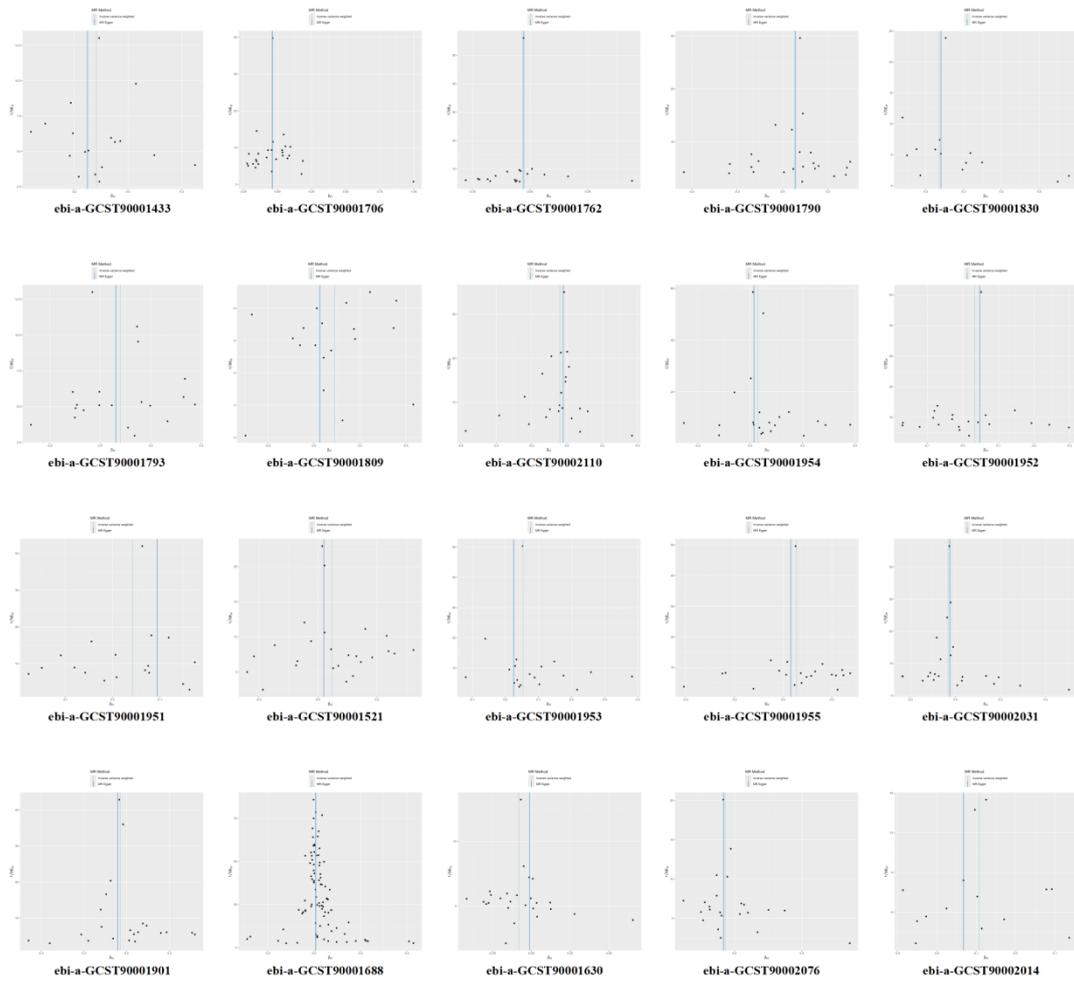| exposure panel	immune cell	method	nsnp	b	se	pval		OR (95% CI)
B cell	IgD- CD27- %lymphocyte	Inverse variance weighted	18	-0.117	0.037	0.002		0.89 (0.83 - 0.96)
		MR Egger	18	-0.150	0.095	0.134		0.86 (0.71 - 1.04)
		Weighted median	18	-0.107	0.055	0.052		0.90 (0.81 - 1.00)
		Simple mode	18	-0.129	0.091	0.175		0.88 (0.73 - 1.05)
		Weighted mode	18	-0.109	0.069	0.135		0.90 (0.78 - 1.03)
B cell	BAFF-R on IgD+ CD38- naive	Inverse variance weighted	28	-0.035	0.017	0.043		0.97 (0.93 - 1.00)
		MR Egger	28	-0.038	0.026	0.162		0.96 (0.91 - 1.01)
		Weighted median	28	-0.034	0.023	0.133		0.97 (0.92 - 1.01)
		Simple mode	28	-0.017	0.051	0.741		0.98 (0.89 - 1.09)
		Weighted mode	28	-0.027	0.023	0.260		0.97 (0.93 - 1.02)
B cell	CD20 on IgD+	Inverse variance weighted	19	-0.033	0.016	0.040		0.97 (0.94 - 1.00)
		MR Egger	19	-0.027	0.020	0.187		0.97 (0.94 - 1.01)
		Weighted median	19	-0.029	0.020	0.151		0.97 (0.93 - 1.01)
		Simple mode	19	-0.047	0.050	0.367		0.95 (0.86 - 1.05)
		Weighted mode	19	-0.029	0.018	0.124		0.97 (0.94 - 1.01)
B cell	CD25 on memory B cell	Inverse variance weighted	24	0.053	0.022	0.017		1.05 (1.01 - 1.10)
		MR Egger	24	0.056	0.030	0.073		1.06 (1.00 - 1.12)
		Weighted median	24	0.077	0.034	0.022		1.08 (1.01 - 1.15)
		Simple mode	24	0.091	0.061	0.153		1.10 (0.97 - 1.24)
		Weighted mode	24	0.075	0.030	0.019		1.08 (1.02 - 1.14)
B cell	BAFF-R on CD20-	Inverse variance weighted	14	0.070	0.033	0.032		1.07 (1.01 - 1.14)
		MR Egger	14	0.079	0.048	0.127		1.08 (0.98 - 1.19)
		Weighted median	14	0.092	0.050	0.067		1.10 (0.99 - 1.21)
		Simple mode	14	0.074	0.083	0.391		1.08 (0.91 - 1.27)
		Weighted mode	14	0.092	0.047	0.073		1.10 (1.00 - 1.20)
B cell	CD25 on sw mem	Inverse variance weighted	20	0.079	0.035	0.026		1.08 (1.01 - 1.16)
		MR Egger	20	0.061	0.069	0.387		1.06 (0.93 - 1.22)
		Weighted median	20	0.062	0.055	0.262		1.06 (0.96 - 1.18)
		Simple mode	20	-0.031	0.100	0.758		0.97 (0.80 - 1.18)
		Weighted mode	20	-0.013	0.076	0.866		0.99 (0.85 - 1.15)
B cell	CD38 on CD20-	Inverse variance weighted	19	0.090	0.046	0.049		1.09 (1.00 - 1.20)
		MR Egger	19	0.026	0.108	0.814		1.03 (0.83 - 1.27)
		Weighted median	19	0.047	0.063	0.456		1.05 (0.93 - 1.19)
		Simple mode	19	0.041	0.110	0.716		1.04 (0.84 - 1.29)
		Weighted mode	19	0.032	0.116	0.790		1.03 (0.82 - 1.30)
Myeloid cell	HLA DR on CD33dim HLA DR+ CD11b+	Inverse variance weighted	23	-0.039	0.016	0.014		0.96 (0.93 - 0.99)
		MR Egger	23	-0.021	0.024	0.387		0.98 (0.93 - 1.03)
		Weighted median	23	-0.018	0.023	0.428		0.98 (0.94 - 1.03)
		Simple mode	23	-0.019	0.031	0.547		0.98 (0.92 - 1.04)
		Weighted mode	23	-0.016	0.020	0.425		0.98 (0.95 - 1.02)
Myeloid cell	CD33 on basophil	Inverse variance weighted	22	0.028	0.013	0.031		1.03 (1.00 - 1.06)
		MR Egger	22	0.015	0.018	0.412		1.01 (0.98 - 1.05)
		Weighted median	22	0.011	0.016	0.496		1.01 (0.98 - 1.04)
		Simple mode	22	0.038	0.036	0.308		1.04 (0.97 - 1.11)
		Weighted mode	22	0.023	0.013	0.085		1.02 (1.00 - 1.05)
Myeloid cell	CD33 on Mo MDSC	Inverse variance weighted	21	0.034	0.017	0.042		1.03 (1.00 - 1.07)
		MR Egger	21	0.048	0.026	0.081		1.05 (1.00 - 1.10)
		Weighted median	21	0.050	0.019	0.009		1.05 (1.01 - 1.09)
		Simple mode	21	-0.014	0.056	0.809		0.99 (0.88 - 1.10)
		Weighted mode	21	0.048	0.020	0.023		1.05 (1.01 - 1.09)
Myeloid cell	CD33 on CD66b++ myeloid cell	Inverse variance weighted	18	0.042	0.017	0.015		1.04 (1.01 - 1.08)
		MR Egger	18	0.094	0.031	0.008		1.10 (1.03 - 1.17)
		Weighted median	18	0.062	0.022	0.005		1.06 (1.02 - 1.11)
		Simple mode	18	0.071	0.050	0.172		1.07 (0.97 - 1.18)
		Weighted mode	18	0.066	0.023	0.011		1.07 (1.02 - 1.12)
Myeloid cell	CD33br HLA DR+ CD14dim %CD33br HLA DR+	Inverse variance weighted	25	0.047	0.023	0.041		1.05 (1.00 - 1.10)
		MR Egger	25	0.020	0.035	0.571		1.02 (0.95 - 1.09)
		Weighted median	25	0.022	0.031	0.475		1.02 (0.96 - 1.09)
		Simple mode	25	0.073	0.056	0.205		1.08 (0.96 - 1.20)
		Weighted mode	25	0.018	0.029	0.532		1.02 (0.96 - 1.08)
Myeloid cell	CD33 on CD33dim HLA DR-	Inverse variance weighted	19	0.053	0.016	0.001		1.05 (1.02 - 1.09)
		MR Egger	19	0.025	0.025	0.328		1.03 (0.98 - 1.08)
		Weighted median	19	0.051	0.019	0.008		1.05 (1.01 - 1.09)
		Simple mode	19	0.042	0.053	0.439		1.04 (0.94 - 1.16)
		Weighted mode	19	0.051	0.020	0.021		1.05 (1.01 - 1.09)
Myeloid cell	CD33 on Im MDSC	Inverse variance weighted	22	0.054	0.020	0.006		1.06 (1.02 - 1.10)
		MR Egger	22	0.031	0.031	0.325		1.03 (0.97 - 1.10)
		Weighted median	22	0.052	0.019	0.006		1.05 (1.01 - 1.09)
		Simple mode	22	0.087	0.059	0.157		1.09 (0.97 - 1.23)
		Weighted mode	22	0.052	0.020	0.015		1.05 (1.01 - 1.09)
Treg	CD39 on CD39+ secreting Treg	Inverse variance weighted	23	-0.032	0.014	0.025		0.97 (0.94 - 1.00)
		MR Egger	23	-0.024	0.020	0.229		0.98 (0.94 - 1.01)
		Weighted median	23	-0.027	0.018	0.134		0.97 (0.94 - 1.01)
		Simple mode	23	-0.053	0.033	0.119		0.95 (0.89 - 1.01)
		Weighted mode	23	-0.029	0.016	0.088		0.97 (0.94 - 1.00)
Treg	CD28 on CD39+ resting Treg	Inverse variance weighted	22	-0.030	0.015	0.044		0.97 (0.94 - 1.00)
		MR Egger	22	-0.041	0.017	0.026		0.96 (0.93 - 0.99)
		Weighted median	22	-0.029	0.021	0.167		0.97 (0.93 - 1.01)
		Simple mode	22	0.001	0.042	0.981		1.00 (0.92 - 1.09)
		Weighted mode	22	-0.034	0.017	0.064		0.97 (0.93 - 1.00)
Treg	CD28+ CD45RA+ CD8br %T cell	Inverse variance weighted	88	0.009	0.003	0.002		1.01 (1.00 - 1.01)
		MR Egger	88	0.006	0.004	0.100		1.01 (1.00 - 1.01)
		Weighted median	88	0.001	0.004	0.800		1.00 (0.99 - 1.01)
		Simple mode	88	0.008	0.006	0.220		1.01 (1.00 - 1.02)
		Weighted mode	88	0.002	0.005	0.726		1.00 (0.99 - 1.01)
TBNK	CD8br NKT AC	Inverse variance weighted	26	-0.080	0.033	0.016		0.92 (0.86 - 0.99)
		MR Egger	26	-0.011	0.065	0.871		0.99 (0.87 - 1.12)
		Weighted median	26	-0.064	0.051	0.210		0.94 (0.85 - 1.04)
		Simple mode	26	-0.050	0.074	0.507		0.95 (0.82 - 1.10)
		Weighted mode	26	-0.050	0.059	0.406		0.95 (0.85 - 1.07)
TBNK	SSC-A on NK	Inverse variance weighted	23	-0.068	0.029	0.021		0.93 (0.88 - 0.99)
		MR Egger	23	-0.080	0.051	0.130		0.92 (0.84 - 1.02)
		Weighted median	23	-0.079	0.042	0.058		0.92 (0.85 - 1.00)
		Simple mode	23	-0.119	0.063	0.074		0.89 (0.78 - 1.01)
		Weighted mode	23	-0.081	0.039	0.051		0.92 (0.85 - 1.00)
cDC	CCR2 on CD62L+ myeloid DC	Inverse variance weighted	14	-0.092	0.034	0.006		0.91 (0.85 - 0.97)
		MR Egger	14	-0.132	0.073	0.094		0.88 (0.76 - 1.01)
		Weighted median	14	-0.097	0.046	0.033		0.91 (0.83 - 0.99)
		Simple mode	14	-0.117	0.075	0.144		0.89 (0.77 - 1.03)
		Weighted mode	14	-0.096	0.053	0.094		0.91 (0.82 - 1.01)

0.6   1   1.4

Supplementary Figure 1 Forest plots including the weighted median, simple mode, weighted mode, and mendelian randomization-Egger regression **methods showed the causal associations between liver cirrhosis and immune cell traits.** CI: Confidence interval; OR: Odds ratio; TBNK: T cells, B cells, and natural killer cells; cDC: Conventional dendritic cells; CD: Cluster of differentiation; BAFF: B-cell-activating factor; HLA: Human leukocyte antigen; DR: Dweller region; AC: Absolute count; MDSC: Myeloid-derived suppressor cells; NKT: Natural killer T cells; NK: Natural killer; CCR2: C-C motif chemokine receptor 2; MR: Mendelian randomization.
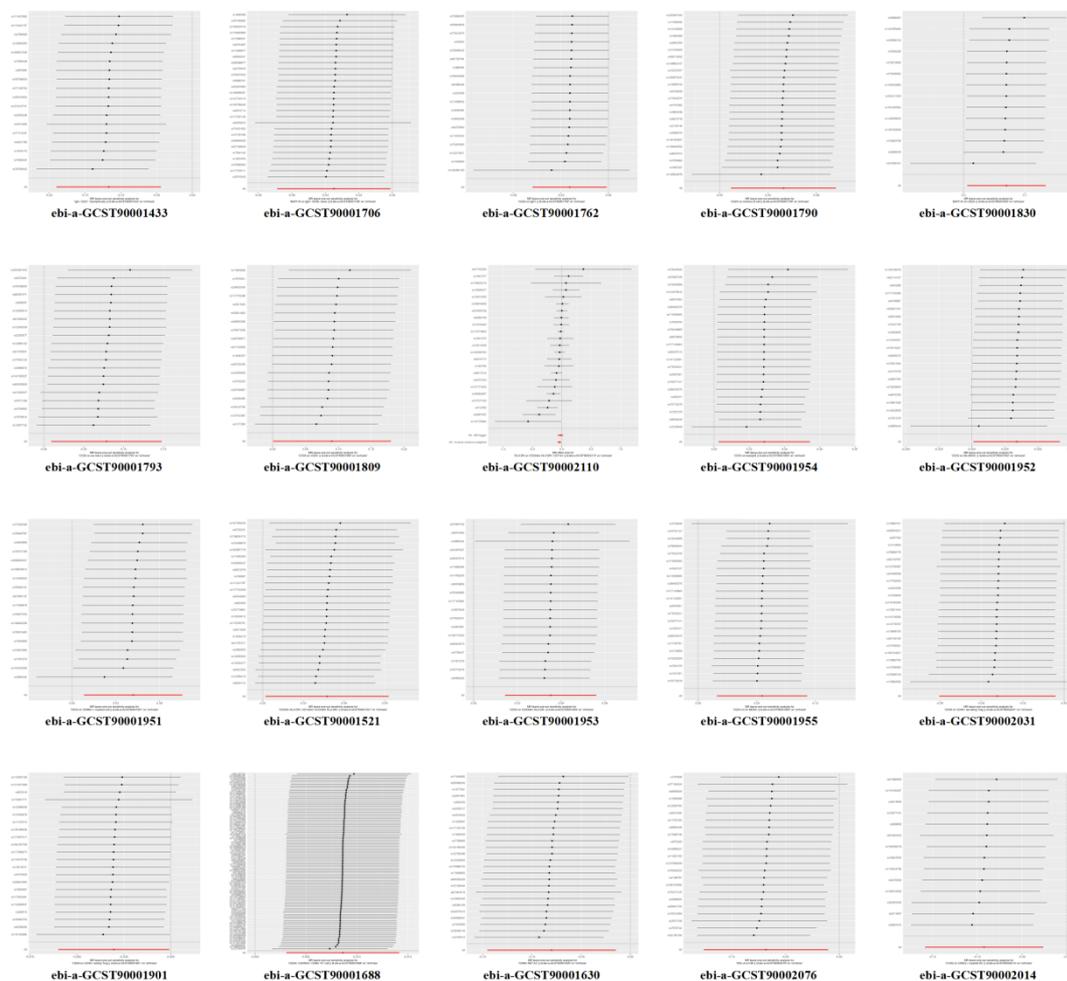
leave-one-out plots：Forward

Supplementary Figure 2 Leave-one-out method shown that the data were robust in the forward sensitivity analyses. MR: Mendelian randomization.

ebi-a-GCST90001433   ebi-a-GCST90001706   ebi-a-GCST90001762   ebi-a-GCST90001790   ebi-a-GCST90001830

ebi-a-GCST90001793   ebi-a-GCST90001809   ebi-a-GCST90002110   ebi-a-GCST90001954   ebi-a-GCST90001952

ebi-a-GCST90001951   ebi-a-GCST90001521   ebi-a-GCST90001953   ebi-a-GCST90001955   ebi-a-GCST90002031

ebi-a-GCST90001901   ebi-a-GCST90001688   ebi-a-GCST90001630   ebi-a-GCST90002076   ebi-a-GCST90002014

Funnel plots：Forward

Supplementary Figure 3 Funnel plots shown that the data were robust in the forward sensitivity analyses.

| outcome panel	immune cell	method	nsnp	b	se	pval		OR (95% CI)
B cell	IgD+ CD38dim AC	Inverse variance weighted	31	-0.062	0.023	0.008		0.94 (0.90 - 0.98)
		MR Egger	31	-0.005	0.046	0.906		0.99 (0.91 - 1.09)
		Weighted median	31	-0.025	0.033	0.456		0.98 (0.91 - 1.04)
		Simple mode	31	-0.019	0.055	0.729		0.98 (0.88 - 1.09)
		Weighted mode	31	-0.019	0.038	0.611		0.98 (0.91 - 1.06)
B cell	IgD+ CD24- AC	Inverse variance weighted	31	-0.053	0.024	0.030		0.95 (0.90 - 0.99)
		MR Egger	31	0.024	0.047	0.611		1.02 (0.93 - 1.12)
		Weighted median	31	-0.014	0.035	0.689		0.99 (0.92 - 1.06)
		Simple mode	31	0.006	0.057	0.918		1.01 (0.90 - 1.12)
		Weighted mode	31	0.002	0.042	0.967		1.00 (0.92 - 1.09)
B cell	Naive-mature B cell AC	Inverse variance weighted	31	-0.051	0.025	0.042		0.95 (0.90 - 1.00)
		MR Egger	31	0.020	0.048	0.676		1.02 (0.93 - 1.12)
		Weighted median	31	-0.015	0.036	0.673		0.98 (0.92 - 1.06)
		Simple mode	31	0.004	0.054	0.936		1.00 (0.90 - 1.12)
		Weighted mode	31	-0.002	0.038	0.950		1.00 (0.93 - 1.07)
B cell	IgD+ CD38br AC	Inverse variance weighted	31	-0.051	0.025	0.046		0.95 (0.90 - 1.00)
		MR Egger	31	-0.014	0.050	0.782		0.99 (0.89 - 1.09)
		Weighted median	31	-0.034	0.035	0.324		0.97 (0.90 - 1.03)
		Simple mode	31	-0.053	0.060	0.387		0.95 (0.84 - 1.07)
		Weighted mode	31	-0.057	0.045	0.211		0.94 (0.87 - 1.03)
B cell	IgD+ AC	Inverse variance weighted	31	-0.048	0.024	0.044		0.95 (0.91 - 1.00)
		MR Egger	31	-0.001	0.047	0.989		1.00 (0.91 - 1.10)
		Weighted median	31	-0.027	0.036	0.455		0.97 (0.91 - 1.04)
		Simple mode	31	0.009	0.053	0.870		1.01 (0.91 - 1.12)
		Weighted mode	31	-0.008	0.039	0.828		0.99 (0.92 - 1.07)
B cell	CD20 on CD24+ CD27+	Inverse variance weighted	31	0.048	0.024	0.043		1.05 (1.00 - 1.10)
		MR Egger	31	-0.026	0.047	0.585		0.97 (0.89 - 1.07)
		Weighted median	31	0.059	0.035	0.095		1.06 (0.99 - 1.14)
		Simple mode	31	0.057	0.055	0.310		1.06 (0.95 - 1.18)
		Weighted mode	31	0.043	0.036	0.248		1.04 (0.97 - 1.12)
B cell	CD20 on sw mem	Inverse variance weighted	31	0.051	0.024	0.033		1.05 (1.00 - 1.10)
		MR Egger	31	0.004	0.047	0.941		1.00 (0.91 - 1.10)
		Weighted median	31	0.058	0.035	0.097		1.06 (0.99 - 1.13)
		Simple mode	31	0.071	0.052	0.179		1.07 (0.97 - 1.19)
		Weighted mode	31	0.071	0.040	0.085		1.07 (0.99 - 1.16)
TBNK	CD3- lymphocyte %leukocyte	Inverse variance weighted	31	-0.052	0.025	0.033		0.95 (0.90 - 1.00)
		MR Egger	31	-0.076	0.048	0.126		0.93 (0.84 - 1.02)
		Weighted median	31	-0.030	0.037	0.411		0.97 (0.90 - 1.04)
		Simple mode	31	-0.032	0.067	0.638		0.97 (0.85 - 1.11)
		Weighted mode	31	-0.024	0.051	0.642		0.98 (0.88 - 1.08)
TBNK	CD4+ %leukocyte	Inverse variance weighted	31	0.049	0.024	0.042		1.05 (1.00 - 1.10)
		MR Egger	31	0.060	0.048	0.223		1.06 (0.97 - 1.17)
		Weighted median	31	0.049	0.035	0.162		1.05 (0.98 - 1.13)
		Simple mode	31	0.073	0.057	0.212		1.08 (0.96 - 1.20)
		Weighted mode	31	0.054	0.047	0.254		1.06 (0.96 - 1.16)
TBNK	FSC-A on B cell	Inverse variance weighted	31	0.052	0.026	0.048		1.05 (1.00 - 1.11)
		MR Egger	31	0.033	0.051	0.531		1.03 (0.93 - 1.14)
		Weighted median	31	0.054	0.038	0.157		1.06 (0.98 - 1.14)
		Simple mode	31	-0.007	0.055	0.906		0.99 (0.89 - 1.11)
		Weighted mode	31	0.036	0.042	0.394		1.04 (0.96 - 1.13)
TBNK	SSC-A on B cell	Inverse variance weighted	31	0.065	0.026	0.014		1.07 (1.01 - 1.12)
		MR Egger	31	0.030	0.052	0.565		1.03 (0.93 - 1.14)
		Weighted median	31	0.056	0.038	0.137		1.06 (0.98 - 1.14)
		Simple mode	31	0.036	0.059	0.550		1.04 (0.92 - 1.16)
		Weighted mode	31	0.047	0.046	0.317		1.05 (0.96 - 1.15)
Myeloid cell	CD33- HLA DR+ AC	Inverse variance weighted	31	-0.075	0.037	0.041		0.93 (0.86 - 1.00)
		MR Egger	31	-0.075	0.074	0.319		0.93 (0.80 - 1.07)
		Weighted median	31	-0.140	0.053	0.008		0.87 (0.78 - 0.96)
		Simple mode	31	-0.188	0.093	0.053		0.83 (0.69 - 0.99)
		Weighted mode	31	-0.165	0.089	0.075		0.85 (0.71 - 1.01)
Myeloid cell	Im MDSC %CD33dim HLA DR- CD66b-	Inverse variance weighted	31	0.085	0.032	0.009		1.09 (1.02 - 1.16)
		MR Egger	31	0.017	0.064	0.790		1.02 (0.90 - 1.15)
		Weighted median	31	0.093	0.048	0.053		1.10 (1.00 - 1.20)
		Simple mode	31	0.082	0.085	0.342		1.09 (0.92 - 1.28)
		Weighted mode	31	0.118	0.059	0.055		1.12 (1.00 - 1.26)
Myeloid cell	Im MDSC AC	Inverse variance weighted	31	0.088	0.034	0.010		1.09 (1.02 - 1.17)
		MR Egger	31	0.036	0.068	0.600		1.04 (0.91 - 1.18)
		Weighted median	31	0.126	0.050	0.011		1.13 (1.03 - 1.25)
		Simple mode	31	0.129	0.082	0.125		1.14 (0.97 - 1.34)
		Weighted mode	31	0.158	0.060	0.013		1.17 (1.04 - 1.32)
Treg	CD8 on CD28- CD8br	Inverse variance weighted	31	-0.063	0.027	0.020		0.94 (0.89 - 0.99)
		MR Egger	31	-0.106	0.053	0.054		0.90 (0.81 - 1.00)
		Weighted median	31	-0.043	0.040	0.281		0.96 (0.89 - 1.04)
		Simple mode	31	-0.023	0.065	0.724		0.98 (0.86 - 1.11)
		Weighted mode	31	-0.034	0.048	0.482		0.97 (0.88 - 1.06)
Treg	CD28+ CD45RA- CD8dim AC	Inverse variance weighted	31	-0.052	0.026	0.043		0.95 (0.90 - 1.00)
		MR Egger	31	-0.058	0.051	0.268		0.94 (0.85 - 1.04)
		Weighted median	31	-0.008	0.034	0.815		0.99 (0.93 - 1.06)
		Simple mode	31	0.030	0.059	0.614		1.03 (0.92 - 1.16)
		Weighted mode	31	0.004	0.042	0.919		1.00 (0.93 - 1.09)
Monocyte	CX3CR1 on monocyte	Inverse variance weighted	31	0.053	0.024	0.030		1.05 (1.01 - 1.11)
		MR Egger	31	0.033	0.048	0.491		1.03 (0.94 - 1.14)
		Weighted median	31	0.030	0.036	0.401		1.03 (0.96 - 1.11)
		Simple mode	31	0.097	0.055	0.090		1.10 (0.99 - 1.23)
		Weighted mode	31	0.032	0.038	0.412		1.03 (0.96 - 1.11)
Monocyte	CX3CR1 on CD14- CD16+ monocyte	Inverse variance weighted	31	0.066	0.025	0.008		1.07 (1.02 - 1.12)
		MR Egger	31	0.074	0.050	0.145		1.08 (0.98 - 1.19)
		Weighted median	31	0.027	0.036	0.445		1.03 (0.96 - 1.10)
		Simple mode	31	0.022	0.060	0.717		1.02 (0.91 - 1.15)
		Weighted mode	31	0.034	0.043	0.431		1.03 (0.95 - 1.13)
cDC	CD62L- plasmacytoid DC AC	Inverse variance weighted	29	-0.065	0.029	0.024		0.94 (0.89 - 0.99)
		MR Egger	29	-0.057	0.058	0.334		0.94 (0.84 - 1.06)
		Weighted median	29	-0.012	0.039	0.767		0.99 (0.92 - 1.07)
		Simple mode	29	-0.033	0.060	0.586		0.97 (0.86 - 1.09)
		Weighted mode	29	-0.026	0.044	0.561		0.97 (0.89 - 1.06)

0.6   1   1.4

Supplementary Figure 4 Forest plots including the weighted median, simple mode, weighted mode, and MR-Egger regression methods showed the causal associations between immune cell traits and liver cirrhosis. CI: Confidence interval; OR: Odds ratio; TBNK: T cells, B cells, and natural killer cells; cDC: Conventional dendritic cells; CD: Cluster of differentiation; AC: Absolute count; DR: Dweller region; FSC-A: Forward scatter-A; SSC-A: Side scatter-A; MDSC: Myeloid-derived suppressor cells; MR: Mendelian randomization.
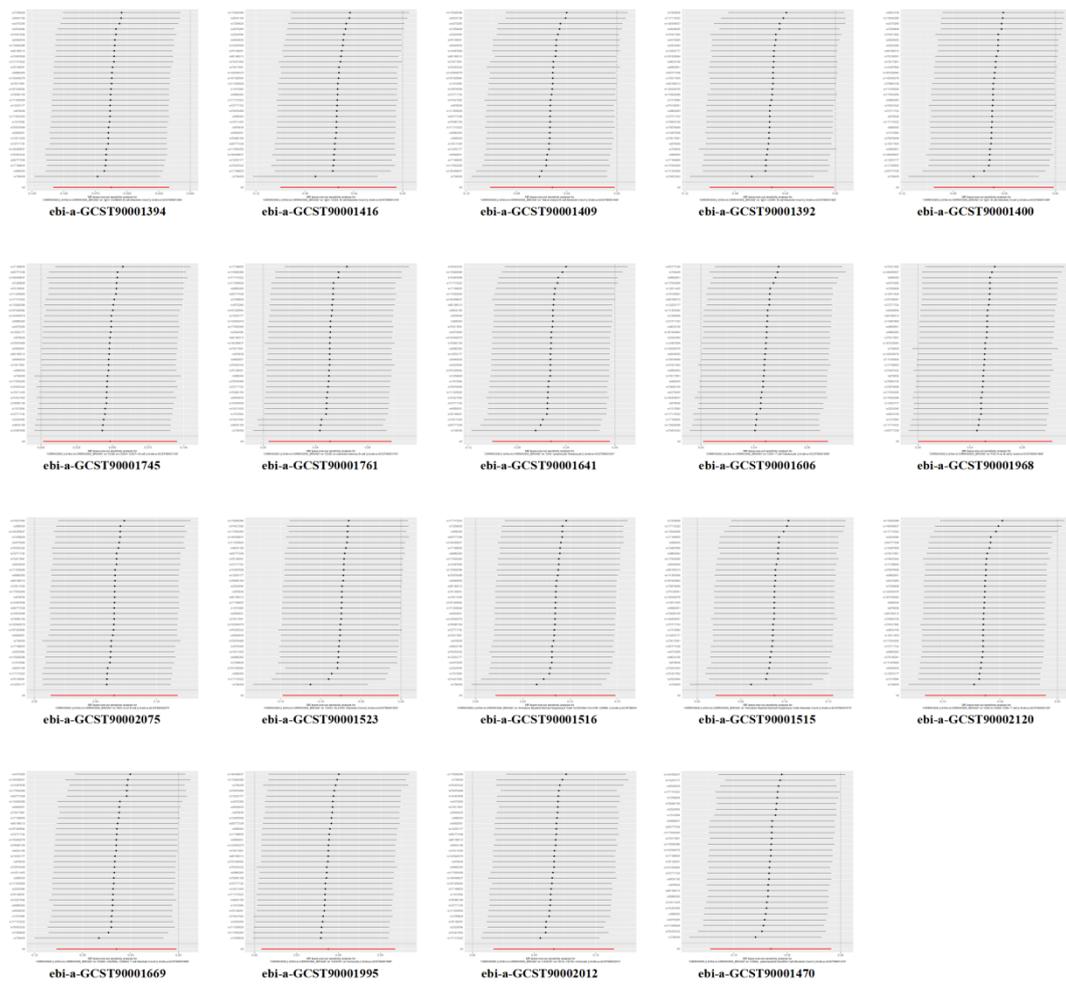
leave-one-out plots： Reverse

Supplementary Figure 5 Leave-one-out method shown that the data were robust in the reverse sensitivity analysis.
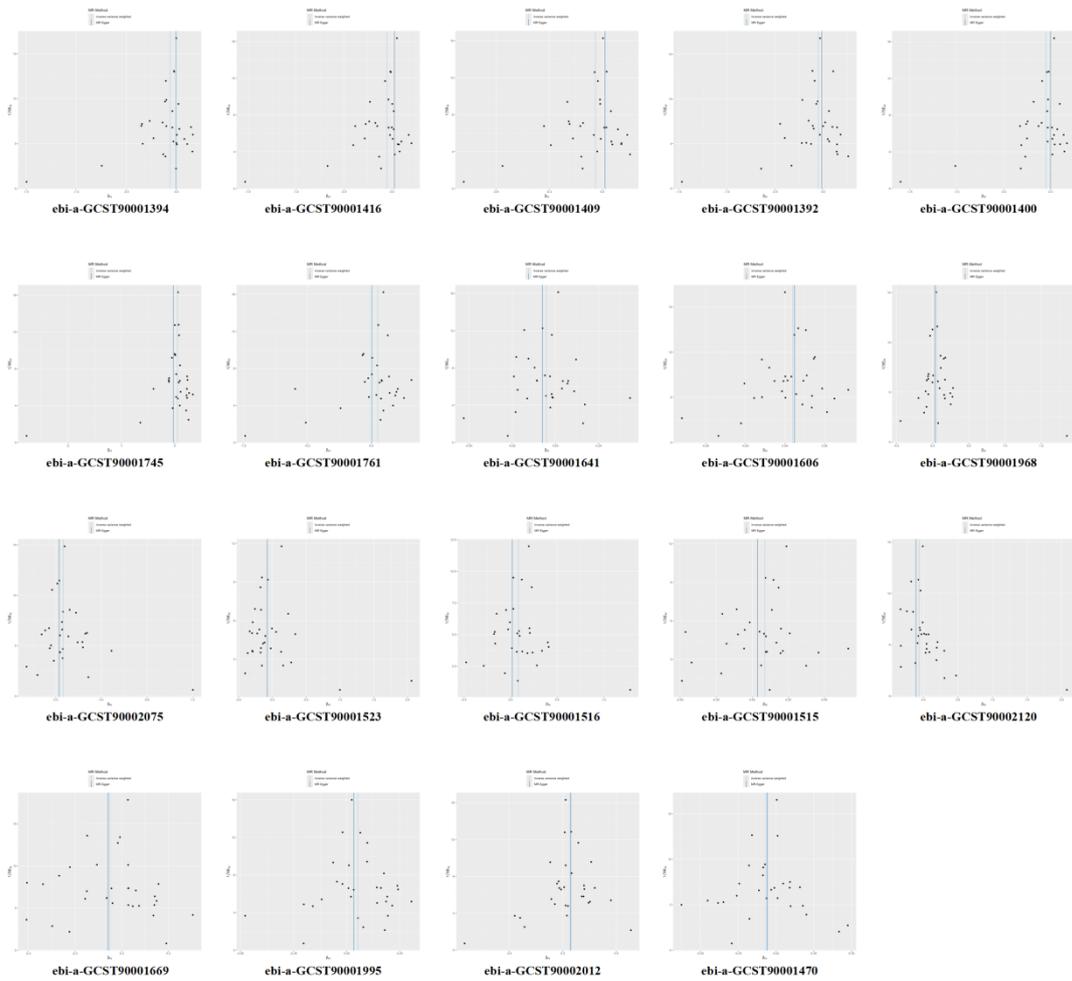
Funnel plots: Reverse

Supplementary Figure 6 Funnel plots shown that the data were robust in the in the reverse sensitivity analysis.