

Supplementary Figures

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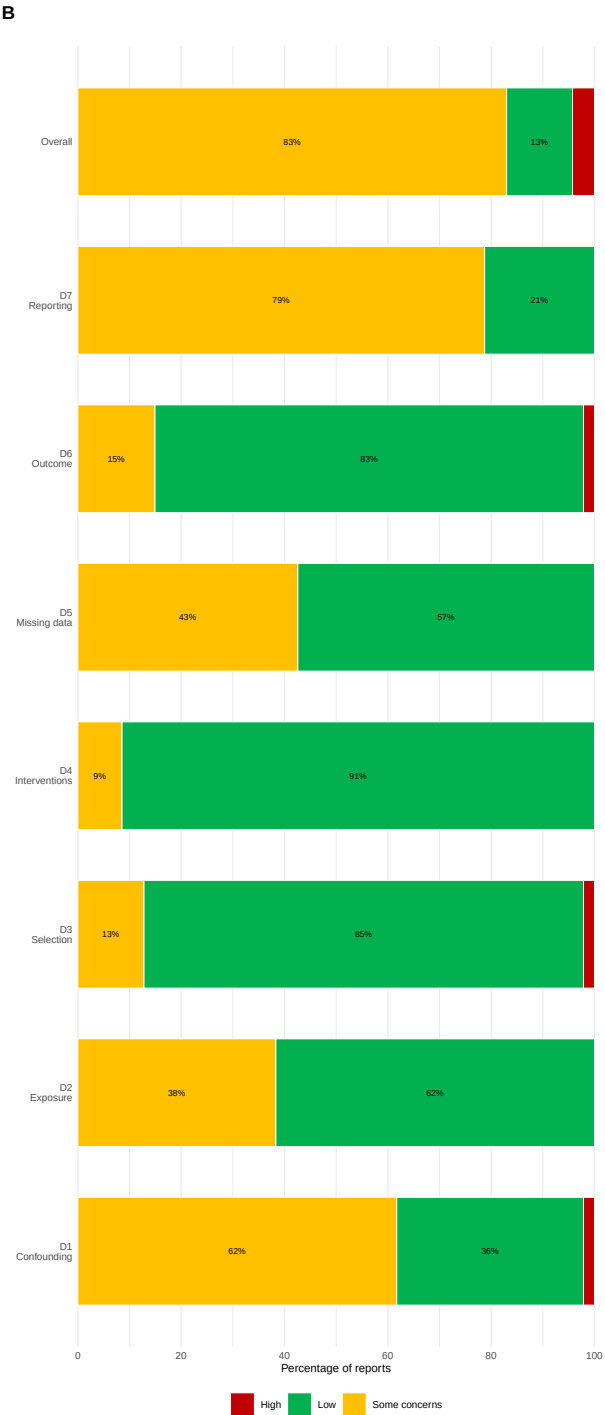
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Supplementary Figure S1. ROBINS-E risk-of-bias judgments for the 47 included reports

Overall judgments: Low risk, 6 reports; Some concerns, 39; High risk, 2. L* denotes Low risk with the prespecified caveat concerning uncontrolled confounding.

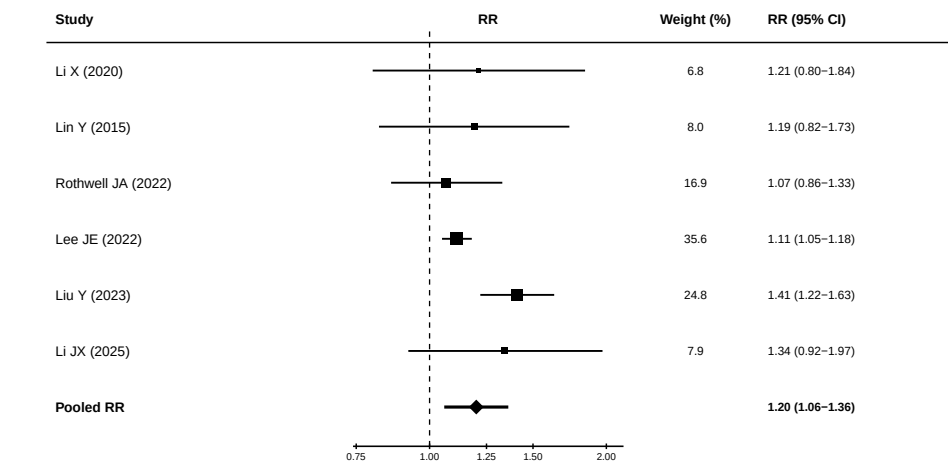
A		D1 Confounding	D2 Exposure	D3 Selection	D4 Interventions	D5 Missing data	D6 Outcome	D7 Reporting	Overall
	Li X (2020)	L*	L	L	L	L	L	L	L
	Wang GQ (2021)	SC	L	L	L	SC	L	SC	SC
	Aleksandrova K (2011)	L*	SC	SC	L	SC	L	SC	SC
	Kabat GC (2012)	L*	L	L	L	L	L	L	L
	Lin Y (2015)	SC	SC	L	L	SC	L	SC	SC
	Lu Y (2015)	SC	L	L	L	L	L	SC	SC
	Tan Y (2019)	L*	L	L	L	L	L	L	L
	Xia B (2020)	L*	L	L	L	L	L	L	L
	Park SK (2020)	SC	L	L	L	L	L	SC	SC
	Xia B (2021)	SC	L	L	L	L	L	SC	SC
	Moon SG (2022)	L*	L	L	L	L	L	SC	SC
	Jin EH (2022)	SC	L	L	L	L	L	SC	SC
	Rothwell JA (2022)	L*	SC	L	L	SC	L	SC	SC
	Lee JE (2022)	SC	L	L	L	L	L	L	SC
	Huang D (2023)	L*	L	L	L	L	L	L	L
	Myashita Y (2024)	SC	SC	SC	L	SC	SC	SC	SC
	Simon TG (2018)	L*	SC	L	L	L	L	SC	SC
	Van Hoang D (2023)	SC	L	L	SC	SC	SC	SC	SC
	Sundaram S (2024)	L*	SC	H	SC	SC	H	SC	H
	Kim J (2020)	SC	SC	L	L	SC	L	SC	SC
	Park JH (2022)	SC	L	L	SC	L	L	SC	SC
	Ahmed RL (2006)	SC	SC	L	L	SC	L	SC	SC
	Osaki Y (2012)	SC	SC	L	L	SC	L	SC	SC
	Liang X (2017)	L*	L	L	L	L	L	SC	SC
	Shin CM (2017)	SC	SC	L	L	SC	SC	SC	SC
	Yoo H (2019)	SC	L	L	L	L	L	L	SC
	Lee JH (2020)	L*	L	L	L	L	L	L	L
	Cho YK (2021)	SC	SC	L	L	SC	SC	SC	SC
	Jimba T (2021)	SC	L	SC	L	L	SC	SC	SC
	Tran TT (2022)	SC	L	L	L	SC	L	L	SC
	Liu T (2022)	L*	L	L	L	L	L	SC	SC
	Song M (2022)	L*	L	L	L	L	L	SC	SC
	Chung KC (2022)	SC	SC	SC	L	SC	SC	SC	SC
	Yang Y (2022)	SC	L	L	L	SC	L	SC	SC
	Liu Y (2023)	L*	SC	L	L	L	L	SC	SC
	Jin EH (2023)	SC	L	L	SC	L	L	SC	SC
	Wang Z (2024)	SC	L	L	L	L	L	L	SC
	Kimoto N (2025)	SC	L	SC	L	SC	SC	SC	SC
	Lv W (2026)	SC	SC	L	L	L	L	SC	SC
	Cho Y (2022)	SC	L	L	L	L	L	SC	SC
	Choi YJ (2018)	SC	L	L	L	L	L	SC	SC
	Chen CT (2013)	H	L	SC	L	SC	L	SC	H
	Stürmer T (2006)	L*	SC	L	L	L	L	SC	SC
	Bowers K (2006)	SC	SC	L	L	SC	L	SC	SC
	Inoue M (2009)	SC	SC	L	L	SC	L	SC	SC
	Li JX (2025)	L*	L	L	L	L	L	SC	SC
	Fu XY (2026)	SC	SC	L	L	SC	L	SC	SC



Supplementary Figure S2. Detailed analyses for esophageal cancer

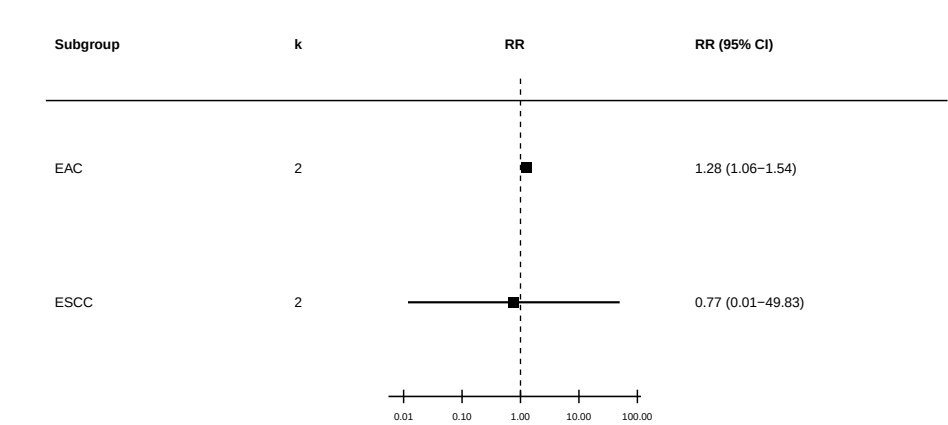
A. Primary analysis

Pooled RR 1.20 (1.06–1.36); I² = 52.2%; tau² = 0.0096.



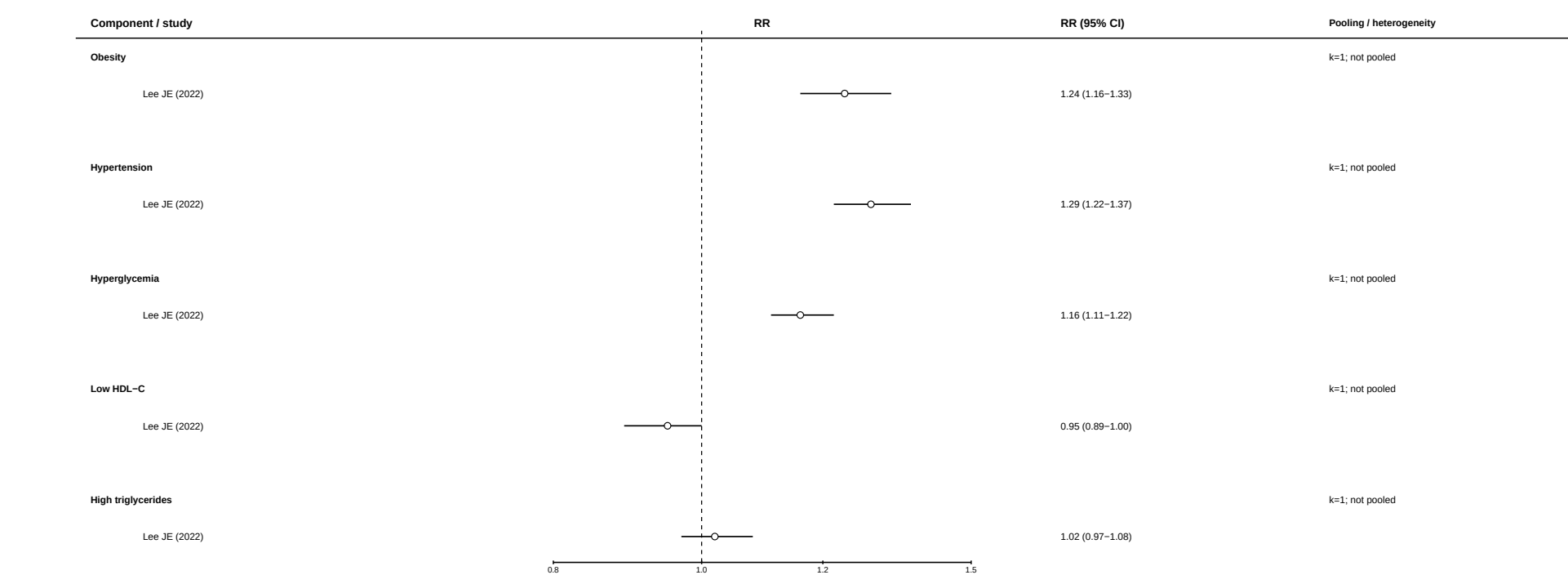
B. Histology

EAC and ESCC are pooled descriptively; no formal between-subtype contrast is calculated.



C. Individual MetS components

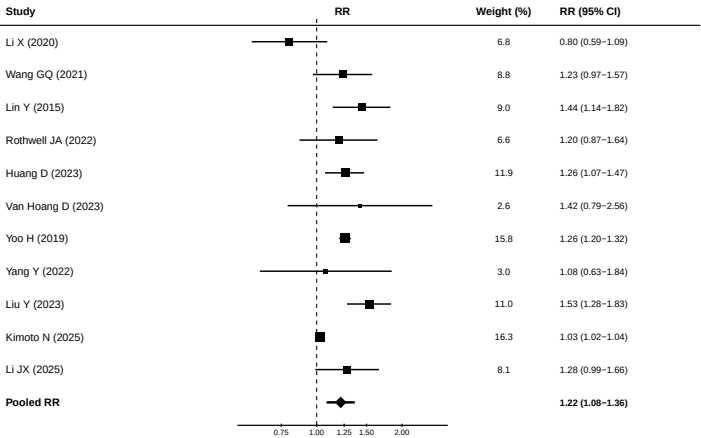
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.



Supplementary Figure S3. Detailed analyses for gastric cancer

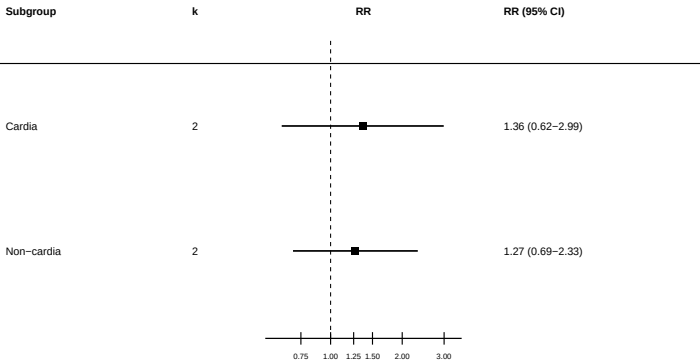
A. Primary analysis

Pooled RR 1.22 (1.08–1.36); I² = 88.2%; tau² = 0.0172.



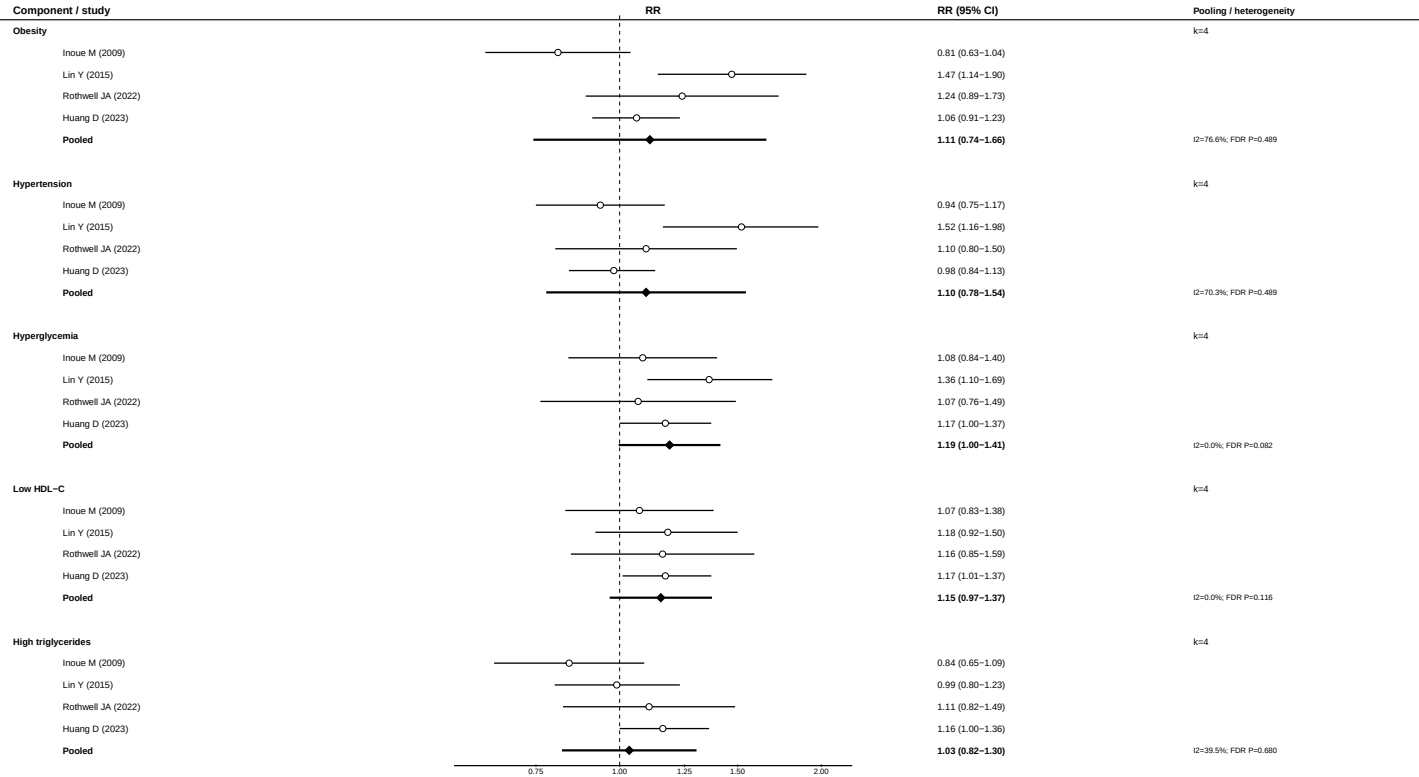
B. Anatomical subsite

Cardia and non-cardia estimates are pooled descriptively; no formal between-subsite contrast is calculated.



C. Individual MetS components

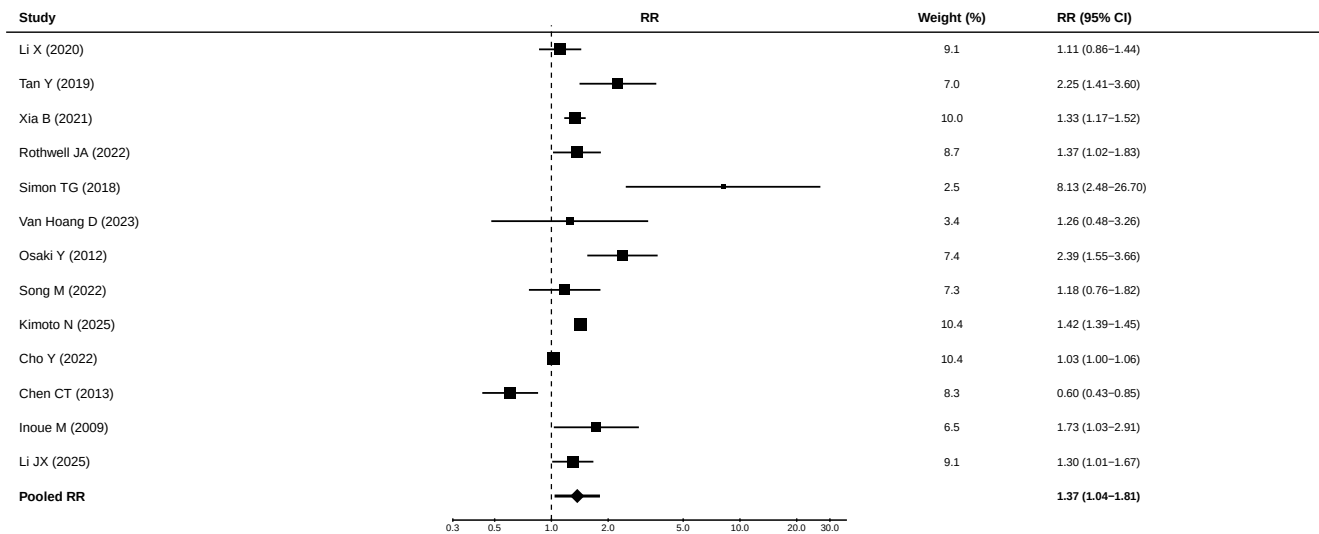
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.



Supplementary Figure S4. Detailed analyses for liver cancer

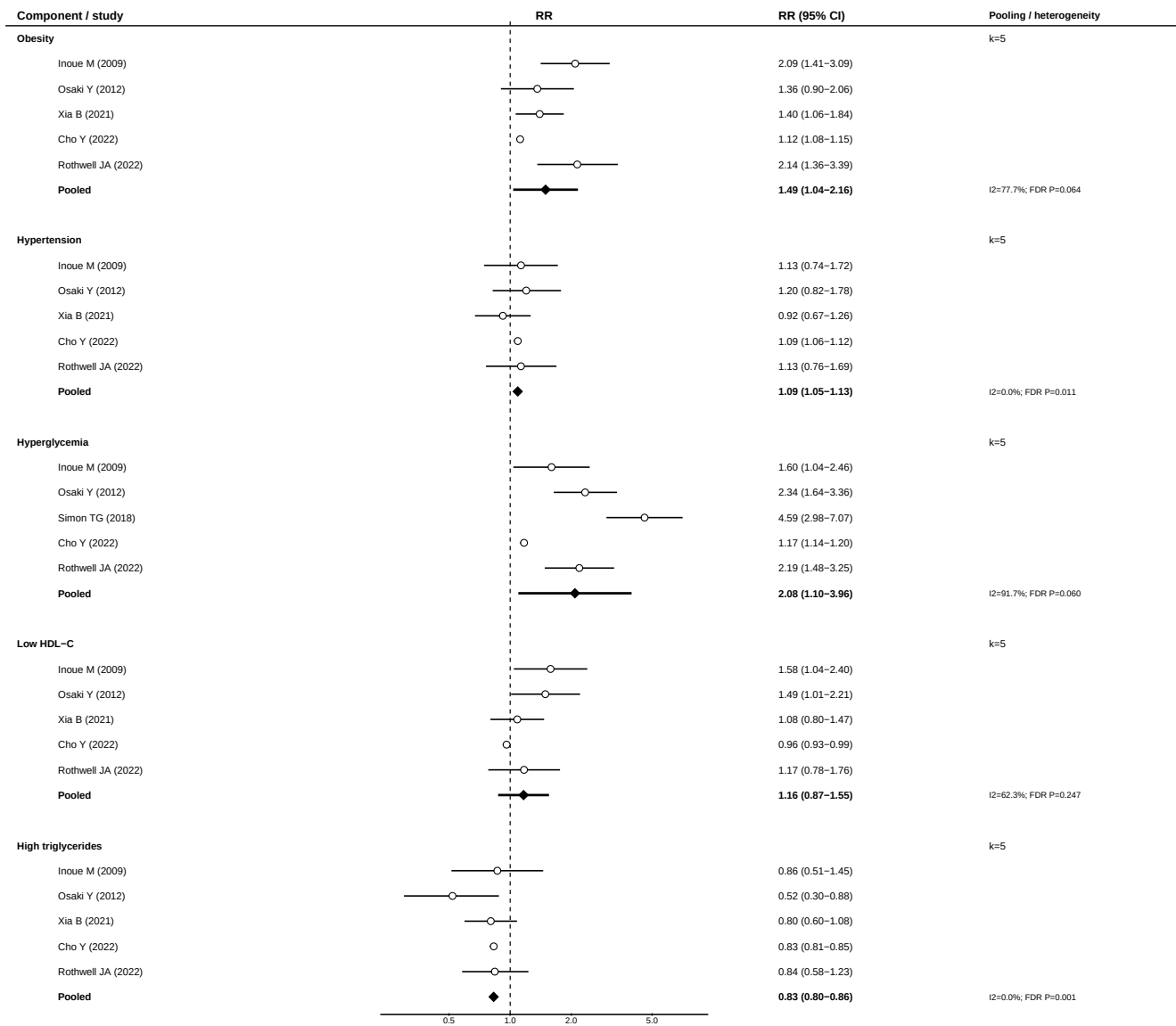
A. Primary analysis

Pooled RR 1.37 (1.04–1.81); I2 = 98.6%; tau2 = 0.1176.



B. Individual MetS components

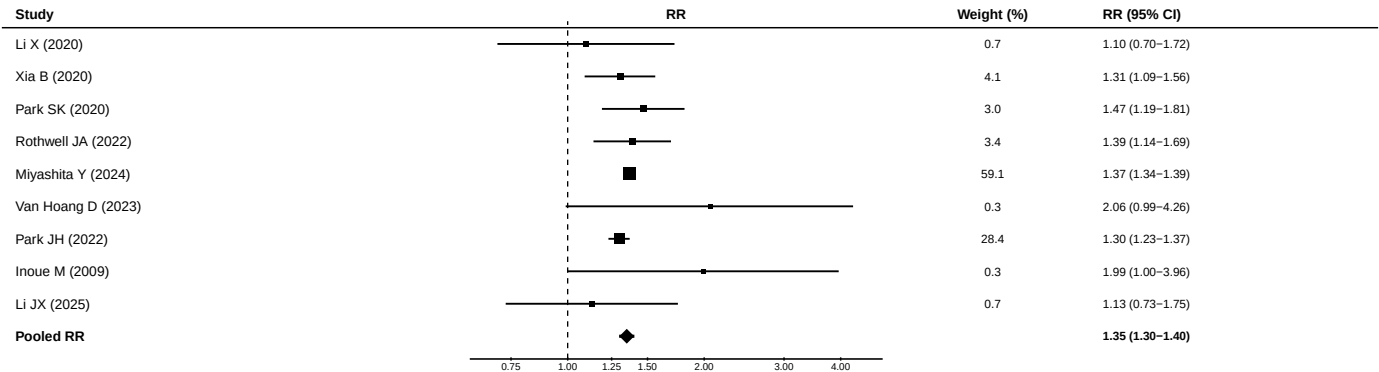
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.



Supplementary Figure S5. Detailed analyses for pancreatic cancer

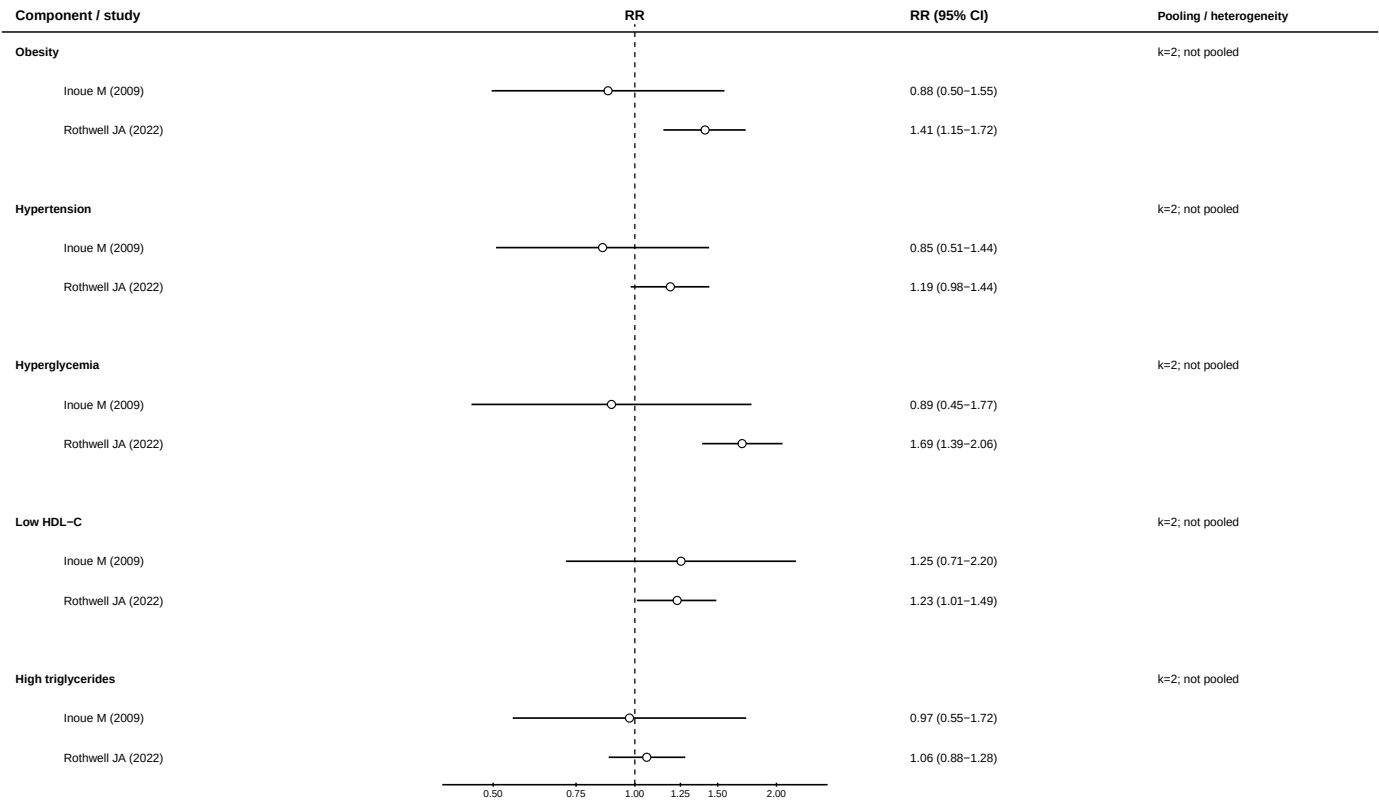
A. Primary analysis

Pooled RR 1.35 (1.30–1.40); I² = 16.6%; tau² = 0.0005.



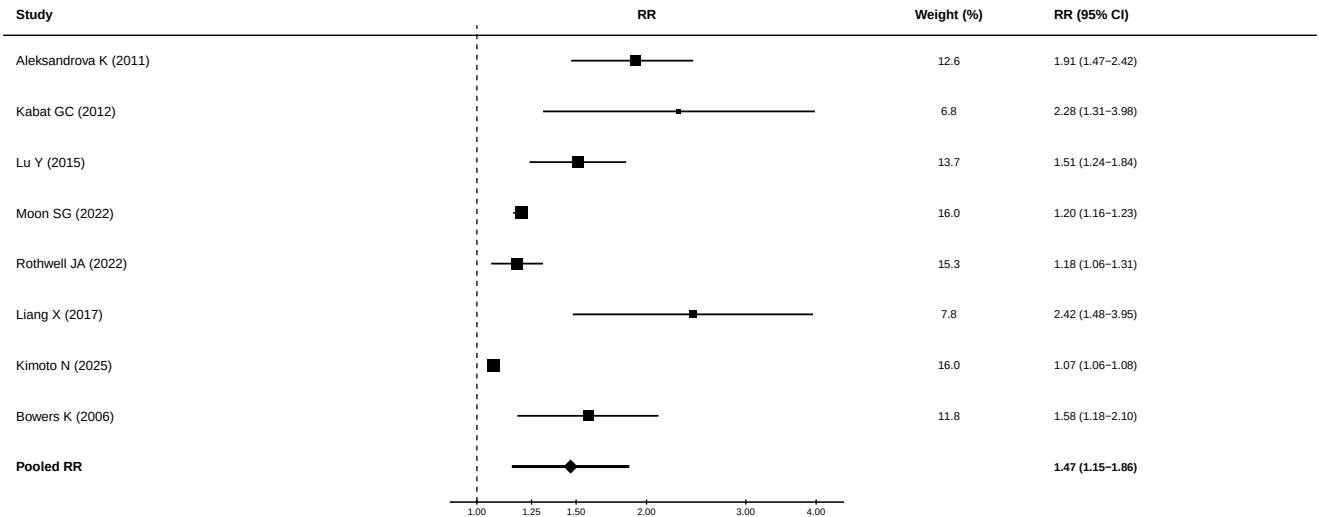
B. Individual MetS components

Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.

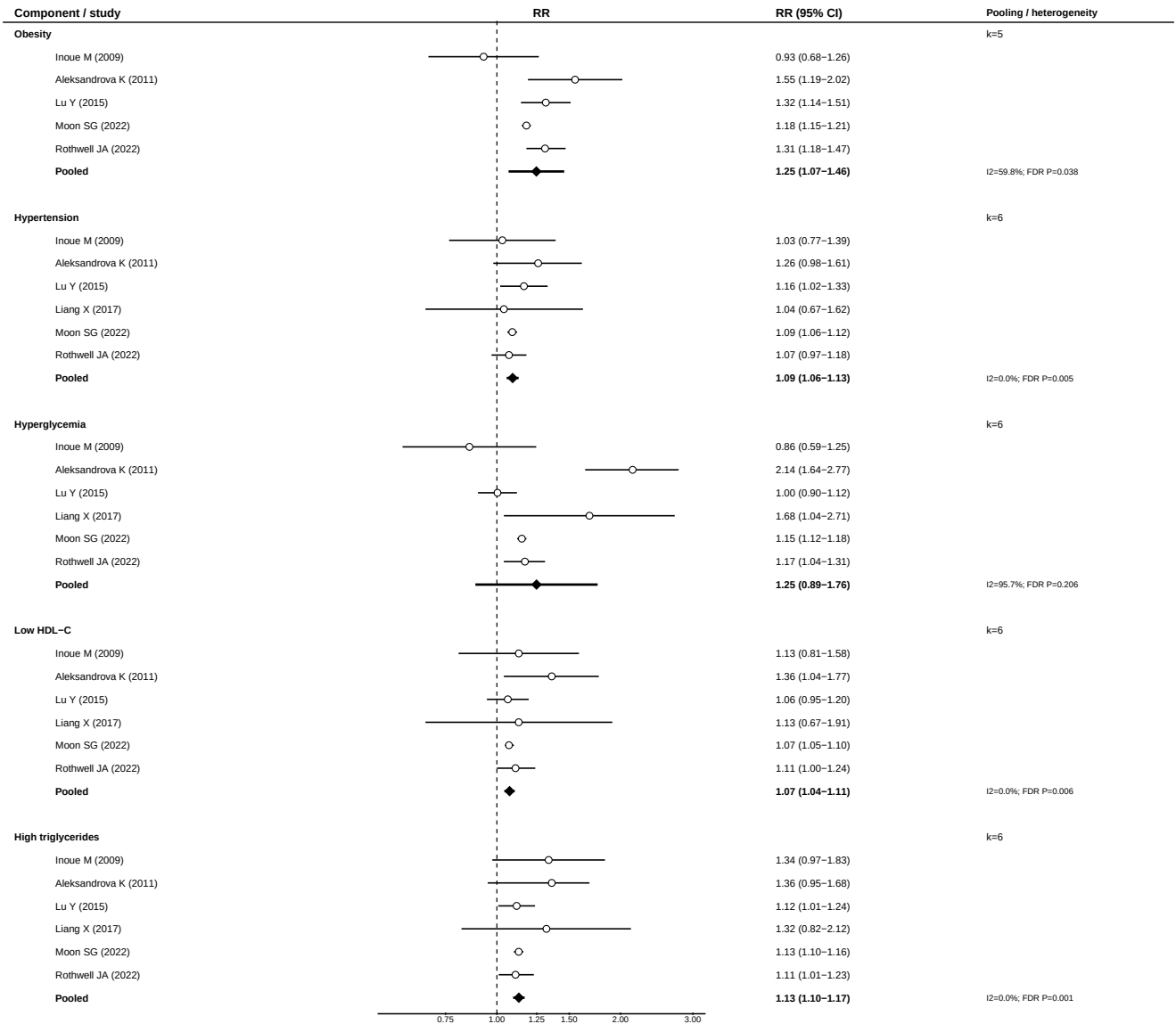


Supplementary Figure S6. Detailed analyses for colon cancer

A. Primary analysis
Pooled RR 1.47 (1.15–1.86); I2 = 98.7%; tau2 = 0.0600.

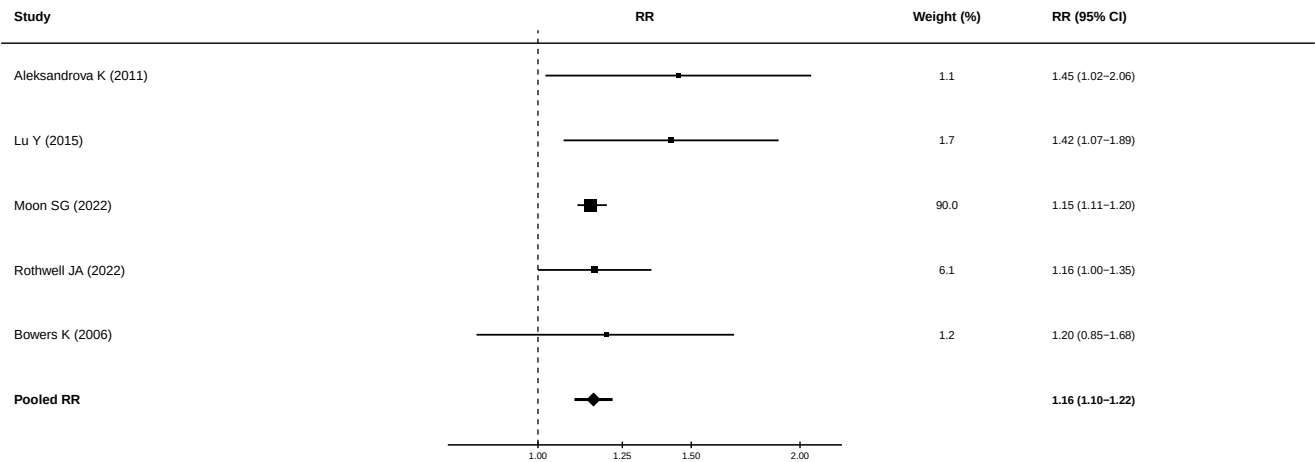


B. Individual MetS components
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.

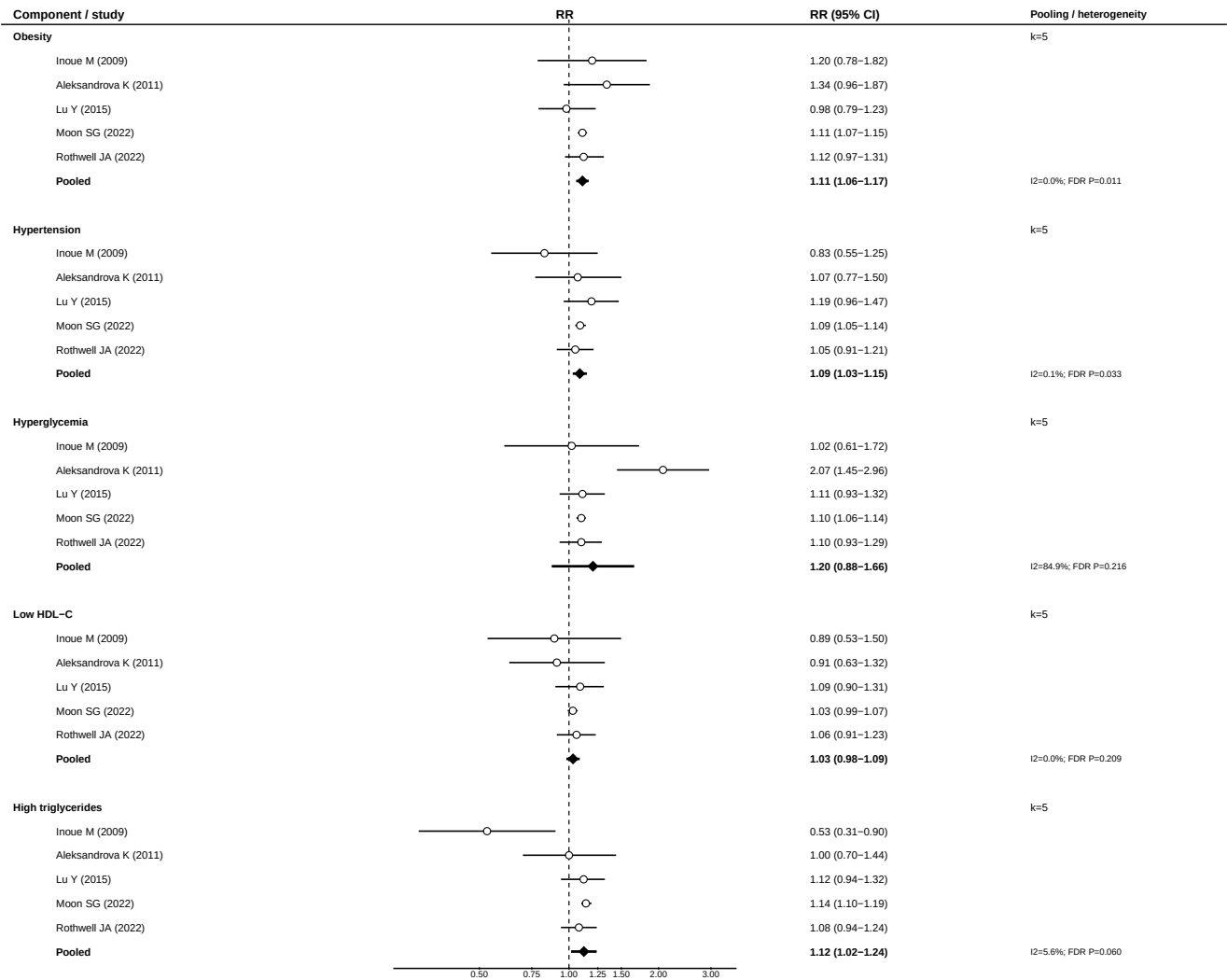


Supplementary Figure S7. Detailed analyses for rectal cancer

A. Primary analysis
Pooled RR 1.16 (1.10–1.22); I2 = 0.0%; tau2 = 0.0000.

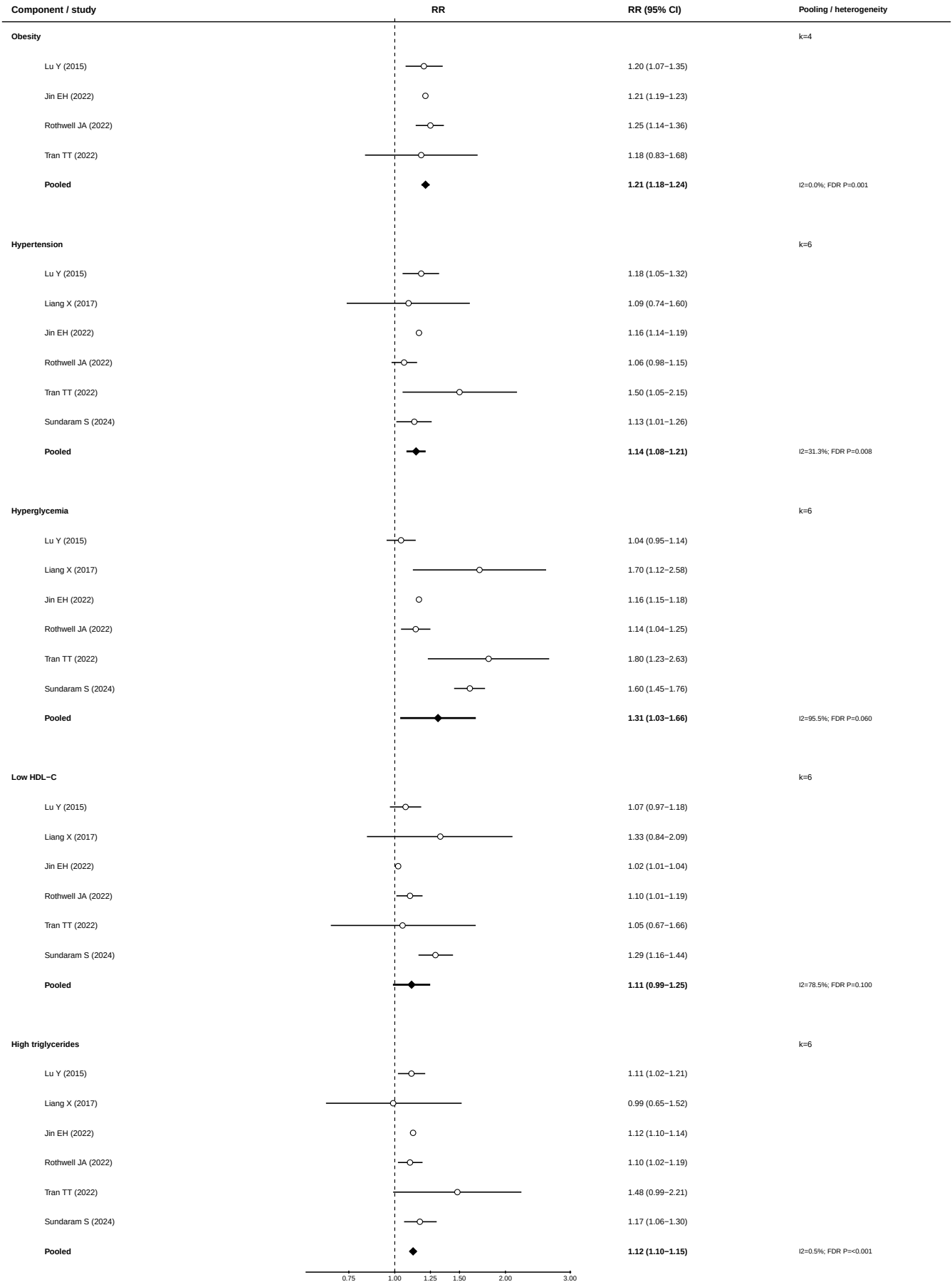


B. Individual MetS components
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung–Knapp inference and BH–FDR correction.

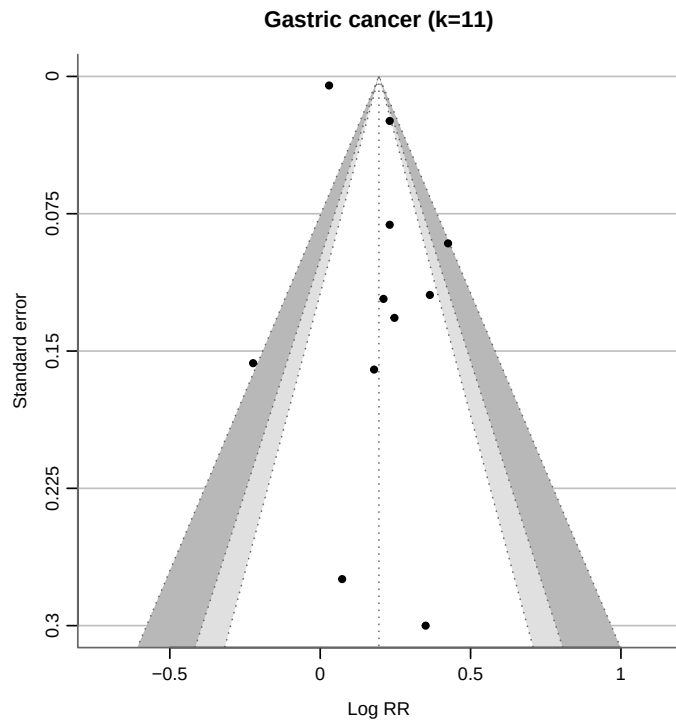


Supplementary Figure S8. Detailed individual MetS component analyses for colorectal cancer

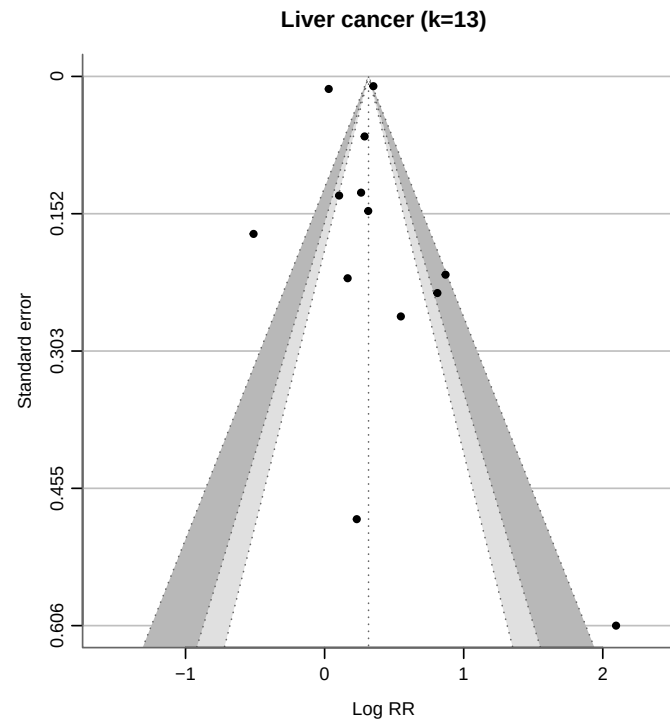
Study-level component estimates are shown; formal pooling requires k >= 3. Pooled component results use REML with modified Hartung-Knapp inference and BH-FDR correction.



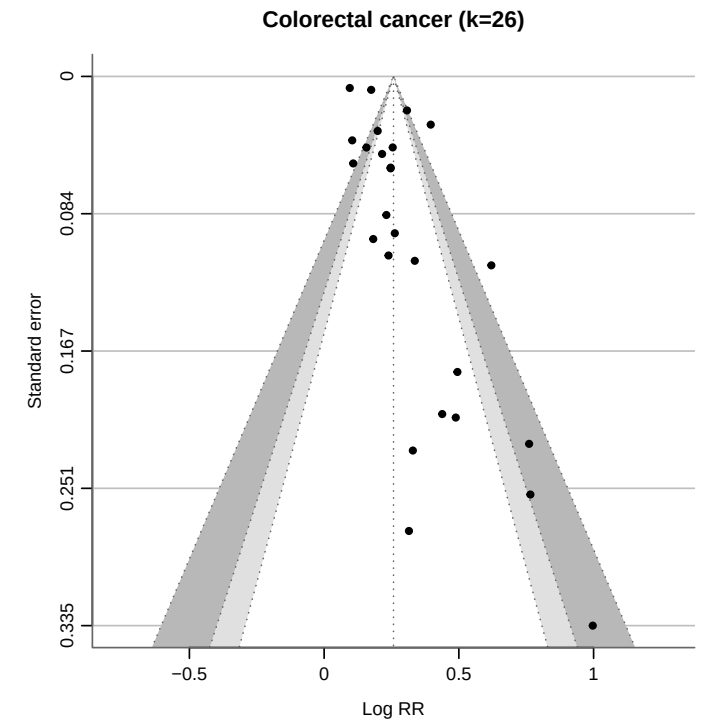
Supplementary Figure S9. Contour-enhanced funnel plots of eligible primary meta-analyses



Egger asymmetry $P = 0.863$



Egger asymmetry $P = 0.076$



Egger asymmetry $P < 0.001$