

Table S1. Performance evaluation of traditional approaches and LLM-based models on the flat NER datasets.

Model		Gene/Protein	Disease		Chemical		Ref.
		BC2GM	NCBI-disease	BC5CDR-disease	BC5CDR-chemical	BC4CHEMD	
Dictionary-based	MetaMap	10.92	15.46	20.58	27.88	15.22	[1]
ML&DL (w.o. PLMs)	TaggerOne	-	82.90	82.60	91.40	-	[2]
	Habibi et al.	77.82	84.44	83.49	90.63	86.62	[3]
	Wang et al.	80.00	83.92	-	-	88.75	[4]
	CollaboNet	78.56	84.69	82.61	92.74	88.19	[5]
BioBERT		84.72	89.71	87.15	93.47	92.36	[6]

* The metrics of MetaMap is referred from the following paper: [7].

Table S2. Examples of the type discrepancy among biomedical datasets

Entity	Type1	Reference	Type2	Reference
c-myc mRNA	Gene/Protein	BC2GM	RNA	JNLPBA
BZLF1	Gene/Protein	BC2GM, JNLPBA	RNA	JNLPBA
IL-2	Gene/Protein	BC2GM, JNLPBA, BioRED	RNA	JNLPBA
HLA-DRA promoter	Gene/Protein	BC2GM	DNA	JNLPBA
c-rel gene	Gene/Protein	BC2GM	DNA	JNLPBA
ICAM-1 promoter	Gene/Protein	BC2GM	DNA	JNLPBA

intercellular adhesion molecule-1	Gene/Protein	JNLPBA, BioRED	Cell	JNLPBA
angiotensin	Gene/Protein	BC2GM, BioRED	Chemical	BC4CHEMD, BC5CDR
C-peptide	Gene/Protein	BC2GM, BioRED	Chemical	BioRED
theophylline	Gene/Protein	JNLPBA	Chemical	BC4CHEMD, BC5CDR
neurofibromatosis type 1	Gene/Protein	BioRED	Disease	NCBI disease
brain tumor	Gene/Protein	BioRED	Disease	BC5CDR

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