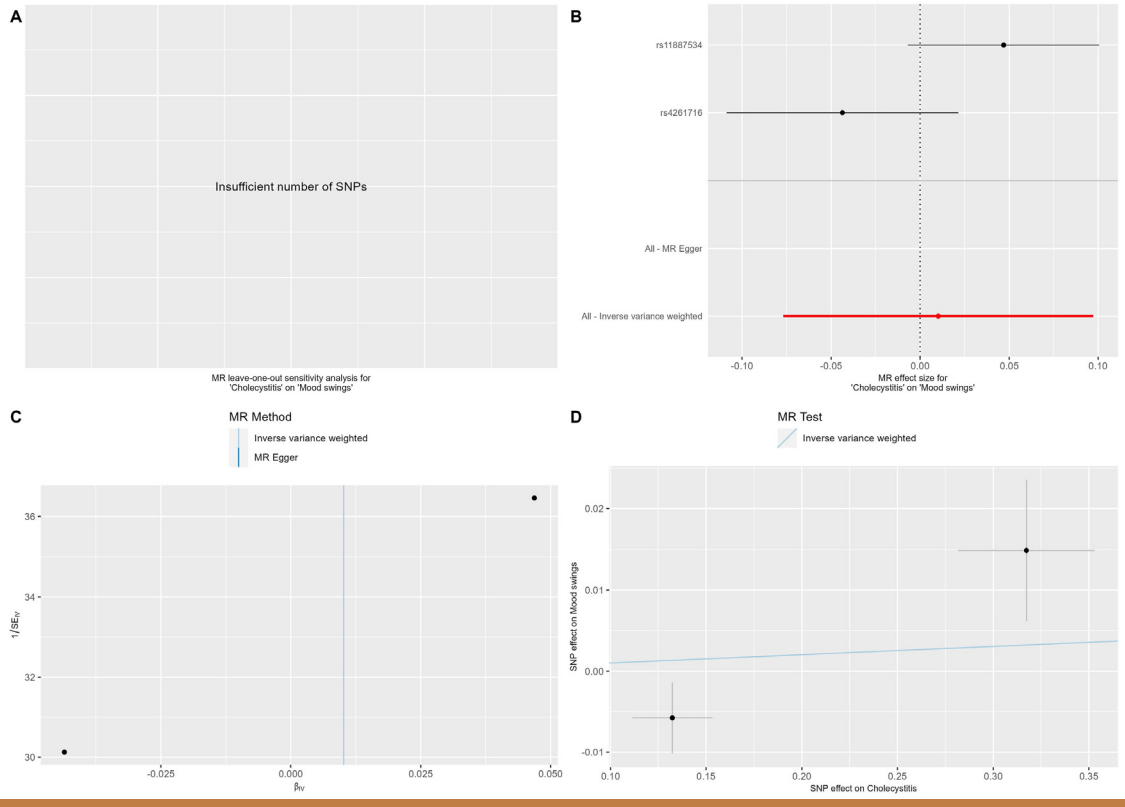
Supplementary Figure 39. Leave-one-out plots, scatter plots, funnel plots and forest plots for nonalcoholic fatty liver disease on mood swings.



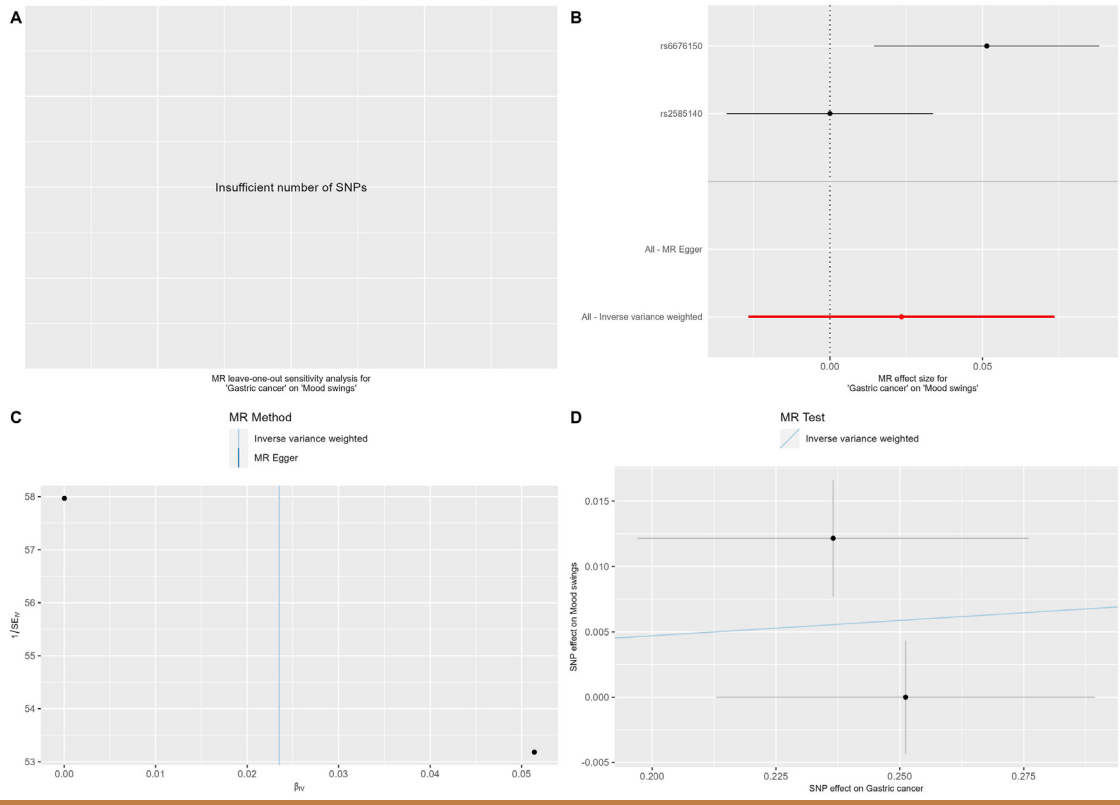
Supplementary Figure 40. Leave-one-out plots, scatter plots, funnel plots and forest plots for fibrosis and cirrhosis of liver on mood swings.



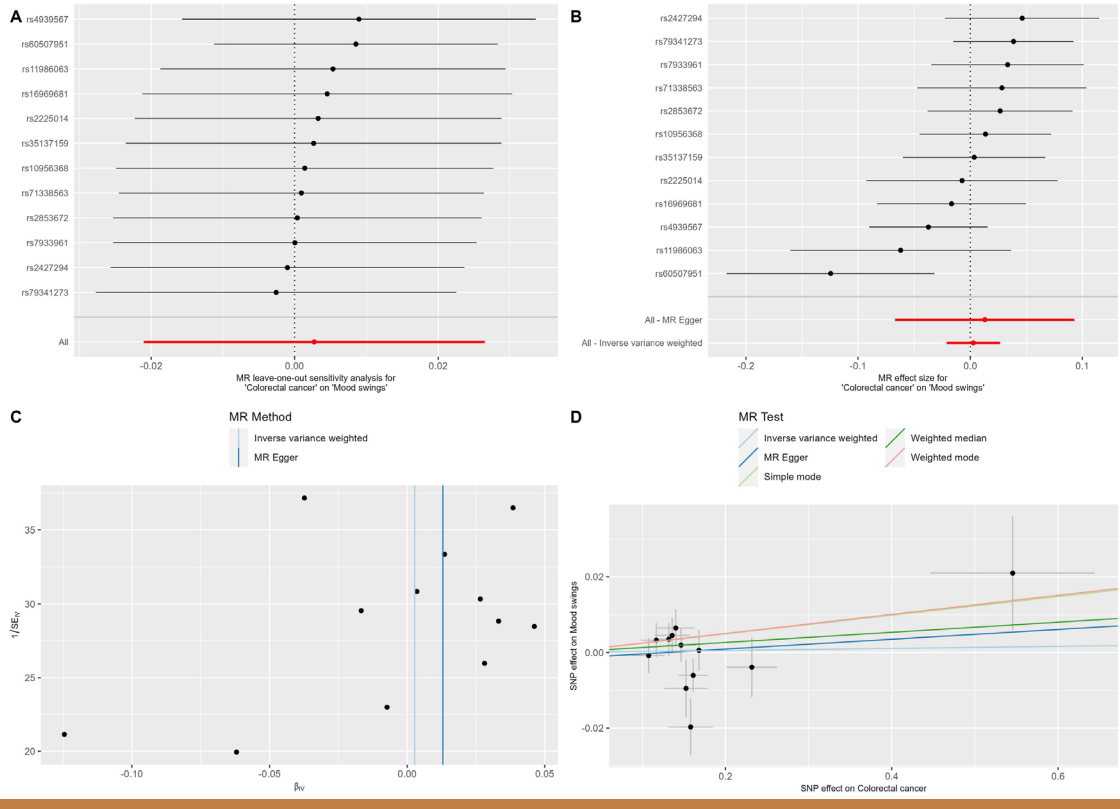
Supplementary Figure 41. Leave-one-out plots, scatter plots, funnel plots and forest plots for cholelithiasis on mood swings.



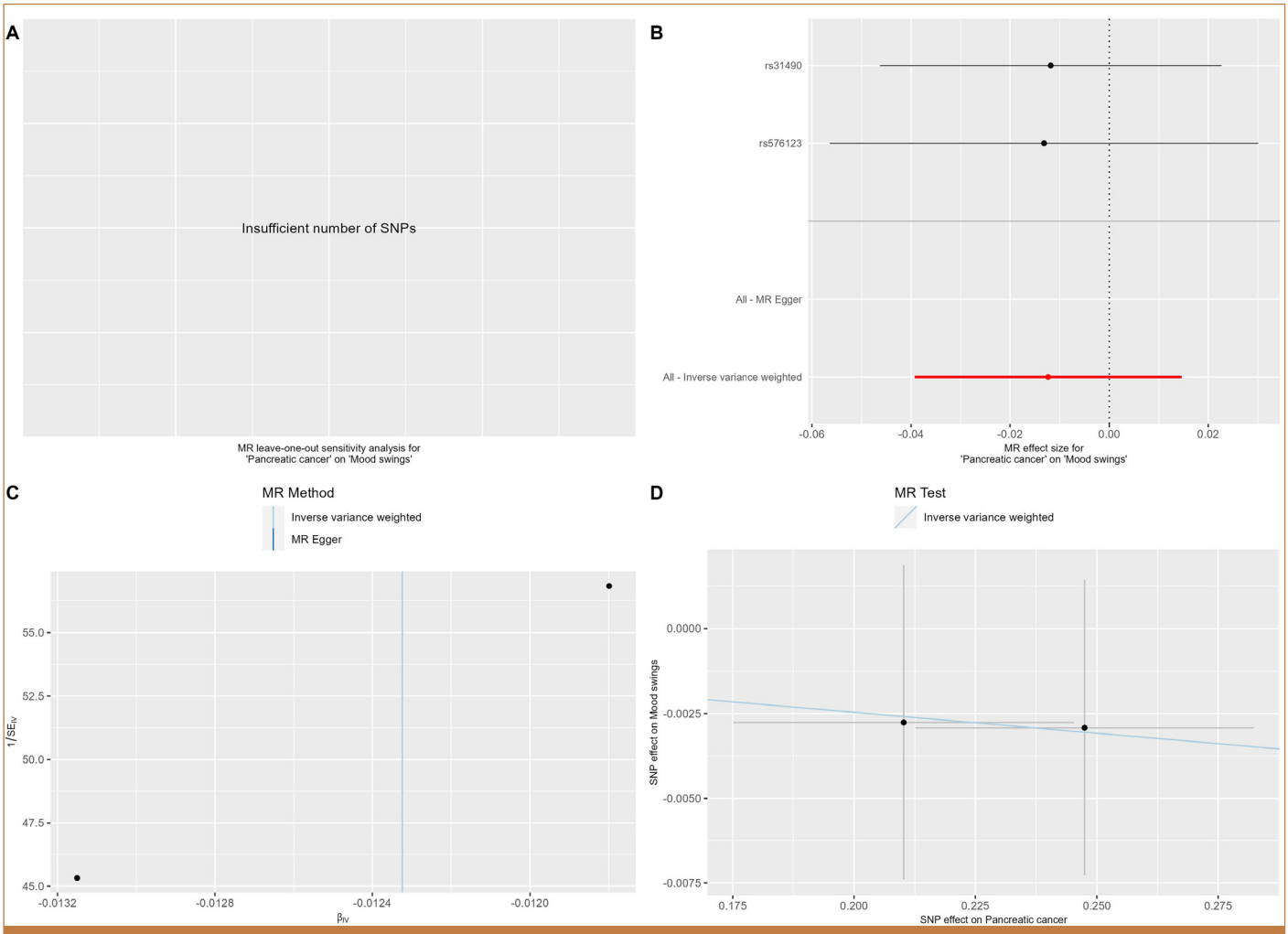
Supplementary Figure 42. Leave-one-out plots, scatter plots, funnel plots and forest plots for cholecystitis on mood swings.



Supplementary Figure 43. Leave-one-out plots, scatter plots, funnel plots and forest plots for gastric cancer on mood swings.



Supplementary Figure 44. Leave-one-out plots, scatter plots, funnel plots and forest plots for colorectal cancer on mood swing.



Supplementary Figure 45. Leave-one-out plots, scatter plots, funnel plots and forest plots for pancreatic cancer on mood swings.

Supplementary Table 1. Information of Genome-Wide Association Summary Data

Characteristic	Resource	Sample size	Population	Cases definition	URL
Mood swings	GWAS catalog	201 373 cases and 243,901 controls	European	UKB:categorical:1920	http://ftp.ebi.ac.uk/pub/databases/gwas/summary_statistics/GCST90041001-GCST90042000/GCST90041863/harmonised/34737426-GCST90041863-EFO_0008475.h.tsv.gz
Gastrointestinal diseases	FinnGen (R7)	159 111 cases and 150 043 controls	European	Hospital discharge: ICD-10 — K00-K93, K77.0*B96.8 Hospital discharge: ICD-9 — 5[2-7] Hospital discharge: ICD-8 — 5[2-7] Cause of death: ICD-10 — K00-K93, K77.0*B96.8 Cause of death: ICD-9 — 5[2-7] Cause of death: ICD-8 — 5[2-7]	https://storage.googleapis.com/finngen-public-data-r7/summary_stats/finngen_R7_K11_GIDISEASES.gz
Gastro-oesophageal reflux disease	FinnGen (R10)	28 859 cases and 350 064 controls	European	Hospital discharge: ICD-10 — K21 Hospital discharge: ICD-9 — 5301A Cause of death: ICD-10 — K21 Cause of death: ICD-9 — 5301A	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_REFLUX.gz
Acute gastritis	FinnGen (R10)	2 558 cases and 350 064 controls	European	Hospital discharge: ICD-10 — K29.0, K29.1 Hospital discharge: ICD-9 — 5350 Hospital discharge: ICD-8 — 3530[0-2] Cause of death: ICD-10 — K29.0, K29.1 Cause of death: ICD-9 — 5350 Cause of death: ICD-8 — 3530[0-2]	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_ACUTGASTR.gz
Chronic gastritis	FinnGen (R10)	3 875 cases and 361 641 controls	European	Hospital discharge: ICD-10 — K29.3, K29.4, K29.5 Hospital discharge: ICD-9 — 5351|5354 Hospital discharge: ICD-8 — 53503 Cause of death: ICD-10 — K29.3, K29.4, K29.5 Cause of death: ICD-9 — 5351|5354 Cause of death: ICD-8 — 53503	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_CHRONGASTR.gz
Gastric ulcer	FinnGen (R10)	6 459 cases and 350 064 controls	European	Hospital discharge: ICD-10 — K25 Hospital discharge: ICD-9 — 531 Cause of death: ICD-10 — K25 Cause of death: ICD-9 — 531	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_GULC.gz
Duodenal ulcer	FinnGen (R10)	3 795 cases and 350 064 controls	European	Hospital discharge: ICD-10 — K26 Hospital discharge: ICD-9 — 532 Cause of death: ICD-10 — K26 Cause of death: ICD-9 — 532	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_DULC.gz
Gastroduodenal ulcer	FinnGen (R10)	10 021 cases and 350 064 controls	European	Hospital discharge: ICD-10 — K25, K26, K27, K28 Cause of death: ICD-10 — K25, K26, K27, K28	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_GASTRODUOULC.gz

Supplementary Table 1. Information of Genome-Wide Association Summary Data (*Continued*)

Characteristic	Resource	Sample size	Population	Cases definition	URL
Crohn's disease	FinnGen (R10)	2 033 cases and 409 940 controls	European	Hospital discharge: ICD-10 — K50 Hospital discharge: ICD-9 — 555 Hospital discharge: ICD-8 — 5630 Cause of death: ICD-10 — K50 Cause of death: ICD-9 — 555 Cause of death: ICD-8 — 5630	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_CD_STRICT2.gz
Ulcerative colitis	FinnGen (R10)	5 931 cases and 405 386 controls	European	Hospital discharge: ICD-10 — K51 Hospital discharge: ICD-9 — 556 Hospital discharge: ICD-8 — 5631|569 Hospital discharge: excluded ICD-9 — 5564A Cause of death: ICD-10 — K51 Cause of death: ICD-9 — 556 Cause of death: ICD-8 — 5631|569 Cause of death: excluded ICD-9 — 5564A	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_UC_STRICT2.gz
Diverticular disease of intestine	FinnGen (R10)	33 619 cases and 329 381 controls	European	Hospital discharge: ICD-10 — K57 Hospital discharge: ICD-9 — 562 Hospital discharge: ICD-8 — 562 Cause of death: ICD-10 — K57 Cause of death: ICD-9 — 562 Cause of death: ICD-8 — 562	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_DIVERTIC.gz
Acute pancreatitis	FinnGen (R10)	6787 cases and 361 641 controls	European	Hospital discharge: ICD-10 — K85 Hospital discharge: ICD-9 — 5770 Hospital discharge: ICD-8 — 5770 Cause of death: ICD-10 — K85 Cause of death: ICD-9 — 5770 Cause of death: ICD-8 — 5770	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_ACUTPANC.gz
Chronic pancreatitis	FinnGen (R10)	3 875 cases and 361 641 controls	European	Hospital discharge: ICD-10 — K86.00, K86.01, K86.08, K86.1 Hospital discharge: ICD-9 — 5771 Hospital discharge: ICD-8 — 5771 Cause of death: ICD-10 — K86.00, K86.01, K86.08, K86.1 Cause of death: ICD-9 — 5771 Cause of death: ICD-8 — 5771 KELA reimbursements: KELA codes — 133	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_CHRONPANC.gz
Irritable bowel syndrome	FinnGen (R10)	10 329 cases and 329 381 controls	European	Hospital discharge: ICD-10 — K58 Hospital discharge: ICD-9 — 5641 Hospital discharge: ICD-8 — 56419 Cause of death: ICD-10 — K58 Cause of death: ICD-9 — 5641 Cause of death: ICD-8 — 56419	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_IBS.gz

Characteristic	Resource	Sample size	Population	Cases definition	URL
Functional dyspepsia	FinnGen (R10)	9 680 cases and 3 500 641 controls	European	Hospital discharge: ICD-10 — K30 Hospital discharge: ICD-9 — 5368A Hospital discharge: ICD-8 — 5361 Cause of death: ICD-10 — K30 Cause of death: ICD-9 — 5368A Cause of death: ICD-8 — 5361	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_FUNCDYSP.gz
Coeliac disease	FinnGen (R10)	4 115 cases and 394 391 controls	European	Hospital discharge: ICD-10 — K90.0 Hospital discharge: ICD-9 — 5790A Cause of death: ICD-10 — K90.0 Cause of death: ICD-9 — 5790A	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_COELIAC.gz
Acute appendicitis	FinnGen (R10)	31 628 cases and 378 082 controls	European	Hospital discharge: ICD-10 — K35 Hospital discharge: ICD-9 — 540 Hospital discharge: ICD-8 — 540 Cause of death: ICD-10 — K35 Cause of death: ICD-9 — 540 Cause of death: ICD-8 — 540	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_APPENDACUT.gz
Alcoholic liver disease	FinnGen (R10)	3 047 cases and 400 247 controls	European	Hospital discharge: ICD-10 — K70 Hospital discharge: ICD-9 — 571[0-3] Hospital discharge: ICD-8 — 5710 Cause of death: ICD-10 — K70 Cause of death: ICD-9 — 571[0-3] Cause of death: ICD-8 — 5710	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_ALCOLIV.gz
Nonalcoholic fatty liver disease	FinnGen (R10)	2 568 cases and 409 613 controls	European	Hospital discharge: ICD-10 — K76.0 Cause of death: ICD-10 — K76.0	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_NAFLD.gz
Fibrosis and cirrhosis of liver	FinnGen (R10)	2 017 cases and 400 247 controls	European	Hospital discharge: ICD-10 — K74 Hospital discharge: ICD-9 — 571[5-6] Hospital discharge: ICD-8 — 5719 Cause of death: ICD-10 — K74 Cause of death: ICD-9 — 571[5-6] Cause of death: ICD-8 — 5719	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_FIBROCHIRLIV.gz
Cholelithiasis	FinnGen (R10)	40 191 cases and 361 641 controls	European	Hospital discharge: ICD-10 — K80 Hospital discharge: ICD-9 — 574 Hospital discharge: ICD-8 — 574 Cause of death: ICD-10 — K80 Cause of death: ICD-9 — 574 Cause of death: ICD-8 — 574	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_CHOLELITH.gz
Cholecystitis	FinnGen (R10)	46 971 cases and 361 641 controls	European	Hospital discharge: ICD-10 — K81 Hospital discharge: ICD-9 — 575[0-1] Hospital discharge: ICD-8 — 5750[0-3] Cause of death: ICD-10 — K81 Cause of death: ICD-9 — 575[0-1] Cause of death: ICD-8 — 5750[0-3]	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_K11_CHOLECYST.gz

(*Continued*)

Supplementary Table 1. Information of Genome-Wide Association Summary Data (*Continued*)

Characteristic	Resource	Sample size	Population	Cases definition	URL
Esophagus cancer	FinnGen (R10)	619 cases and 314 193 controls	European	Hospital discharge: ICD-10 — C15 Hospital discharge: ICD-9 — 150 Hospital discharge: ICD-8 — 150 Cause of death: ICD-10 — C15 Cause of death: ICD-9 — 150 Cause of death: ICD-8 — 150 Cancer registry: Topography ICD-O-3 — C15 Cancer registry: Morphology ICD-O-3 — ANY Cancer registry: Behavior codes — 3	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_C3_OESOPHAGUS_EXALLC.gz
Gastric cancer	FinnGen (R10)	1 423 cases and 314 193 controls	European	Hospital discharge: ICD-10 — C16 Hospital discharge: ICD-9 — 151 Hospital discharge: ICD-8 — 151 Cause of death: ICD-10 — C16 Cause of death: ICD-9 — 151 Cause of death: ICD-8 — 151 Cancer registry: Topography ICD-O-3 — C16 Cancer registry: Morphology ICD-O-3 — ANY Cancer registry: Behavior codes — 3	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_C3_STOMACH_EXALLC.gz
Colorectal cancer	FinnGen (R10)	6 847 cases and 314 193 controls	European	ICD-O-3	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_C3_COLORECTAL_EXALLC.gz
Pancreatic cancer	FinnGen (R10)	1 626 cases and 314 193 controls	European	Hospital discharge: ICD-10 — C25 Hospital discharge: ICD-9 — 157 Hospital discharge: ICD-8 — 157 Cause of death: ICD-10 — C25 Cause of death: ICD-9 — 157 Cause of death: ICD-8 — 157 Cancer registry: Topography ICD-O-3 — C25 Cancer registry: Morphology ICD-O-3 — ANY Cancer registry: Behavior codes — 3	https://storage.googleapis.com/finngen-public-data-r10/summary_stats/finngen_R10_C3_PANCREAS_EXALLC.gz

Supplementary Table 2. The Summary Information for SNPs of Mood Swings

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Mood swings	rs6694904	1	67911575	T	C	0.634157	-0.0261214	0.00451866	7.44e-09	33.41747023
Mood swings	rs2000228	1	72258180	C	T	0.313995	0.0306801	0.00465908	4.55e-11	43.36238952
Mood swings	rs4651205	1	174903292	T	C	0.271919	-0.0266305	0.00488399	4.96e-08	29.73097208
Mood swings	rs2678871	2	57926467	A	G	0.593812	0.028175	0.00445697	2.59e-10	39.96211155
Mood swings	rs35125029	2	143504088	A	G	0.379778	-0.0276801	0.00449297	7.24e-10	37.95493675
Mood swings	rs10180895	2	198630265	A	C	0.581921	-0.026029	0.00441923	3.86e-09	34.69139441
Mood swings	rs6435670	2	211791160	T	G	0.287544	0.028063	0.00482615	6.07e-09	33.81166525
Mood swings	rs9881798	3	16805459	C	A	0.404393	0.025074	0.00442504	1.46e-08	32.10796947
Mood swings	rs73082357	3	49046133	A	G	0.118454	-0.043611	0.00668905	7.04e-11	42.50726923
Mood swings	rs9852417	3	65175479	A	C	0.587995	-0.0249646	0.00442571	1.69e-08	31.81876492
Mood swings	rs539711	3	107552348	T	A	0.259847	0.0320546	0.00516842	5.57e-10	38.46494598
Mood swings	rs13434208	3	117288817	G	A	0.525832	-0.0244442	0.00433934	1.77e-08	31.73250064
Mood swings	rs60799144	4	21851144	T	A	0.601252	0.0249364	0.00452443	3.56e-08	30.37664213
Mood swings	rs10488866	4	104524122	C	T	0.267186	-0.0267895	0.00490118	.000000046	29.8763756
Mood swings	rs67970900	4	146827674	T	G	0.307706	-0.0262217	0.00469722	2.37e-08	31.16304494
Mood swings	rs6882578	5	104410123	C	G	0.512119	0.0238142	0.00433979	4.08e-08	30.11165069
Mood swings	rs6895295	5	108421537	T	C	0.214708	0.0303752	0.00529206	9.48e-09	32.94494398
Mood swings	rs186121425	5	117532956	T	G	0.145587	-0.0358465	0.00614341	5.38e-09	34.04666016
Mood swings	rs58746316	5	148458109	T	A	0.589745	0.0278641	0.00442412	3.01e-10	39.66762908
Mood swings	rs3025646	6	29599065	C	T	0.0665062	0.0515162	0.00867373	2.86e-09	35.27571644
Mood swings	rs200250173	6	64392217	T	C	0.280778	-0.0275627	0.00486132	1.43e-08	32.14660373
Mood swings	rs2503775	6	98073724	G	A	0.87095	-0.0368092	0.00646842	1.27e-08	32.38294446
Mood swings	rs67447472	6	142741079	T	G	0.0967712	0.0457899	0.00735202	4.72e-10	38.79055832
Mood swings	rs6460902	7	12215885	A	G	0.41808	0.0256874	0.00438837	4.81e-09	34.26366554
Mood swings	rs763646	7	133658600	T	C	0.444591	0.0263874	0.00439284	1.89e-09	36.08298272
Mood swings	rs7818437	8	10352113	C	T	0.232477	0.0369458	0.00520265	1.24e-12	50.42906651
Mood swings	rs1962104	8	140625230	C	T	0.558635	0.0315008	0.00443214	1.18e-12	50.5145195
Mood swings	rs10960067	9	11651144	G	A	0.223075	-0.037386	0.00521633	7.66e-13	51.36743578
Mood swings	rs1111818	9	23315442	C	G	0.631051	-0.0257611	0.00451104	1.13e-08	32.61185111
Mood swings	rs10120798	9	93681194	G	A	0.592214	-0.025893	0.00443118	5.12e-09	34.14490893
Mood swings	rs10983775	9	117758822	T	C	0.53444	-0.0270361	0.00436483	5.86e-10	38.36660943
Mood swings	rs10818399	9	119894725	G	C	0.59583	0.0297381	0.00442955	1.9e-11	45.07204035
Mood swings	rs999483	9	132426002	G	T	0.249198	0.0288186	0.00500489	8.51e-09	33.1555842
Mood swings	rs11599236	10	104694914	C	T	0.408474	-0.0246909	0.00447242	3.38e-08	30.47815541
Mood swings	rs297343	11	16333107	G	T	0.638983	-0.0308684	0.00451859	8.41e-12	46.66834125
Mood swings	rs11039154	11	47256951	T	C	0.277679	0.0356116	0.00483672	1.8e-13	54.2102088
Mood swings	rs3133388	11	113536392	A	G	0.315683	-0.0363991	0.0047079	1.06e-14	59.77599749
Mood swings	rs7954112	12	16163404	A	G	0.418235	0.0251362	0.00444424	1.55e-08	31.98926331
Mood swings	rs28655666	12	121748411	A	G	0.55244	-0.0293402	0.00434668	1.48e-11	45.56284164
Mood swings	rs1373921	13	58060689	G	A	0.238622	0.0377152	0.00507181	1.04e-13	55.29767591
Mood swings	rs9517301	13	98442834	C	T	0.376016	0.0275496	0.00452682	1.16e-09	37.03771139
Mood swings	rs7156084	14	71237098	A	T	0.707269	0.0271777	0.00482314	1.75e-08	31.75160362
Mood swings	rs4899532	14	74707429	G	A	0.745781	0.0309192	0.00497189	5.01e-10	38.67349963
Mood swings	rs4243048	15	77717718	A	G	0.560296	-0.0253962	0.00455096	.000000024	31.14092011
Mood swings	rs11864857	16	5742822	T	A	0.277867	0.0305537	0.00491429	5.06e-10	38.65503382
Mood swings	rs7202252	16	24730365	C	T	0.733042	0.0304521	0.00490489	5.35e-10	38.54570119
Mood swings	rs35856211	16	74105001	A	G	0.540829	-0.0265702	0.00437662	1.27e-09	36.85631963
Mood swings	rs9933873	16	87363149	C	T	0.439598	0.0302215	0.0043675	4.53e-12	47.88132996
Mood swings	rs669915	17	45646879	A	G	0.222411	0.0478423	0.00520471	3.85e-20	84.49500339
Mood swings	rs11082011	18	37565159	T	C	0.669366	-0.0345511	0.00462659	8.15e-14	55.77013906
Mood swings	rs62097985	18	53284305	T	C	0.419319	0.0282388	0.00440901	1.51e-10	41.02138388
Mood swings	rs12963231	18	55100746	A	C	0.328391	0.0361901	0.00464628	6.75e-15	60.66927565
Mood swings	rs613872	18	55543071	T	G	0.826073	0.0463201	0.00571822	5.48e-16	65.61713381
Mood swings	rs1688000	19	35128262	G	A	0.626691	-0.026825	0.0044895	2.3e-09	35.70125717
Mood swings	rs4578918	20	46093017	C	T	0.739361	-0.0292367	0.00494588	3.39e-09	34.94375348
Mood swings	rs2092563	22	41196673	A	G	0.285323	0.0328158	0.00480933	8.89e-12	46.55827021

Supplementary Table 3. Confounding SNPs for Various Phenotypes

phenotypes	Confounding SNPs	confounders
Functional dyspepsia	NA	rs9881798:Cigarettes smoked per day
Pancreatic cancer	NA	rs3133388:Smoking status
Acute gastritis	rs9881798,rs3133388	rs613872:Body mass index
Coeliac disease	rs9881798,rs3133388	rs11599236:Depression
Colorectal cancer	rs9881798,rs3133388	rs12963231:Depression
Gastric cancer	rs9881798,rs3133388	rs2092563:Depression
Cholecystitis	rs9881798,rs3133388,rs613872	rs4651205:Drinks per week
Crohn's disease	rs9881798,rs3133388,rs613872	
Acute appendicitis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Acute pancreatitis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Chronic gastritis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Diverticular disease of intestine	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Duodenal ulcer	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Gastric ulcer	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Gastro-oesophageal reflux disease	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Gastroduodenal ulcer	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Irritable bowel syndrome	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563	
Cholelithiasis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872	
Nonalcoholic fatty liver disease	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872	
Ulcerative colitis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872	
Esophagus cancer	rs9881798,rs3133388,rs4651205	
Fibrosis and cirrhosis of liver	rs9881798,rs3133388,rs4651205,rs613872	
Alcoholic liver disease	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872,rs4651205	
Chronic pancreatitis	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872,rs4651205	
Gastrointestinal diseases	rs9881798,rs3133388,rs11599236,rs12963231,rs2092563,rs613872,rs4651205	

Supplementary Table 4. Causal Effects of Mood Swings on Gastrointestinal Diseases Risk

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Mood swings	Functional dyspepsia	Inverse variance weighted (multiplicative random effects)	51	1.327276515	1.113768555	1.581713669	.001555207
Mood swings	Functional dyspepsia	MR Egger	51	0.922429433	0.318192477	2.674092323	.882408377
Mood swings	Functional dyspepsia	Weighted median	51	1.328535132	1.047927908	1.68428151	.018938843
Mood swings	Pancreatic cancer	Inverse variance weighted (fixed effects)	51	1.552751874	1.078043591	2.236494333	.01809513
Mood swings	Pancreatic cancer	MR Egger	51	1.360371272	0.150199529	12.32101063	.785433083
Mood swings	Pancreatic cancer	Weighted median	51	1.447901089	0.878977065	2.385065147	.1461034
Mood swings	Acute gastritis	Inverse variance weighted (fixed effects)	50	1.664110434	1.242203325	2.229315829	.000640629
Mood swings	Acute gastritis	MR Egger	50	2.090887575	0.35708651	12.24300197	.41740954
Mood swings	Acute gastritis	Weighted median	50	1.752114433	1.178104868	2.605799424	.005616227
Mood swings	Coeliac disease	Inverse variance weighted (multiplicative random effects)	50	1.03571513	0.726269568	1.477007817	.846341546
Mood swings	Coeliac disease	MR Egger	50	0.202682311	0.024146017	1.701320728	.147968445
Mood swings	Coeliac disease	Weighted median	50	0.945674841	0.663933215	1.346974189	.75693425
Mood swings	Colorectal cancer	Inverse variance weighted (multiplicative random effects)	50	0.990887736	0.78513237	1.250564291	.938554361
Mood swings	Colorectal cancer	MR Egger	50	2.0988204	0.514449635	8.562640099	.306562105
Mood swings	Colorectal cancer	Weighted median	50	1.028268304	0.779560823	1.356322269	.843579482
Mood swings	Gastric cancer	Inverse variance weighted (fixed effects)	50	1.024511472	0.691083908	1.51880798	.904044646
Mood swings	Gastric cancer	MR Egger	50	0.607455929	0.056158135	6.570779228	.683398243
Mood swings	Gastric cancer	Weighted median	50	0.977498149	0.550475382	1.735777224	.938079208
Mood swings	Cholecystitis	Inverse variance weighted (fixed effects)	49	1.003934912	0.804963745	1.252087828	.972201361
Mood swings	Cholecystitis	MR Egger	49	4.792871387	1.14710939	20.02565434	.036888917
Mood swings	Cholecystitis	Weighted median	49	1.000070493	0.743267872	1.345599655	.999628543
Mood swings	Crohn's disease	Inverse variance weighted (fixed effects)	49	1.207357194	0.865529209	1.684185096	.267168602
Mood swings	Crohn's disease	MR Egger	49	0.253772666	0.023571958	2.73208392	.263777011

(*Continued*)

Supplementary Table 4. Causal Effects of Mood Swings on Gastrointestinal Diseases Risk (*Continued*)

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Mood swings	Crohn's disease	Weighted median	49	1.384030444	0.855120667	2.240081833	.185863958
Mood swings	Acute appendicitis	Inverse variance weighted (multiplicative random effects)	47	1.06080456	0.947364126	1.187828716	.306335051
Mood swings	Acute appendicitis	MR Egger	47	1.24243027	0.623106055	2.477319811	.54066687
Mood swings	Acute appendicitis	Weighted median	47	1.033845717	0.903218393	1.183364927	.629107514
Mood swings	Acute pancreatitis	Inverse variance weighted (fixed effects)	47	1.3681608	1.133457518	1.651463725	.001095863
Mood swings	Acute pancreatitis	MR Egger	47	1.288943044	0.371833197	4.468063057	.690908318
Mood swings	Acute pancreatitis	Weighted median	47	1.3227648	1.003564027	1.74349286	.047116716
Mood swings	Chronic gastritis	Inverse variance weighted (fixed effects)	47	1.181951162	1.01289059	1.379229468	.033784437
Mood swings	Chronic gastritis	MR Egger	47	0.643646091	0.253043248	1.637191637	.359889614
Mood swings	Chronic gastritis	Weighted median	47	1.21879942	0.971005847	1.529828097	.087956681
Mood swings	Diverticular disease of intestine	Inverse variance weighted (multiplicative random effects)	47	1.189722183	1.030350384	1.373745179	.017910445
Mood swings	Diverticular disease of intestine	MR Egger	47	0.688058977	0.290297512	1.630827467	.40028207
Mood swings	Diverticular disease of intestine	Weighted median	47	1.24413787	1.074693232	1.44029849	.003451691
Mood swings	Duodenal ulcer	Inverse variance weighted (fixed effects)	47	1.435095948	1.115842944	1.845690195	.004895887
Mood swings	Duodenal ulcer	MR Egger	47	1.446468307	0.310714967	6.733729589	.640337757
Mood swings	Duodenal ulcer	Weighted median	47	1.676032272	1.167070086	2.406954143	.005163462
Mood swings	Gastric ulcer	Inverse variance weighted (fixed effects)	47	1.231356433	1.014658965	1.494333286	.035086628
Mood swings	Gastric ulcer	MR Egger	47	0.50151656	0.155684809	1.615564559	.253664183
Mood swings	Gastric ulcer	Weighted median	47	1.318736633	1.001794816	1.735950595	.048519925
Mood swings	Gastro-oesophageal reflux disease	Inverse variance weighted (multiplicative random effects)	47	1.29417997	1.1445877	1.463323251	3.87418E-05
Mood swings	Gastro-oesophageal reflux disease	MR Egger	47	1.136924733	0.537309584	2.405685451	.738746071
Mood swings	Gastro-oesophageal reflux disease	Weighted median	47	1.207995395	1.041563563	1.401021431	.012474329
Mood swings	Gastroduodenal ulcer	Inverse variance weighted (fixed effects)	47	1.302530993	1.113140269	1.524144831	.000977064
Mood swings	Gastroduodenal ulcer	MR Egger	47	0.889900732	0.344320057	2.299962768	.810823284

(*Continued*)

Supplementary Table 4. Causal Effects of Mood Swings on Gastrointestinal Diseases Risk (*Continued*)

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Mood swings	Gastroduodenal ulcer	Weighted median	47	1.17568386	0.931043937	1.484605058	.173911849
Mood swings	Irritable bowel syndrome	Inverse variance weighted (multiplicative random effects)	47	1.375231318	1.138609207	1.661027475	.000941411
Mood swings	Irritable bowel syndrome	MR Egger	47	2.260508422	0.71923892	7.104590959	.169583749
Mood swings	Irritable bowel syndrome	Weighted median	47	1.296430842	1.018156068	1.650761588	.035207975
Mood swings	Cholelithiasis	Inverse variance weighted (multiplicative random effects)	46	1.105122582	0.988088558	1.236018687	.080086486
Mood swings	Cholelithiasis	MR Egger	46	1.149675292	0.550040696	2.403009971	.71255539
Mood swings	Cholelithiasis	Weighted median	46	1.09247918	0.961697524	1.241045889	.173942767
Mood swings	Nonalcoholic fatty liver disease	Inverse variance weighted (fixed effects)	46	1.506685435	1.107312199	2.050100235	.009087871
Mood swings	Nonalcoholic fatty liver disease	MR Egger	46	1.272375015	0.142857804	11.33251478	.830061008
Mood swings	Nonalcoholic fatty liver disease	Weighted median	46	1.810489127	1.159985176	2.82578687	.008965154
Mood swings	Ulcerative colitis	Inverse variance weighted (fixed effects)	44	0.997766606	0.808919147	1.230701738	.983336448
Mood swings	Ulcerative colitis	MR Egger	44	0.292832434	0.056828745	1.508934141	.149502539
Mood swings	Ulcerative colitis	Weighted median	44	1.093241511	0.800248874	1.493506633	.575436148
Mood swings	Esophagus cancer	Inverse variance weighted (fixed effects)	49	0.903048711	0.496232378	1.643377199	.73850324
Mood swings	Esophagus cancer	MR Egger	49	0.147922518	0.002762501	7.920746972	.351517562
Mood swings	Esophagus cancer	Weighted median	49	0.737776435	0.302711669	1.798127142	.503438985
Mood swings	Fibrosis and cirrhosis of liver	Inverse variance weighted (multiplicative random effects)	48	1.264264613	0.961197699	1.662888927	.093547272
Mood swings	Fibrosis and cirrhosis of liver	MR Egger	48	0.936125379	0.156920156	5.584564449	.942569027
Mood swings	Fibrosis and cirrhosis of liver	Weighted median	48	1.176707184	0.822770466	1.682899246	.372729509
Mood swings	Alcoholic liver disease	Inverse variance weighted (multiplicative random effects)	45	1.079429157	0.758337441	1.536476035	.671337972
Mood swings	Alcoholic liver disease	MR Egger	45	0.322879151	0.032359985	3.221600562	.340825783
Mood swings	Alcoholic liver disease	Weighted median	45	1.023698828	0.663417046	1.579638776	.915714378
Mood swings	Chronic pancreatitis	Inverse variance weighted (fixed effects)	45	1.541134436	1.194457542	1.988430116	.000878747

(*Continued*)

Supplementary Table 4. Causal Effects of Mood Swings on Gastrointestinal Diseases Risk (*Continued*)

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Mood swings	Chronic pancreatitis	MR Egger	45	0.624931847	0.119307245	3.273395635	.580798931
Mood swings	Chronic pancreatitis	Weighted median	45	1.562807859	1.091722907	2.237168781	.014708249
Mood swings	Gastrointestinal diseases	Inverse variance weighted (multiplicative random effects)	44	1.213026384	1.117995903	1.316134526	3.4887E-06
Mood swings	Gastrointestinal diseases	MR Egger	44	1.198934312	0.706416148	2.034839507	.505106825
Mood swings	Gastrointestinal diseases	Weighted median	44	1.223853473	1.109712981	1.349733984	5.25268E-05

Supplementary Table 5. Summary of Pleiotropy

Exposure	Outcome	Egger_intercept	SE	*P*
Mood swings	Functional dyspepsia	0.011027234	0.016229422	.500044109
Mood swings	Pancreatic cancer	0.004008184	0.033597888	.9055265
Mood swings	Acute gastritis	-0.006942467	0.027043038	.798492759
Mood swings	Coeliac disease	0.049571182	0.032536567	.134182276
Mood swings	Colorectal cancer	-0.022825793	0.021516907	.294075646
Mood swings	Gastric cancer	0.015894319	0.036433431	.664606666
Mood swings	Cholecystitis	-0.046997404	0.021669996	.035192854
Mood swings	Crohn's disease	0.046884905	0.036008175	.199240147
Mood swings	Acute appendicitis	-0.004788262	0.010520828	.651209625
Mood swings	Acute pancreatitis	0.001807208	0.018953029	.924458645
Mood swings	Chronic gastritis	0.018424846	0.014240435	.202322168
Mood swings	Diverticular disease of intestine	0.01659766	0.013160844	.213757689
Mood swings	Duodenal ulcer	-0.000239222	0.023454159	.991907147
Mood swings	Gastric ulcer	0.027220319	0.017837406	.134002214
Mood swings	Gastro-oesophageal reflux disease	0.003926563	0.011430501	.732809976
Mood swings	Gastroduodenal ulcer	0.011544667	0.014478906	.429438634
Mood swings	Irritable bowel syndrome	-0.015059333	0.017460845	.393005924
Mood swings	Cholelithiasis	-0.001183202	0.01112706	.915799457
Mood swings	Nonalcoholic fatty liver disease	0.005060606	0.03300748	.87884932
Mood swings	Ulcerative colitis	0.036424771	0.024594783	.146071332
Mood swings	Esophagus cancer	0.055131246	0.061030944	.370956093
Mood swings	Fibrosis and cirrhosis of liver	0.009051175	0.027115562	.740047438
Mood swings	Alcoholic liver disease	0.036178916	0.034765878	.303856677
Mood swings	Chronic pancreatitis	0.027065548	0.025031732	.285613012
Mood swings	Gastrointestinal diseases	0.000351138	0.008010722	.965244872

Supplementary Table 6. Summary of Heterogeneity

Exposure	Outcome	Method	Q	Q_df	Q_pval
Mood swings	Functional dyspepsia	MR Egger	67.01425946	49	0.044517167
Mood swings	Functional dyspepsia	Inverse variance weighted	67.64565014	50	0.048821273
Mood swings	Pancreatic cancer	MR Egger	39.15026432	49	0.841862685
Mood swings	Pancreatic cancer	Inverse variance weighted	39.1644965	50	0.86552595
Mood swings	Acute gastritis	MR Egger	33.64001542	48	0.942278054
Mood swings	Acute gastritis	Inverse variance weighted	33.70592016	49	0.952930473
Mood swings	Coeliac disease	MR Egger	108.3896705	48	1.45439e-06
Mood swings	Coeliac disease	Inverse variance weighted	113.631245	49	4.76918e-07
Mood swings	Colorectal cancer	MR Egger	77.4544011	48	0.004499198
Mood swings	Colorectal cancer	Inverse variance weighted	79.27032199	49	0.003991869
Mood swings	Gastric cancer	MR Egger	47.21810796	48	0.504802479
Mood swings	Gastric cancer	Inverse variance weighted	47.40842763	49	0.53782505
Mood swings	Cholecystitis	MR Egger	38.30536441	47	0.812996596
Mood swings	Cholecystitis	Inverse variance weighted	43.00896134	48	0.677059383
Mood swings	Crohn's disease	MR Egger	57.08605386	47	0.148779587
Mood swings	Crohn's disease	Inverse variance weighted	59.14524198	48	0.129948283
Mood swings	Acute appendicitis	MR Egger	72.7153763	45	0.005523275
Mood swings	Acute appendicitis	Inverse variance weighted	73.05008715	46	0.006759791
Mood swings	Acute pancreatitis	MR Egger	53.6705467	45	0.176090519
Mood swings	Acute pancreatitis	Inverse variance weighted	53.68139053	46	0.203603701
Mood swings	Chronic gastritis	MR Egger	45.14756809	45	0.465786702
Mood swings	Chronic gastritis	Inverse variance weighted	46.82708	46	0.438335533
Mood swings	Diverticular disease of intestine	MR Egger	110.1280654	45	2.21325e-07
Mood swings	Diverticular disease of intestine	Inverse variance weighted	114.0204142	46	1.06076e-07
Mood swings	Duodenal ulcer	MR Egger	46.03545314	45	0.429151988
Mood swings	Duodenal ulcer	Inverse variance weighted	46.03555957	46	0.470792457
Mood swings	Gastric ulcer	MR Egger	41.30737368	45	0.629144056
Mood swings	Gastric ulcer	Inverse variance weighted	43.63612463	46	0.5717875
Mood swings	Gastro-oesophageal reflux disease	MR Egger	77.71861108	45	0.001761405
Mood swings	Gastro-oesophageal reflux disease	Inverse variance weighted	77.92241241	46	0.002277032
Mood swings	Gastroduodenal ulcer	MR Egger	40.35255427	45	0.668899058
Mood swings	Gastroduodenal ulcer	Inverse variance weighted	40.98831151	46	0.6817363
Mood swings	Irritable bowel syndrome	MR Egger	68.5055095	45	0.013514189
Mood swings	Irritable bowel syndrome	Inverse variance weighted	69.63789404	46	0.013791702
Mood swings	Cholelithiasis	MR Egger	79.05756908	44	0.000927048
Mood swings	Cholelithiasis	Inverse variance weighted	79.07788553	45	0.001273592
Mood swings	Nonalcoholic fatty liver disease	MR Egger	52.34701023	44	0.181642897

(*Continued*)

Supplementary Table 6. Summary of Heterogeneity (*Continued*)

Exposure	Outcome	Method	Q	Q_df	Q_pval
Mood swings	Nonalcoholic fatty liver disease	Inverse variance weighted	52.37497554	45	0.209543233
Mood swings	Ulcerative colitis	MR Egger	53.32598868	42	0.112995393
Mood swings	Ulcerative colitis	Inverse variance weighted	56.11080971	43	0.086672054
Mood swings	Esophagus cancer	MR Egger	57.3155	47	0.144017885
Mood swings	Esophagus cancer	Inverse variance weighted	58.31060674	48	0.146360474
Mood swings	Fibrosis and cirrhosis of liver	MR Egger	66.66147175	46	0.024786323
Mood swings	Fibrosis and cirrhosis of liver	Inverse variance weighted	66.82294097	47	0.030136813
Mood swings	Alcoholic liver disease	MR Egger	64.97898038	43	0.016793334
Mood swings	Alcoholic liver disease	Inverse variance weighted	66.61545445	44	0.015458252
Mood swings	Chronic pancreatitis	MR Egger	42.59122959	43	0.488908943
Mood swings	Chronic pancreatitis	Inverse variance weighted	43.76033015	44	0.481822623
Mood swings	Gastrointestinal diseases	MR Egger	82.10111712	42	0.000211706
Mood swings	Gastrointestinal diseases	Inverse variance weighted	82.104873	43	0.000303922

Supplementary Table 7. The Summary Information for SNPs of Gastrointestinal Diseases

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Acute appendicitis	rs3738182	1	220884320	A	G	0.24014	-0.0948389	0.0098852	8.47032e-22	92.04540124
Acute appendicitis	rs7575706	2	18675186	A	G	0.796476	-0.0559412	0.0102314	4.56205e-08	29.89464694
Acute appendicitis	rs6707044	2	19290998	G	A	0.217912	0.0796341	0.00992549	1.03039e-15	64.37159053
Acute appendicitis	rs976568	4	110629565	T	G	0.598844	-0.0599877	0.00847937	1.49934e-12	50.04921259
Acute appendicitis	rs13121924	4	110799663	G	A	0.530436	-0.152285	0.00829329	2.62301e-75	337.1790255
Acute appendicitis	rs3850473	4	111887334	T	A	0.658899	0.0678463	0.0088196	1.44079e-14	59.17721999
Acute appendicitis	rs9273368	6	32658698	A	G	0.277051	0.0559688	0.00920476	1.19867e-09	36.97149839
Acute appendicitis	rs4734039	8	101728366	T	C	0.300434	-0.0499969	0.00912698	4.30328e-08	30.007648
Acute appendicitis	rs7824074	8	127576577	G	T	0.701058	-0.052896	0.00906707	5.41614e-09	34.03390064
Acute appendicitis	rs10748784	10	99560363	A	G	0.542533	0.0490883	0.0083638	4.38077e-09	34.44678591
Acute appendicitis	rs10849448	12	6384185	G	A	0.756268	0.0829448	0.00987797	4.58247e-17	70.50873497
Acute appendicitis	rs12312786	12	19653137	A	C	0.60323	0.0475281	0.00852101	2.43635e-08	31.11134281
Acute appendicitis	rs770388	13	50570629	A	G	0.429312	-0.051964	0.0084371	7.32116e-10	37.93313661
Acute appendicitis	rs113159970	15	95671001	A	G	0.254785	-0.0611629	0.00963316	2.16421e-10	40.31239406
Acute appendicitis	rs8054231	16	86134198	A	G	0.192565	-0.0742236	0.0107051	4.10582e-12	48.07314912
Acute appendicitis	rs142069498	20	51831701	A	G	0.057687	-0.102949	0.0182814	1.78797e-08	31.7121263
Acute pancreatitis	rs11887534	2	43839108	C	G	0.079176	0.258431	0.0300779	8.54476e-18	73.82342564
Acute pancreatitis	rs147839099	5	147654455	G	A	0.0486109	0.251597	0.0385739	6.91512e-11	42.54257921
Acute pancreatitis	rs559363229	5	147805265	T	C	0.0164175	0.65655	0.056167	1.44644e-31	136.638522
Acute pancreatitis	rs191041365	5	147887437	T	C	0.0226971	0.426978	0.05196	2.07922e-16	67.52626246
Acute pancreatitis	rs150176211	7	142780235	A	G	0.0246216	-0.492909	0.0657188	6.36796e-14	56.25410849
Acute pancreatitis	rs12532408	7	142916804	A	G	0.0592276	0.221906	0.0348656	1.95785e-10	40.50828002
Acute pancreatitis	rs4888362	16	75234347	C	T	0.892334	0.183679	0.0294533	4.48116e-10	38.89117735
Alcoholic liver disease	rs28636836	4	87310713	T	C	0.216269	-0.222591	0.0325205	7.66655e-12	46.84904827
Alcoholic liver disease	rs142548379	11	90960263	G	C	0.0454412	0.342377	0.0553852	6.33972e-10	38.21393036
Alcoholic liver disease	rs188247550	19	19285807	T	C	0.0506347	0.393469	0.0526723	8.01124e-14	55.80286253
Alcoholic liver disease	rs3747207	22	43928975	A	G	0.22569	0.356707	0.0286911	1.7374e-35	154.5713022
Cholecystitis	rs11887534	2	43839108	C	G	0.0791135	0.317358	0.0357362	6.6512e-19	78.86461019
Cholecystitis	rs4261716	2	233684471	T	G	0.480233	0.132395	0.020951	2.62791e-10	39.93315779
Cholelithiasis	rs35176086	1	25512737	T	A	0.44867	0.0425767	0.00774727	3.89144e-08	30.20275859
Cholelithiasis	rs4660585	1	41927330	A	G	0.702272	0.0569994	0.00850109	2.01465e-11	44.95638069
Cholelithiasis	rs1127313	1	154583949	A	G	0.462039	0.0528545	0.00771818	7.48686e-12	46.89581977
Cholelithiasis	rs3790844	1	200038304	G	A	0.368021	0.0519841	0.00801039	8.60597e-11	42.11470247
Cholelithiasis	rs1260326	2	27508073	C	T	0.6503	0.0670143	0.00810675	1.37975e-16	68.33471863
Cholelithiasis	rs115383258	2	43294374	G	A	0.0281622	0.481635	0.0212013	3.0269e-114	516.0729495
Cholelithiasis	rs17406264	2	43361690	T	C	0.0234263	0.306577	0.0236325	1.74864e-38	168.29058
Cholelithiasis	rs7596134	2	43825694	A	C	0.292582	0.279617	0.00822479	1e-200	1155.786207
Cholelithiasis	rs116649224	2	44226778	A	G	0.0199462	0.423283	0.0252224	3.3037e-63	281.6364331
Cholelithiasis	rs12466939	2	45260280	A	C	0.49715	0.0548306	0.00769685	1.05003e-12	50.74811914
Cholelithiasis	rs114600798	2	45653845	G	A	0.0198978	0.21542	0.0261179	1.61065e-16	68.0292266
Cholelithiasis	rs138809297	2	45795447	C	T	0.0616313	0.119327	0.01569	2.84381e-14	57.84043589

(*Continued*)

Supplementary Table 7. The Summary Information for SNPs of Gastrointestinal Diseases (*Continued*)

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Cholelithiasis	rs4673546	2	210700968	T	C	0.265788	-0.0511618	0.00877306	5.48668e-09	34.0086531
Cholelithiasis	rs3731859	2	218259499	A	G	0.669906	0.0570945	0.00819058	3.1521e-12	48.59138018
Cholelithiasis	rs887829	2	233759924	T	C	0.391913	0.0886896	0.00782797	9.33899e-30	128.3651366
Cholelithiasis	rs9845092	3	56859097	G	A	0.452184	-0.0459243	0.00774233	3.00034e-09	35.18371824
Cholelithiasis	rs4681503	3	149379523	A	G	0.43625	0.0611398	0.00776989	3.58014e-15	61.91819486
Cholelithiasis	rs6794817	3	149465095	T	C	0.19327	0.118135	0.00960316	8.86952e-35	151.3313275
Cholelithiasis	rs4681515	3	149494289	G	A	0.495776	-0.125737	0.00769296	4.76431e-60	267.1401957
Cholelithiasis	rs549211656	3	149713884	C	G	0.0445416	-0.112433	0.0194969	8.08295e-09	33.25496304
Cholelithiasis	rs3129317	4	3285928	G	A	0.260618	0.0544365	0.0087352	4.60935e-10	38.83601703
Cholelithiasis	rs2013231	4	48087441	T	A	0.197167	-0.0573833	0.00976444	4.18369e-09	34.53634371
Cholelithiasis	rs6532417	4	76484566	G	T	0.715308	0.057557	0.00860194	2.21411e-11	44.77168927
Cholelithiasis	rs13126112	4	94918869	T	C	0.158987	0.059304	0.0104591	1.42712e-08	32.14987906
Cholelithiasis	rs2290846	4	150277928	A	G	0.221765	0.109256	0.00911195	3.99117e-33	143.7698888
Cholelithiasis	rs17671591	5	75319196	T	C	0.357067	0.0455553	0.00801352	1.3096e-08	32.31700993
Cholelithiasis	rs72763208	5	76869711	A	C	0.0637393	-0.0994318	0.0162143	8.65845e-10	37.60574481
Cholelithiasis	rs9396788	6	17676239	G	A	0.367057	-0.0637535	0.0080155	1.80926e-15	63.26256947
Cholelithiasis	rs3132722	6	29867174	C	T	0.663378	0.04999	0.00818514	1.0126e-09	37.30044812
Cholelithiasis	rs75894113	6	104983309	A	G	0.0756024	-0.0866473	0.0149514	6.82087e-09	33.58507695
Cholelithiasis	rs113638914	6	157981676	C	T	0.206817	0.0576114	0.00943613	1.02539e-09	37.27597632
Cholelithiasis	rs79949326	7	6421679	T	C	0.226409	0.0547111	0.00913173	2.08142e-09	35.89589358
Cholelithiasis	rs147491739	7	86116958	C	T	0.0527181	-0.112984	0.0177238	1.8335e-10	40.63686637
Cholelithiasis	rs45561635	7	87404651	C	A	0.0425193	-0.130772	0.0196933	3.12752e-11	44.09532399
Cholelithiasis	rs66869391	7	87489753	A	G	0.135526	-0.191504	0.0116364	7.43533e-61	270.8434991
Cholelithiasis	rs75741381	7	101166177	G	C	0.152301	-0.0665724	0.0108427	8.26133e-10	37.69758634
Cholelithiasis	rs17154498	7	107827680	A	C	0.284032	-0.0900145	0.00862959	1.79143e-25	108.8039399
Cholelithiasis	rs62490880	8	11556384	T	C	0.15274	-0.0756265	0.0109235	4.41367e-12	47.9318705
Cholelithiasis	rs6471717	8	58464798	A	G	0.615588	-0.114862	0.00787729	3.68893e-48	212.6175354
Cholelithiasis	rs16894137	8	95934063	C	T	0.130565	0.0878145	0.011285	7.16638e-15	60.55211805
Cholelithiasis	rs2468191	8	119222029	A	G	0.582991	0.0431407	0.00783026	3.59898e-08	30.35442494
Cholelithiasis	rs28601761	8	125487789	G	C	0.410975	0.0663183	0.00779217	1.72624e-17	72.43524481
Cholelithiasis	rs686030	9	15304784	A	C	0.881683	0.127897	0.0122117	1.14551e-25	109.69036
Cholelithiasis	rs115478735	9	133274295	T	A	0.198909	0.0962828	0.00951822	4.70977e-24	102.3259878
Cholelithiasis	rs11012726	10	21508343	C	T	0.316303	0.0479562	0.00827716	6.88129e-09	33.56810499
Cholelithiasis	rs11239549	10	45523383	G	A	0.283438	0.0860151	0.00845051	2.46888e-24	103.605678
Cholelithiasis	rs7912893	10	63402240	A	T	0.4727	0.049251	0.00770933	1.67533e-10	40.81284159
Cholelithiasis	rs12220311	10	77921749	T	C	0.223217	0.0505945	0.00918494	3.62068e-08	30.34268227
Cholelithiasis	rs7915944	10	100182496	C	T	0.126119	0.0630824	0.0115185	4.33541e-08	29.99332148
Cholelithiasis	rs58514600	11	1355653	T	C	0.149381	0.0642919	0.0106923	1.82213e-09	36.15515686
Cholelithiasis	rs9633835	11	13324046	A	G	0.397664	-0.0536376	0.00790865	1.18413e-11	45.99747184
Cholelithiasis	rs174549	11	61803910	A	G	0.388125	0.0737272	0.00785807	6.45208e-21	88.02857972
Cholelithiasis	rs3867287	11	69960696	T	C	0.0982944	0.084642	0.0128259	4.13143e-11	43.55079973
Cholelithiasis	rs75497660	12	14984781	T	A	0.156052	0.0590686	0.0104756	1.71356e-08	31.79475929
Cholelithiasis	rs7979478	12	120982460	G	A	0.581426	0.0632586	0.00786616	8.84708e-16	64.67159924

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Cholelithiasis	rs7325496	13	102847067	A	C	0.78466	-0.0813693	0.00926183	1.5574e-18	77.18404752
Cholelithiasis	rs16961277	13	103064473	G	A	0.139203	-0.112636	0.0113117	2.3383e-23	99.15136127
Cholelithiasis	rs28929474	14	94378610	T	C	0.0197333	0.318602	0.0257318	3.287e-35	153.3051206
Cholelithiasis	rs11644920	16	11551157	T	A	0.324122	0.0507302	0.00825316	7.90788e-10	37.78266779
Cholelithiasis	rs7206790	16	53763996	G	C	0.483413	0.0519229	0.00770869	1.6323e-11	45.36874011
Cholelithiasis	rs9909593	17	39813896	G	A	0.528206	-0.0459436	0.00771665	2.61933e-09	35.4480573
Cholelithiasis	rs12449576	17	79930325	A	T	0.621289	-0.0452691	0.00796797	1.33607e-08	32.27812805
Cholelithiasis	rs12326100	18	22076747	A	G	0.150905	0.059595	0.0106494	2.1926e-08	31.3162224
Cholelithiasis	rs8097764	18	57650664	A	G	0.116213	-0.0816442	0.0121353	1.72266e-11	45.26365726
Cholelithiasis	rs708686	19	5840608	T	C	0.334175	0.0955934	0.00811191	4.70219e-32	138.8703627
Cholelithiasis	rs2733738	19	35554601	A	G	0.597709	-0.0480683	0.00784302	8.85462e-10	37.56218791
Cholelithiasis	rs8108864	19	45798413	A	G	0.297763	0.0689141	0.00839309	2.19685e-16	67.41746483
Cholelithiasis	rs67165745	19	47420724	A	C	0.0365428	-0.145218	0.0215056	1.45278e-11	45.59715803
Cholelithiasis	rs76531193	19	47857434	A	T	0.150579	-0.146963	0.0110753	3.48257e-40	176.0779688
Cholelithiasis	rs686548	20	12992873	T	A	0.657911	-0.0526082	0.00806999	7.07783e-11	42.49725629
Cholelithiasis	rs1800961	20	44413724	T	C	0.0454273	0.317622	0.0173166	3.82032e-75	336.4309189
Cholelithiasis	rs2072858	22	40312675	C	T	0.393762	0.0446305	0.00786506	1.39072e-08	32.20026342
Cholelithiasis	rs738408	22	43928850	T	C	0.226937	-0.0565375	0.00927174	1.07515e-09	37.18353817
Chronic gastritis	rs2476601	1	113834946	G	A	0.852025	-0.120346	0.0197109	1.0244e-09	37.27781174
Chronic gastritis	rs11751024	6	32618459	A	C	0.398566	-0.0905838	0.0146894	6.97654e-10	38.02707811
Chronic pancreatitis	rs115343810	5	147138130	G	A	0.0195196	0.432486	0.0731619	3.39305e-09	34.94412385
Chronic pancreatitis	rs147839099	5	147654455	G	A	0.0485444	0.287685	0.0499717	8.56466e-09	33.14257046
Chronic pancreatitis	rs559363229	5	147805265	T	C	0.0163691	0.823767	0.0693697	1.59588e-32	141.0162455
Chronic pancreatitis	rs191041365	5	147887437	T	C	0.022674	0.570242	0.0643838	8.22621e-19	78.44498624
Chronic pancreatitis	rs7744721	6	76547558	A	T	0.493956	0.128673	0.0231646	2.78061e-08	30.85497811
Chronic pancreatitis	rs150176211	7	142780235	A	G	0.0246802	-0.605613	0.0886272	8.30042e-12	46.69348838
Coeliac disease	rs6740034	2	181172173	G	A	0.509444	0.173467	0.0223741	8.97429e-15	60.10942669
Coeliac disease	rs34005848	3	46222254	T	C	0.107083	0.269027	0.03377	1.63305e-15	63.46431782
Coeliac disease	rs6808893	3	188415651	T	C	0.560215	0.224282	0.0227241	5.62859e-23	97.41267217
Coeliac disease	rs6822844	4	122588266	T	G	0.113911	-0.253943	0.0373711	1.08168e-11	46.17434348
Coeliac disease	rs116673776	6	22383086	C	T	0.013597	0.483647	0.0824565	4.47816e-09	34.40386251
Coeliac disease	rs13191296	6	25684378	T	C	0.0455861	1.17505	0.0366847	1e-200	1025.989107
Coeliac disease	rs142229030	6	29320314	G	A	0.0387136	0.683178	0.0461079	1.13868e-49	219.5417188
Coeliac disease	rs189005954	6	30539514	A	G	0.0294525	-0.688696	0.0798333	6.31684e-18	74.41953598
Coeliac disease	rs3130290	6	32207180	C	T	0.512175	0.676041	0.0211719	1e-200	1019.591962
Coeliac disease	rs6899657	6	33082446	A	G	0.245976	0.726413	0.0217767	1e-200	1112.712788
Coeliac disease	rs72891915	6	33508423	A	G	0.0397786	1.29981	0.0370964	1e-200	1227.711195
Coeliac disease	rs9469549	6	33671728	T	G	0.0555971	-0.430024	0.0545095	3.04719e-15	62.23590259
Coeliac disease	rs73743401	6	33749168	T	G	0.0881939	0.732927	0.0314951	8.6896e-120	541.5461321
Coeliac disease	rs1906953	6	34068669	T	C	0.127815	0.449725	0.0296235	4.70002e-52	230.473673
Coeliac disease	rs181416918	6	35931587	T	C	0.0351565	0.542158	0.0510108	2.20141e-26	112.9607252
Coeliac disease	rs67707912	6	127896629	C	T	0.130024	-0.199779	0.0347205	8.71907e-09	33.10760221
Coeliac disease	rs6933404	6	137638098	C	T	0.189224	0.183272	0.0270636	1.27087e-11	45.85863319

(*Continued*)

Supplementary Table 7. The Summary Information for SNPs of Gastrointestinal Diseases (*Continued*)

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Coeliac disease	rs55781052	11	128581737	T	C	0.25974	0.144067	0.0249489	7.71934e-09	33.34465442
Coeliac disease	rs3184504	12	111446804	C	T	0.592264	-0.146296	0.0226262	1.0077e-10	41.80629304
Colorectal cancer	rs2853672	5	1292868	A	C	0.529652	0.132033	0.0177051	8.82877e-14	55.61196163
Colorectal cancer	rs11986063	8	116628076	T	C	0.124233	0.15268	0.0257431	3.01266e-09	35.17568918
Colorectal cancer	rs10956368	8	127411405	C	T	0.578774	-0.146741	0.0177683	1.47401e-16	68.20421146
Colorectal cancer	rs2225014	10	8668752	T	A	0.298813	-0.107513	0.019444	3.21425e-08	30.57389263
Colorectal cancer	rs35137159	10	99584492	T	C	0.160813	0.168212	0.0230332	2.8132e-13	53.33415168
Colorectal cancer	rs7933961	11	111309906	A	T	0.231576	0.136046	0.0204882	3.13184e-11	44.09242092
Colorectal cancer	rs16969681	15	32700910	T	C	0.0827208	0.231703	0.0302006	1.69161e-14	58.86161467
Colorectal cancer	rs4939567	18	48925503	A	G	0.505954	-0.161297	0.0175926	4.79844e-20	84.06060729
Colorectal cancer	rs79341273	19	18447707	A	G	0.0108056	-0.545182	0.0988457	3.47816e-08	30.4205775
Colorectal cancer	rs60507951	19	33053281	A	G	0.134689	-0.158236	0.026773	3.41547e-09	34.93144216
Colorectal cancer	rs71338563	20	6425097	T	C	0.305535	0.116934	0.0188705	5.76766e-10	38.39854752
Colorectal cancer	rs2427294	20	62352201	A	G	0.202397	-0.140375	0.0225487	4.80286e-10	38.75578352
Crohn's disease	rs10889669	1	67210045	G	T	0.244659	0.234788	0.0349051	1.7382e-11	45.24535704
Crohn's disease	rs10473190	5	40412505	A	C	0.567765	0.236608	0.0318849	1.1652e-13	55.06665936
Crohn's disease	rs3130980	6	31114627	T	C	0.330545	0.19529	0.0324682	1.80098e-09	36.17791931
Crohn's disease	rs34434863	6	32591896	G	T	0.336305	-0.256963	0.0339687	3.88776e-14	57.224675
Crohn's disease	rs10807943	7	5301033	C	T	0.936678	-0.432494	0.0569789	3.1886e-14	57.61453382
Crohn's disease	rs181316459	7	5433979	C	G	0.0478222	0.658972	0.0608607	2.54859e-27	117.2357421
Crohn's disease	rs13300483	9	114881082	T	C	0.327434	0.18343	0.0327124	2.05428e-08	31.44241649
Crohn's disease	rs7856092	9	136493166	G	A	0.768037	0.227683	0.0387581	4.24238e-09	34.50930814
Crohn's disease	rs76176364	16	50485831	G	A	0.0196732	0.64404	0.0918429	2.34261e-12	49.17388326
Diverticular disease of intestine	rs284255	1	10726749	A	G	0.131247	0.0924004	0.0124225	1.02094e-13	55.32605342
Diverticular disease of intestine	rs2473325	1	22052595	A	G	0.634514	-0.049899	0.00878113	1.32721e-08	32.29110234
Diverticular disease of intestine	rs4420086	1	221029593	G	T	0.436872	-0.0518613	0.00856754	1.41968e-09	36.64160735
Diverticular disease of intestine	rs10910384	1	234217307	C	A	0.221551	0.100199	0.0100749	2.64058e-23	98.91115794
Diverticular disease of intestine	rs848525	2	36518102	G	A	0.403636	-0.0472431	0.00866098	4.90535e-08	29.75381809
Diverticular disease of intestine	rs11899888	2	55875609	G	A	0.125498	0.0979911	0.0126397	8.99912e-15	60.1034959
Diverticular disease of intestine	rs4662339	2	143561263	C	T	0.807403	-0.18138	0.0104509	1.79267e-67	301.2114042
Diverticular disease of intestine	rs1427669	2	217930633	G	T	0.297543	-0.0559493	0.0093642	2.30356e-09	35.69833437
Diverticular disease of intestine	rs7609897	3	15461174	T	G	0.24867	-0.0874322	0.0100536	3.41979e-18	75.63095924
Diverticular disease of intestine	rs6796333	3	52325662	C	T	0.105917	-0.0924184	0.0139247	3.20037e-11	44.04992734

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Diverticular disease of intestine	rs9842218	3	55906155	C	T	0.330014	0.0509731	0.00901207	1.54864e-08	31.99138044
Diverticular disease of intestine	rs7617433	3	78834329	A	G	0.275185	0.053335	0.00947898	1.83734e-08	31.6593056
Diverticular disease of intestine	rs4383453	3	123349512	A	G	0.252242	-0.0584966	0.00986825	3.071e-09	35.13831745
Diverticular disease of intestine	rs77234000	3	150915691	A	T	0.0591778	0.0995069	0.0177254	1.97938e-08	31.51478178
Diverticular disease of intestine	rs13327359	3	151405364	C	A	0.145957	-0.071092	0.0121501	4.88214e-09	34.23590083
Diverticular disease of intestine	rs13111751	4	119129607	G	C	0.31996	-0.0506569	0.00915037	3.09357e-08	30.64784254
Diverticular disease of intestine	rs75686861	4	144700176	A	G	0.0899344	-0.0856647	0.0151271	1.48754e-08	32.06951861
Diverticular disease of intestine	rs13187416	5	37683762	T	C	0.551125	-0.0562251	0.00853868	4.55617e-11	43.35897401
Diverticular disease of intestine	rs3733892	5	79236265	C	A	0.395243	-0.0499292	0.00870166	9.58606e-09	32.92342399
Diverticular disease of intestine	rs75746146	6	31723099	G	C	0.289835	0.0577441	0.00931879	5.77245e-10	38.39690185
Diverticular disease of intestine	rs12216014	6	80612646	A	G	0.369254	-0.0531247	0.00881919	1.70416e-09	36.28570646
Diverticular disease of intestine	rs9320747	6	97862415	G	T	0.373065	-0.0511469	0.00878867	5.89753e-09	33.86821572
Diverticular disease of intestine	rs11766945	7	1848418	A	G	0.267224	-0.0542085	0.00965889	1.99664e-08	31.49780862
Diverticular disease of intestine	rs12702317	7	47208699	T	G	0.369202	-0.0520697	0.00883263	3.74326e-09	34.7528219
Diverticular disease of intestine	rs55675441	7	74026655	C	T	0.0818384	0.117559	0.0151976	1.0311e-14	59.83588886
Diverticular disease of intestine	rs1091814	7	74075333	A	C	0.706566	0.0592351	0.0093765	2.65993e-10	39.90954128
Diverticular disease of intestine	rs12538955	7	102820557	A	T	0.150406	0.076732	0.0117406	6.33578e-11	42.71421726
Diverticular disease of intestine	rs17058204	8	27909549	A	G	0.172925	-0.0618024	0.0113356	4.97943e-08	29.72498582
Diverticular disease of intestine	rs11785549	8	119423465	C	T	0.1717	-0.0686549	0.0113777	1.59779e-09	36.41112697
Diverticular disease of intestine	rs7027599	9	20782101	C	T	0.651132	0.0522711	0.00892626	4.74482e-09	34.29132085
Diverticular disease of intestine	rs12005101	9	124828354	A	G	0.81507	-0.0655973	0.0108634	1.55675e-09	36.46199157
Diverticular disease of intestine	rs143378550	9	130307462	A	C	0.0442174	0.16091	0.0199185	6.56296e-16	65.26086258
Diverticular disease of intestine	rs1888693	10	18151515	A	G	0.385816	-0.056398	0.00874874	1.14525e-10	41.55625343

(*Continued*)

Supplementary Table 7. The Summary Information for SNPs of Gastrointestinal Diseases (*Continued*)

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Diverticular disease of intestine	rs7905216	10	25425268	G	C	0.102872	-0.0976971	0.0142915	8.14329e-12	46.7312844
Diverticular disease of intestine	rs7086249	10	25522506	C	T	0.440114	-0.080518	0.00854797	4.53002e-21	88.72785429
Diverticular disease of intestine	rs2026558	10	51523175	A	G	0.657678	0.0558826	0.00895678	4.39977e-10	38.92686185
Diverticular disease of intestine	rs2153914	10	95871294	C	T	0.701103	0.0537124	0.00928944	7.37751e-09	33.43259199
Diverticular disease of intestine	rs6581506	12	63763073	C	T	0.660152	0.0513206	0.00904786	1.41036e-08	32.17301091
Diverticular disease of intestine	rs4765482	12	124242668	A	G	0.513615	0.0497471	0.00853413	5.56968e-09	33.97950352
Diverticular disease of intestine	rs73234681	13	79492033	C	G	0.0333227	-0.147659	0.0244565	1.56416e-09	36.45282883
Diverticular disease of intestine	rs9514638	13	107249968	C	G	0.226623	-0.0716681	0.010229	2.44568e-12	49.08914012
Diverticular disease of intestine	rs11619840	13	107566610	A	C	0.204769	-0.134613	0.0107277	4.06537e-36	157.4565626
Diverticular disease of intestine	rs16970633	15	40350676	T	G	0.14891	0.0717591	0.0118286	1.3065e-09	36.80334347
Diverticular disease of intestine	rs8038526	15	76178414	T	C	0.799257	0.0779589	0.0107316	3.74714e-13	52.77186607
Diverticular disease of intestine	rs9926533	16	31002858	T	C	0.385179	0.0475968	0.00868954	4.3142e-08	30.0028104
Diverticular disease of intestine	rs9888980	16	69848678	G	C	0.107313	-0.0955165	0.0139535	7.62957e-12	46.85872712
Diverticular disease of intestine	rs11149687	16	84813684	C	T	0.805211	-0.076433	0.0106041	5.6846e-13	51.95342492
Diverticular disease of intestine	rs2280028	16	86199807	A	G	0.0956643	-0.0809558	0.014646	3.24833e-08	30.55328267
Diverticular disease of intestine	rs41280074	17	41896746	T	C	0.0163803	0.175947	0.0321421	4.39906e-08	29.96506587
Diverticular disease of intestine	rs78077208	17	48126317	G	A	0.19112	-0.0679401	0.0108958	4.50474e-10	38.88070381
Diverticular disease of intestine	rs72636731	18	10720928	T	C	0.114408	-0.0800808	0.0136153	4.06191e-09	34.59412705
Diverticular disease of intestine	rs2337106	18	48934533	G	C	0.515469	0.0481368	0.00849369	1.45014e-08	32.11897076
Diverticular disease of intestine	rs182069332	19	10074131	T	C	0.0303335	-0.165633	0.0256636	1.08916e-10	41.65417917
Diverticular disease of intestine	rs3786877	19	38268540	C	T	0.554719	-0.0688446	0.00852583	6.75772e-16	65.20282676
Diverticular disease of intestine	rs56131196	19	44919589	A	G	0.27126	-0.0532785	0.00968626	3.78905e-08	30.25462219
Diverticular disease of intestine	rs17265513	20	41203988	C	T	0.28276	-0.0527266	0.00949601	2.81605e-08	30.83026148

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Diverticular disease of intestine	rs13051496	21	46003595	T	C	0.215182	0.0739777	0.0102709	5.90609e-13	51.87816999
Diverticular disease of intestine	rs369935000	21	46124540	T	C	0.605675	0.0524851	0.00874494	1.95187e-09	36.02121768
Duodenal ulcer	rs2666827	1	155711062	T	C	0.0835447	0.221649	0.0402682	3.70578e-08	30.29752264
Duodenal ulcer	rs2978981	8	142677719	T	C	0.501986	-0.220209	0.0231742	2.05258e-21	90.29436081
Duodenal ulcer	rs576123	9	133268896	T	C	0.562798	0.184782	0.0235706	4.52376e-15	61.45794737
Duodenal ulcer	rs12274456	11	6234754	T	C	0.218173	0.214482	0.027063	2.27615e-15	62.81014939
Fibrosis and cirrhosis of liver	rs28636836	4	87310713	T	C	0.215987	-0.222029	0.0271778	3.09671e-16	66.74070795
Fibrosis and cirrhosis of liver	rs138295924	19	19283559	G	A	0.0606703	0.264825	0.0420523	3.02448e-10	39.65869816
Fibrosis and cirrhosis of liver	rs188247550	19	19285807	T	C	0.0508301	0.407579	0.0436871	1.06365e-20	87.03965591
Fibrosis and cirrhosis of liver	rs3747207	22	43928975	A	G	0.22649	0.393654	0.0237257	7.98362e-62	275.2905276
Functional dyspepsia	rs9265948	6	31347416	T	C	0.0914019	0.144331	0.0247158	5.23215e-09	34.10121845
Functional dyspepsia	rs62046253	16	60610717	T	C	0.372802	-0.0838897	0.0152868	4.07108e-08	30.11508652
Gastric cancer	rs6676150	1	155151361	C	G	0.376152	-0.236524	0.039445	2.01878e-09	35.95559742
Gastric cancer	rs2585140	8	142725478	G	A	0.434849	-0.251181	0.0382148	4.93515e-11	43.20265014
Gastro-oesophageal reflux disease	rs1549726	2	104896566	G	A	0.371291	0.0502177	0.00901917	2.57858e-08	31.0013417
Gastroduodenal ulcer	rs2920296	8	142681691	G	A	0.501823	-0.112514	0.014524	9.4254e-15	60.01235211
Gastroduodenal ulcer	rs576123	9	133268896	T	C	0.562937	0.0985109	0.0147265	2.2413e-11	44.74757351
Gastroduodenal ulcer	rs12274456	11	6234754	T	C	0.218367	0.120356	0.0172183	2.74916e-12	48.86016739
Gastrointestinal diseases	rs11887534	2	43839108	C	G	0.0841502	0.133586	0.00951419	8.79023e-45	197.1415884
Gastrointestinal diseases	rs1802575	2	55866069	C	G	0.0730218	0.0689153	0.010165	1.20448e-11	45.96386455
Gastrointestinal diseases	rs6920512	6	28279444	A	G	0.802063	0.0374104	0.00664528	1.80605e-08	31.69261932
Gastrointestinal diseases	rs3134796	6	32222144	G	A	0.125334	0.078193	0.00796041	8.98669e-23	96.48612801
Gastrointestinal diseases	rs1239709	13	50552741	G	T	0.711109	0.0318719	0.00581324	4.19015e-08	30.05933731
Gastrointestinal diseases	rs28929474	14	94378610	T	C	0.0196976	0.119595	0.0189448	2.74019e-10	39.85162149
Gastrointestinal diseases	rs11082430	18	45172412	G	C	0.236931	-0.0361152	0.00619664	5.60338e-09	33.96780755
Nonalcoholic fatty liver disease	rs2954029	8	125478730	T	A	0.458823	-0.16629	0.0280625	3.10985e-09	35.11393897
Nonalcoholic fatty liver disease	rs150057262	19	19210016	G	C	0.0497407	0.399234	0.0576913	4.51128e-12	47.88884795
Nonalcoholic fatty liver disease	rs739846	19	19308262	A	G	0.0632336	0.434314	0.0505004	7.95793e-18	73.96359669
Nonalcoholic fatty liver disease	rs738409	22	43928847	G	C	0.226988	0.474321	0.0300889	5.50681e-56	248.5032563
Pancreatic cancer	rs31490	5	1344343	A	G	0.478804	0.247469	0.0348531	1.24451e-12	50.41488514
Pancreatic cancer	rs576123	9	133268896	T	C	0.562561	-0.21021	0.0350771	2.06272e-09	35.9136365
Ulcerative colitis	rs12736494	1	8075956	A	G	0.264806	-0.126424	0.021438	3.69675e-09	34.77687233
Ulcerative colitis	rs4655159	1	19784345	T	C	0.634237	-0.107843	0.0192616	2.15774e-08	31.34723227

(*Continued*)

Supplementary Table 7. The Summary Information for SNPs of Gastrointestinal Diseases (*Continued*)

Exposure	SNP	chr	pos	effect allele	other allele	eaf	β	SE	*P*	F
Ulcerative colitis	rs6674040	1	19875420	T	G	0.490822	-0.18187	0.0185103	8.7579e-23	96.53731567
Ulcerative colitis	rs34145423	1	22382523	A	G	0.0774263	-0.207834	0.0368378	1.68221e-08	31.83067299
Ulcerative colitis	rs148170789	1	67244548	G	A	0.046007	-0.36893	0.0492766	7.0518e-14	56.05398261
Ulcerative colitis	rs1801274	1	161509955	G	A	0.503416	-0.162744	0.0184938	1.36867e-18	77.4386296
Ulcerative colitis	rs12132298	1	200905967	C	T	0.21262	-0.146813	0.0233183	3.05344e-10	39.64014693
Ulcerative colitis	rs3024495	1	206769068	T	C	0.15723	0.265226	0.0240177	2.37247e-28	121.9465054
Ulcerative colitis	rs3732179	2	60927190	C	T	0.671625	0.11123	0.0200092	2.71431e-08	30.90184601
Ulcerative colitis	rs1990760	2	162267541	T	C	0.585139	-0.1058	0.0187436	1.65581e-08	31.86143414
Ulcerative colitis	rs10931828	2	198694453	T	C	0.44086	-0.109155	0.0187744	6.0979e-09	33.8029914
Ulcerative colitis	rs34236350	2	240628909	T	C	0.267497	0.183297	0.0203578	2.18072e-19	81.06791941
Ulcerative colitis	rs113595266	3	46430034	A	G	0.151292	0.151365	0.0250788	1.58376e-09	36.42817602
Ulcerative colitis	rs3197999	3	49684099	A	G	0.39223	0.193702	0.018728	4.50713e-25	106.9757669
Ulcerative colitis	rs11745587	5	132461230	A	G	0.405247	-0.127965	0.0190284	1.75631e-11	45.22492523
Ulcerative colitis	rs12518457	5	159397502	T	G	0.288297	0.111957	0.0202692	3.32307e-08	30.50909247
Ulcerative colitis	rs1061537	6	29970018	A	G	0.393366	-0.147226	0.0191264	1.38708e-14	59.25193768
Ulcerative colitis	rs111432088	6	31835161	T	C	0.0149661	0.486843	0.0656338	1.19289e-13	55.02027557
Ulcerative colitis	rs4587163	6	32625390	T	C	0.283395	-0.255166	0.0212016	2.32113e-33	144.8466109
Ulcerative colitis	rs1042131	6	33080825	A	C	0.502366	-0.139269	0.0185179	5.44503e-14	56.5620896
Ulcerative colitis	rs7761376	6	106041095	G	T	0.601338	-0.104791	0.0188889	2.89374e-08	30.77759176
Ulcerative colitis	rs12536069	7	4869839	C	T	0.068463	0.243305	0.0344247	1.57471e-12	49.95301885
Ulcerative colitis	rs10807943	7	5301033	C	T	0.936726	-0.32745	0.0349591	7.48514e-21	87.73431762
Ulcerative colitis	rs181316459	7	5433979	C	G	0.0477545	0.604016	0.0370107	7.1105e-60	266.3436135
Ulcerative colitis	rs113827118	7	5804177	G	C	0.186174	0.194184	0.0230199	3.29762e-17	71.15739168
Ulcerative colitis	rs4730276	7	107843992	A	G	0.430388	-0.156065	0.0188566	1.26911e-16	68.49900392
Ulcerative colitis	rs7865719	9	5082333	G	A	0.556917	0.111096	0.0187342	3.02677e-09	35.16628896
Ulcerative colitis	rs7101270	10	11670594	T	C	0.24666	-0.122445	0.0219688	2.49546e-08	31.06486287
Ulcerative colitis	rs10761659	10	62685804	G	A	0.528021	0.11128	0.0186228	2.29419e-09	35.70625281
Ulcerative colitis	rs10748781	10	99523573	A	C	0.652091	-0.168544	0.0191946	1.62293e-18	77.10250017
Ulcerative colitis	rs11190368	10	100018265	T	A	0.444284	0.104938	0.0187073	2.0295e-08	31.46613081
Ulcerative colitis	rs7931483	11	76591023	A	C	0.41714	0.118971	0.0187045	2.0102e-10	40.45665923
Ulcerative colitis	rs11614178	12	68114342	A	G	0.336586	0.121856	0.0194308	3.58146e-10	39.32896096
Ulcerative colitis	rs13379369	14	105863077	G	A	0.875317	0.180701	0.031494	9.6013e-09	32.92042745
Ulcerative colitis	rs34399539	14	106011733	G	C	0.138186	-0.185175	0.0293196	2.68856e-10	39.88858446
Ulcerative colitis	rs79973254	15	90648210	A	T	0.0693439	-0.212868	0.0386677	3.6902e-08	30.30568317
Ulcerative colitis	rs16940186	16	85976134	C	T	0.145225	0.166186	0.0253161	5.22276e-11	43.09186241
Ulcerative colitis	rs12942330	17	39783586	T	C	0.528561	0.128182	0.0186429	6.17021e-12	47.27452207
Ulcerative colitis	rs6017342	20	44436388	C	A	0.559222	0.15623	0.0187875	9.12431e-17	69.14979204
Ulcerative colitis	rs6089926	20	63572597	T	C	0.208287	-0.157565	0.0236767	2.83596e-11	44.28709205
Ulcerative colitis	rs2836883	21	39094818	A	G	0.247089	-0.158251	0.0221231	8.47813e-13	51.16829681
Ulcerative colitis	rs9607629	22	39274849	G	A	0.124865	-0.196543	0.0295736	3.0137e-11	44.16790221
Ulcerative colitis	rs9617090	22	50000765	T	C	0.371904	-0.156376	0.0194362	8.58223e-16	64.73176983

Supplementary Table 8. Causal Effects of Gastrointestinal Diseases on Mood Swings Risk

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Acute appendicitis	Mood swings	Inverse variance weighted (fixed effects)	16	1.020456913	0.987907963	1.054078264	.220795315
Acute appendicitis	Mood swings	MR Egger	16	1.076293365	0.983019688	1.1784173	.134223461
Acute appendicitis	Mood swings	Weighted median	16	1.023418664	0.977323174	1.071688249	.324878788
Acute pancreatitis	Mood swings	Inverse variance weighted (fixed effects)	6	1.013701757	0.983812239	1.044499358	.372813941
Acute pancreatitis	Mood swings	MR Egger	6	1.000470726	0.906060813	1.104717981	.993020632
Acute pancreatitis	Mood swings	Weighted median	6	1.008218861	0.969887192	1.048065466	.678946536
Alcoholic liver disease	Mood swings	Inverse variance weighted (fixed effects)	4	0.99356798	0.971146719	1.016506889	.579504844
Alcoholic liver disease	Mood swings	MR Egger	4	0.997943525	0.900980612	1.105341519	.972097928
Alcoholic liver disease	Mood swings	Weighted median	4	0.996741508	0.971946984	1.022168544	.799533597
Cholecystitis	Mood swings	Inverse variance weighted (multiplicative random effects)	2	1.010228622	0.925988197	1.102132696	.818805302
Cholelithiasis	Mood swings	Inverse variance weighted (multiplicative random effects)	68	0.99250706	0.975508843	1.00980147	.393467656
Cholelithiasis	Mood swings	MR Egger	68	0.96771347	0.936362734	1.000113871	.055034783
Cholelithiasis	Mood swings	Weighted median	68	0.994805064	0.970187193	1.020047597	.683711883
Chronic gastritis	Mood swings	Inverse variance weighted (fixed effects)	2	1.063985469	0.988364271	1.145392554	.099178372
Chronic pancreatitis	Mood swings	Inverse variance weighted (fixed effects)	4	0.98804189	0.956079983	1.021072289	.47334269
Chronic pancreatitis	Mood swings	MR Egger	4	1.100168621	0.955942598	1.266154472	.314496107
Chronic pancreatitis	Mood swings	Weighted median	4	1.0042075	0.965186031	1.044806567	.835510366
Coeliac disease	Mood swings	Inverse variance weighted (multiplicative random effects)	17	0.997873255	0.987581345	1.00827242	.687317441
Coeliac disease	Mood swings	MR Egger	17	1.001579496	0.984283033	1.019179903	.861432223
Coeliac disease	Mood swings	Weighted median	17	1.003854752	0.993377781	1.014442222	.472297127
Colorectal cancer	Mood swings	Inverse variance weighted (fixed effects)	12	1.002737954	0.98352217	1.022329172	.781807974
Colorectal cancer	Mood swings	MR Egger	12	1.013033967	0.93514289	1.097412843	.757581141
Colorectal cancer	Mood swings	Weighted median	12	1.013468206	0.986502241	1.041171283	.330891825

(*Continued*)

Supplementary Table 8. Causal Effects of Gastrointestinal Diseases on Mood Swings Risk (*Continued*)

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Crohn's disease	Mood swings	Inverse variance weighted (fixed effects)	8	1.012514618	0.998184874	1.027050077	.08723275
Crohn's disease	Mood swings	MR Egger	8	0.972289891	0.915586206	1.032505323	.394696578
Crohn's disease	Mood swings	Weighted median	8	1.01528815	0.995724196	1.035236496	.126422372
Diverticular disease of intestine	Mood swings	Inverse variance weighted (multiplicative random effects)	53	0.994086527	0.964126157	1.02497792	.704042073
Diverticular disease of intestine	Mood swings	MR Egger	53	0.955714277	0.874744082	1.044179432	.320663592
Diverticular disease of intestine	Mood swings	Weighted median	53	0.983656097	0.952530201	1.015799095	.315145208
Duodenal ulcer	Mood swings	Inverse variance weighted (fixed effects)	4	1.011029893	0.986458839	1.036212971	.382183561
Duodenal ulcer	Mood swings	MR Egger	4	0.979929056	0.707503671	1.357252256	.914053818
Duodenal ulcer	Mood swings	Weighted median	4	1.013374589	0.984509921	1.043085534	.367514284
Fibrosis and cirrhosis of liver	Mood swings	Inverse variance weighted (fixed effects)	4	0.994111433	0.973449802	1.01521161	.581534834
Fibrosis and cirrhosis of liver	Mood swings	MR Egger	4	1.004498578	0.92673538	1.088786957	.923025517
Fibrosis and cirrhosis of liver	Mood swings	Weighted median	4	0.996763079	0.97405014	1.020005638	.78278913
Functional dyspepsia	Mood swings	Inverse variance weighted (multiplicative random effects)	2	0.973957412	0.816701674	1.16149271	.768982059
Gastric cancer	Mood swings	Inverse variance weighted (multiplicative random effects)	2	1.023777809	0.973689015	1.076443285	.358518904
Gastro-oesophageal reflux disease	Mood swings	Wald ratio	1	1.248520922	1.049619822	1.485113428	.012176634
Gastroduodenal ulcer	Mood swings	Inverse variance weighted (fixed effects)	3	1.023580005	0.975678725	1.073833015	.340539934
Gastroduodenal ulcer	Mood swings	MR Egger	3	0.972212989	0.531592496	1.778050111	.941916068
Gastroduodenal ulcer	Mood swings	Weighted median	3	1.02536582	0.970683193	1.083128948	.370330613
Gastrointestinal diseases	Mood swings	Inverse variance weighted (multiplicative random effects)	7	1.005825464	0.847736989	1.19339474	.946915884
Gastrointestinal diseases	Mood swings	MR Egger	7	0.891366733	0.615048675	1.291824019	.570077797
Gastrointestinal diseases	Mood swings	Weighted median	7	1.035240916	0.930168119	1.152182849	.525899805
Nonalcoholic fatty liver disease	Mood swings	Inverse variance weighted (fixed effects)	3	0.998556823	0.980326548	1.017126111	.87790209
Nonalcoholic fatty liver disease	Mood swings	MR Egger	3	1.142103092	0.765519193	1.703940913	.632642275

(*Continued*)

Supplementary Table 8. Causal Effects of Gastrointestinal Diseases on Mood Swings Risk (*Continued*)

Exposure	Outcome	Method	SNPs(n)	OR	or_lci95	or_uci95	*P*
Nonalcoholic fatty liver disease	Mood swings	Weighted median	3	1.000083466	0.980530781	1.020026049	.99338956
Pancreatic cancer	Mood swings	Inverse variance weighted (fixed effects)	2	0.987751617	0.961475353	1.014745988	.370315902
Ulcerative colitis	Mood swings	Inverse variance weighted (fixed effects)	35	1.004207852	0.994018409	1.014501744	.419675785
Ulcerative colitis	Mood swings	MR Egger	35	0.957756635	0.927131386	0.989393505	.013735269
Ulcerative colitis	Mood swings	Weighted median	35	1.006430829	0.990881316	1.022224355	.419723011

Supplementary Table 9. Summary of Pleiotropy of the Effects of Gastrointestinal Diseases on Mood Swings

Exposure	Outcome	Egger_intercept	SE	*P*
Acute appendicitis	Mood swings	-0.00426141	0.003438647	.235619657
Acute pancreatitis	Mood swings	0.003882246	0.013557547	.788826697
Alcoholic liver disease	Mood swings	-0.001344825	0.015540097	.938921902
Cholecystitis	Mood swings	NA	NA	NA
Cholelithiasis	Mood swings	0.00262319	0.001491849	.083324098
Chronic gastritis	Mood swings	NA	NA	NA
Chronic pancreatitis	Mood swings	-0.070104609	0.045458936	.262982476
Coeliac disease	Mood swings	-0.00218401	0.004152708	.60662959
Colorectal cancer	Mood swings	-0.001664111	0.006320322	.797668558
Crohn's disease	Mood swings	0.010984896	0.007903819	.213956646
Diverticular disease of intestine	Mood swings	0.002968446	0.003195415	.357280515
Duodenal ulcer	Mood swings	0.006522635	0.034595304	.867850567
Fibrosis and cirrhosis of liver	Mood swings	-0.003361346	0.012821103	.817721507
Functional dyspepsia	Mood swings	NA	NA	NA
Gastric cancer	Mood swings	NA	NA	NA
Gastroduodenal ulcer	Mood swings	0.005696561	0.033971007	.894230007
Gastrointestinal diseases	Mood swings	0.008842731	0.01215602	.499579072
Nonalcoholic fatty liver disease	Mood swings	-0.061992117	0.094109059	.629178341
Pancreatic cancer	Mood swings	NA	NA	NA
Ulcerative colitis	Mood swings	0.008182508	0.002719348	.004990303

Supplementary Table 10. Summary of Heterogeneity of Effects of Gastrointestinal Diseases on Mood Swings

Exposure	Outcome	Method	Q	Q_df	Q_pval
Acute appendicitis	Mood swings	MR Egger	14.90076541	14	0.384971754
Acute appendicitis	Mood swings	Inverse variance weighted	16.53536692	15	0.347389694
Acute pancreatitis	Mood swings	MR Egger	7.760729962	4	0.100746787
Acute pancreatitis	Mood swings	Inverse variance weighted	7.919821266	5	0.160710145
Alcoholic liver disease	Mood swings	MR Egger	2.083142275	2	0.352899792
Alcoholic liver disease	Mood swings	Inverse variance weighted	2.090942608	3	0.553747308
Cholecystitis	Mood swings	Inverse variance weighted	4.415427115	1	0.035615362
Cholelithiasis	Mood swings	MR Egger	89.01954603	66	0.03105676
Cholelithiasis	Mood swings	Inverse variance weighted	93.18969354	67	0.018914598
Chronic gastritis	Mood swings	Inverse variance weighted	1.038571984	1	0.308153823
Chronic pancreatitis	Mood swings	MR Egger	1.496165678	2	0.473273024
Chronic pancreatitis	Mood swings	Inverse variance weighted	3.874399841	3	0.275349978
Coeliac disease	Mood swings	MR Egger	43.65816992	15	0.000124362
Coeliac disease	Mood swings	Inverse variance weighted	44.46321591	16	0.000167678
Colorectal cancer	Mood swings	MR Egger	16.50582476	10	0.086039354
Colorectal cancer	Mood swings	Inverse variance weighted	16.62025046	11	0.119621092
Crohn's disease	Mood swings	MR Egger	10.11268298	6	0.119986201
Crohn's disease	Mood swings	Inverse variance weighted	13.36829798	7	0.063627374
Diverticular disease of intestine	Mood swings	MR Egger	114.5245573	51	8.77298E-07
Diverticular disease of intestine	Mood swings	Inverse variance weighted	116.4624616	52	7.64702E-07
Duodenal ulcer	Mood swings	MR Egger	0.285589682	2	0.86693191
Duodenal ulcer	Mood swings	Inverse variance weighted	0.321137414	3	0.956005298
Fibrosis and cirrhosis of liver	Mood swings	MR Egger	2.057378259	2	0.357475257
Fibrosis and cirrhosis of liver	Mood swings	Inverse variance weighted	2.128084833	3	0.546251939
Functional dyspepsia	Mood swings	Inverse variance weighted	7.227644215	1	0.007178935
Gastric cancer	Mood swings	Inverse variance weighted	4.053388685	1	0.04408277
Gastroduodenal ulcer	Mood swings	MR Egger	0.013273397	1	0.908278491
Gastroduodenal ulcer	Mood swings	Inverse variance weighted	0.041392964	2	0.97951622
Gastrointestinal diseases	Mood swings	MR Egger	28.95821636	5	2.36294E-05
Gastrointestinal diseases	Mood swings	Inverse variance weighted	32.02294354	6	1.61532E-05
Nonalcoholic fatty liver disease	Mood swings	MR Egger	0.663336209	1	0.415384601
Nonalcoholic fatty liver disease	Mood swings	Inverse variance weighted	1.097256616	2	0.577741751
Pancreatic cancer	Mood swings	Inverse variance weighted	0.00229347	1	0.96180376
Ulcerative colitis	Mood swings	MR Egger	33.13643235	33	0.460600981
Ulcerative colitis	Mood swings	Inverse variance weighted	42.22792368	34	0.157090851