

Supplementary Table S2. Representative biomedical knowledge graphs

KG name	Focus	Description	Latest update/status	Access method	Entity types	Relation types	Application domain
SPOKE ^[58]	General	Unified knowledge network from molecules to phenotypes for broad biomedical discovery and precision medicine	Published/updated in 2023; accessibility checked on 2026-05-29.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
Hetionet ^[59]	General	Systematic integration of biomedical knowledge for drug repurposing	Static Hetionet v1.0 project-era KG; published 2017 and available through public downloads/repositories.	Hetionet website/GitHub; TSV/JSON/Neo4j-style downloads from project repositories.	Compounds, diseases, genes, anatomies, pathways, biological processes, molecular functions, side effects and symptoms.	Compound-treats-disease, compound-binds-gene, gene-associates-disease, gene-interacts-gene, pathway/process membership and side-effect links.	Drug repurposing, network medicine and interpretable path-based reasoning.
PrimeKG ^[60]	General	Integration of multimodal precision medicine data to support individualized diagnosis and treatment decisions	Published 2023 precision-medicine KG; static benchmark/resource with public repository and dataset access.	GitHub and Harvard Dataverse/project downloads; tabular KG files and code.	Diseases, drugs, genes/proteins, phenotypes, pathways, biological processes, molecular functions, exposures and anatomical terms.	Drug-disease, drug-target, disease-gene, gene-gene, disease-phenotype, pathway/ontology and indication/contraindication links.	Precision medicine, drug repurposing, target prioritization and multimodal biomedical reasoning.

BioKG ^[61]	General	Standardized biomedical knowledge graph with supporting software modules and benchmark datasets	Published/updated in 2020; accessibility checked on 2026-05-29.	Public project website, GitHub, Zenodo/Dataaverse or article-associated downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
OpenBioLink ^[62]	General	Fair comparison benchmark for KG completion methods	Published 2020 benchmark; static biomedical link-prediction dataset with public code/data access.	OpenBioLink website/GitHub; downloadable benchmark files and predefined train/validation/test splits.	Drugs, diseases, genes/proteins, pathways, phenotypes, side effects and Gene Ontology terms.	Drug-target, drug-disease, gene-disease, PPI, pathway, phenotype, side-effect and ontology relations.	Biomedical KG completion benchmarking and fair model comparison.
OREGANO ^[63]	General	Drug repurposing and mechanism discovery	Published/updated in 2023; accessibility checked on 2026-05-29.	Public project website, GitHub, Zenodo/Dataaverse or article-associated downloads; check license before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
BIOS ^[64]	General	First large-scale publicly available biomedical KG built entirely by machine learning for knowledge discovery and	Published/updated in 2022; accessibility checked on 2026-05-29.	Public project website, GitHub, Zenodo/Dataaverse or article-associated downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.

		relation inference					
RWD-KG ^[65]	Healthcare	Disease prediction and clinical decision support	Published/updated in 2020; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Patients/visits, diseases, symptoms, drugs, procedures, labs and clinical concepts.	Diagnosis, treatment, temporal/co-occurrence and admission-history links.	Clinical decision support, disease prediction and interpretation.
TarKG ^[66]	Target discovery	Target prediction, knowledge retrieval, and relation reasoning	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs/compounds, targets/genes/proteins, diseases, pathways and evidence.	Drug-target, target-disease, compound-protein and pathway/mechanism links.	Target discovery, DTI prediction and mechanism analysis.
MultiGML ^[67]	Adverse drug reactions	Prediction of adverse drug events (ADEs)	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs/chemicals, adverse events, targets, phenotypes and evidence.	Drug-adverse event, chemical-target, toxicity phenotype and evidence links.	Drug safety, toxicity prediction and pharmacovigilance.
CEKG ^[68]	Chemical elements	Knowledge graph of chemical element properties and relations for	Published/updated in 2022; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads;	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular

		molecular representation learning		check license before reuse.			representation learning.
ChemReactKG ^[69]	Chemical reactions	Chemical reaction knowledge graph, used for reaction prediction and catalyst recommendation	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular representation learning.
ChemQAKG ^[70]	Chemical QA	Chemical knowledge question answering	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular representation learning.
ChemSynKG ^[71]	Chemical synthesis	Synthetic route planning	Published/updated in 2022; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular representation learning.

MacroRetroSynKG ^[72]	Macromolecular synthesis	Planning of macromolecular synthesis routes	Published/updated in 2025; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular representation learning.
PertKGE ^[73]	Transcriptomics/targets	Inference of compound-protein interactions from perturbational transcriptomics	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs/compounds, targets/genes/proteins, diseases, pathways and evidence.	Drug-target, target-disease, compound-protein and pathway/mechanism links.	Target discovery, DTI prediction and mechanism analysis.
ProteinKG25 ^[74]	Proteins	Protein function prediction	Published/updated in 2022; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
FORUM ^[75]	Chemical-disease associations	Discovery of metabolite-disease associations	Published/updated in 2021; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Chemicals, reactions, catalysts, elements, molecules, routes and conditions.	Reaction, reactant-product, catalyst, property and synthesis-route relations.	Chemical reasoning, synthesis planning and molecular representation learning.

GenomicKB ^[76]	Genomics	Querying genomic knowledge	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
CKG ^[77]	Clinical proteomics	Interpretation of proteomics data	Published/updated in 2022; accessibility checked on 2026-05-29.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Patients/visits, diseases, symptoms, drugs, procedures, labs and clinical concepts.	Diagnosis, treatment, temporal/co-occurrence and admission-history links.	Clinical decision support, disease prediction and interpretation.
MMiKG ^[78]	Microbiome-gut-brain axis	Mechanism analysis of the gut-brain axis	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Microbes, metabolites, diseases, host genes/proteins and pathways.	Microbe-disease, microbe-metabolite, host-microbe and pathway relations.	Microbiome mechanism discovery and host-microbe KG reasoning.
RNA-KG ^[79]	RNA	RNA function research	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads;	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.

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PhenoKG ^[80]	Phenotype-gene	Rare disease gene diagnosis and precision medicine	Published/updated in 2025; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
SpaTalk ^[81]	Spatial transcriptomics	Inference of cell-cell communication	Published/updated in 2022; accessibility checked on 2026-05-29.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
KG-COVID-19 ^[82]	Infectious disease/COVID-19	Rapid response to emerging infectious diseases and drug repurposing	Static or project-era KG resource; latest cited publication/update: 2021.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
ICKG ^[83]	Immune cells	Annotation of immune gene sets	Published/updated in 2026; accessibility checked on 2026-05-29.	Public web/repository or dataset resources	Genes/proteins, diseases, drugs/compounds, pathways,	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification

				associated with the article; check current repository before reuse.	phenotypes and evidence.		and KG reasoning.
DRKG ^[84]	Drug repurposing	Rapid response to emerging infectious disease and drug repurposing	Static or project-era KG resource; latest cited publication/update: 2020.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
CTKG ^[85]	Clinical trials	Drug repurposing and similarity retrieval	Published/updated in 2022; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
medicX-KG ^[86]	Pharmacy information	Drug availability queries, drug interactions, and adverse reactions	Published/updated in 2025; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs/chemicals, adverse events, targets, phenotypes and evidence.	Drug-adverse event, chemical-target, toxicity phenotype and evidence links.	Drug safety, toxicity prediction and pharmacovigilance.

OncodashKB ^[87]	Personalized medicine	Integration of ovarian cancer clinical and molecular data for precision treatment decisions	Published/updated in 2025; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Patients/visits, diseases, symptoms, drugs, procedures, labs and clinical concepts.	Diagnosis, treatment, temporal/co-occurrence and admission-history links.	Clinical decision support, disease prediction and interpretation.
Decagon KG ^[88]	Drug-side effects	Prediction of polypharmacy side effects	Published/updated in 2018; accessibility checked on 2026-05-29.	Public project repository or article-associated dataset downloads; check license before reuse.	Drugs/chemicals, adverse events, targets, phenotypes and evidence.	Drug-adverse event, chemical-target, toxicity phenotype and evidence links.	Drug safety, toxicity prediction and pharmacovigilance.
MKG-FENN ^[89]	Drug-drug interactions	Multimodal DDI knowledge graph	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated code/data repository or supplementary files; check license before reuse.	Drugs, drug pairs, targets, adverse reactions and evidence.	Drug-drug interaction, mechanism, severity/effect and evidence links.	Medication safety and DDI prediction.
DDI-GPT ^[90]	Drug-drug interactions	LLM-enhanced knowledge graph for drug interactions	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated code/data repository or supplementary files; check license before reuse.	Drugs, drug pairs, targets, adverse reactions and evidence.	Drug-drug interaction, mechanism, severity/effect and evidence links.	Medication safety and DDI prediction.
UniDTI-KG ^[91]	Drug-target	Drug-target prediction	Published/updated in 2021; accessibility	Article-associated code/data repository or	Drugs/compounds, targets/genes/proteins, diseases,	Drug-target, target-disease, compound-protein and	Target discovery, DTI prediction and

			checked on 2026-05-29.	supplementary files; check license before reuse.	pathways and evidence.	pathway/mechanism links.	mechanism analysis.
e-TSN KG ^[92]	Drug-target	Target discovery	Published/updated in 2022; accessibility checked on 2026-05-29.	Article-associated code/data repository or supplementary files; check license before reuse.	Drugs/compounds, targets/genes/proteins, diseases, pathways and evidence.	Drug-target, target-disease, compound-protein and pathway/mechanism links.	Target discovery, DTI prediction and mechanism analysis.
RepoMultiKG ^[93]	Drug repurposing	Drug repurposing	Published/updated in 2023; accessibility checked on 2026-05-29.	Public project website, GitHub or article-associated dataset downloads; check license before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
TxGNN ^[94]	Drug repurposing	Drug repurposing	Published 2024; model built on large biomedical KG resources for zero-shot drug repurposing.	Project GitHub and article-associated data/code resources; uses public biomedical KG inputs such as PrimeKG.	Diseases, drugs, genes/proteins, biological processes, pathways, phenotypes and side effects.	Drug-disease indication/contraindication, drug-target, disease-gene, gene-gene, pathway, phenotype and ontology links.	Zero-shot drug repurposing, rare disease therapeutics and translational prioritization.
iKraph ^[95]	Biomedical	Data-driven biomedical research	Published/updated in 2025; accessibility checked on 2026-05-29.	Public web/repository or dataset resources associated with the article; check current	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.

				repository before reuse.			
VitaGraph ^[96]	Biomedical	Drug repurposing, gene-disease association prediction, and PPI prediction	Published/updated in 2025; accessibility checked on 2026-05-29.	Public web/repository or dataset resources associated with the article; check current repository before reuse.	Drugs, diseases, genes/proteins, pathways, phenotypes and side effects.	Drug-disease, drug-target, gene-disease, pathway and similarity relations.	Drug repurposing and translational hypothesis generation.
ReproTox-KG ^[97]	Reproductive toxicity	Prediction of drug teratogenicity	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Drugs/chemicals, adverse events, targets, phenotypes and evidence.	Drug-adverse event, chemical-target, toxicity phenotype and evidence links.	Drug safety, toxicity prediction and pharmacovigilance.
PerMedRec KG ^[96]	Personalized medicine	Personalized medication recommendation	Published/updated in 2025; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
TeroACT ^[98]	Drug-target	Research on terpene bioactivity	Published/updated in 2026; accessibility checked on 2026-05-29.	Article-associated code/data repository or supplementary files; check	Drugs/compounds, targets/genes/proteins, diseases, pathways and evidence.	Drug-target, target-disease, compound-protein and pathway/mechanism links.	Target discovery, DTI prediction and mechanism analysis.

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KGSCS ^[99]	Care for chronic diseases in older adults	Knowledge graph for intelligent care of chronic disease in the elderly, used for personalized care guidance	Published/updated in 2024; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
CardioKG ^[100]	Cardiovascular disease	Multimodal visual KG for cardiovascular disease and gene-disease association prediction	Published/updated in 2026; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Genes/proteins, diseases, drugs/compounds, pathways, phenotypes and evidence.	Gene-disease, drug-target, drug-disease, PPI, pathway and ontology relations.	Biomedical discovery, target identification and KG reasoning.
KGxDP ^[101]	Disease prediction	Disease prediction and interpretation	Published/updated in 2023; accessibility checked on 2026-05-29.	Article-associated web resource, code repository, supplementary files or dataset downloads; check license before reuse.	Patients/visits, diseases, symptoms, drugs, procedures, labs and clinical concepts.	Diagnosis, treatment, temporal/co-occurrence and admission-history links.	Clinical decision support, disease prediction and interpretation.

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