

Jessa Bekker

Arjen Hommersom

Martijn Lappenschaar

Jesse Davis

jessa.bekker@cs.kuleuven.be

Context and Motivation

Patients with multiple diseases (multimorbidity) get multiple treatments (polypharmacy)

● A drug prescribed for one condition may aggravate another.

● How do various treatments affect the further development of multimorbidity?

Contributions

Exploratory multimorbidity research based on tractable learning

Developed first scalable method to learn Bayesian networks that can answer complex questions

patient	date	diagnosis
54651	01-03-2005	cardiomyopathy
26845	16-08-2008	myalgia
15688	27-12-2010	arthritis

patient	date	prescription
54651	31-10-2003	metolazone
26846	05-11-2006	ibuprofen
56878	09-02-2009	morphine

222,506 patients
90 general practices
2003-2011

Tractable Learning

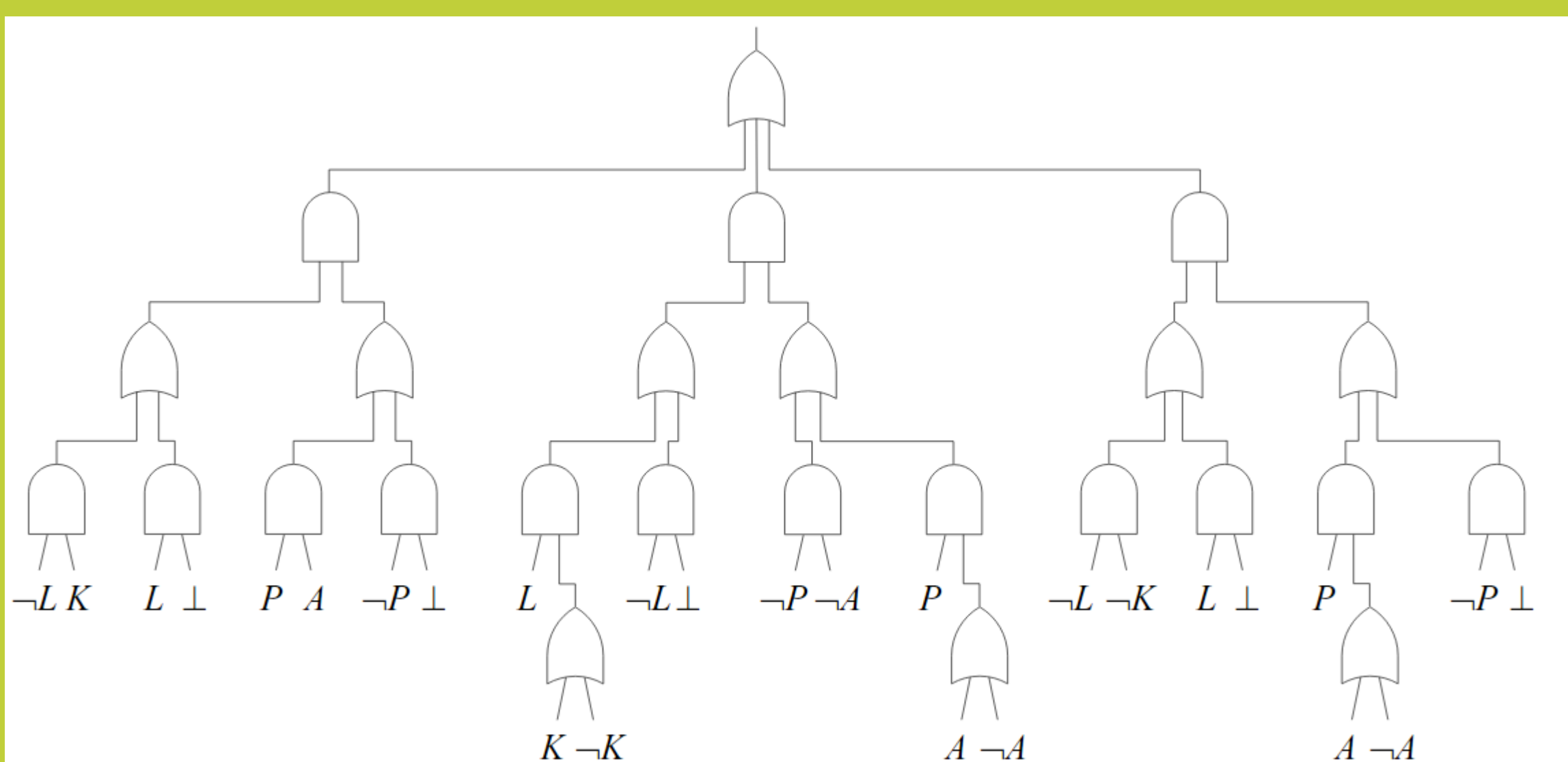
What: Learn graphical model that can answer questions efficiently

How: Use a "tractable representation" that directly measures inference cost

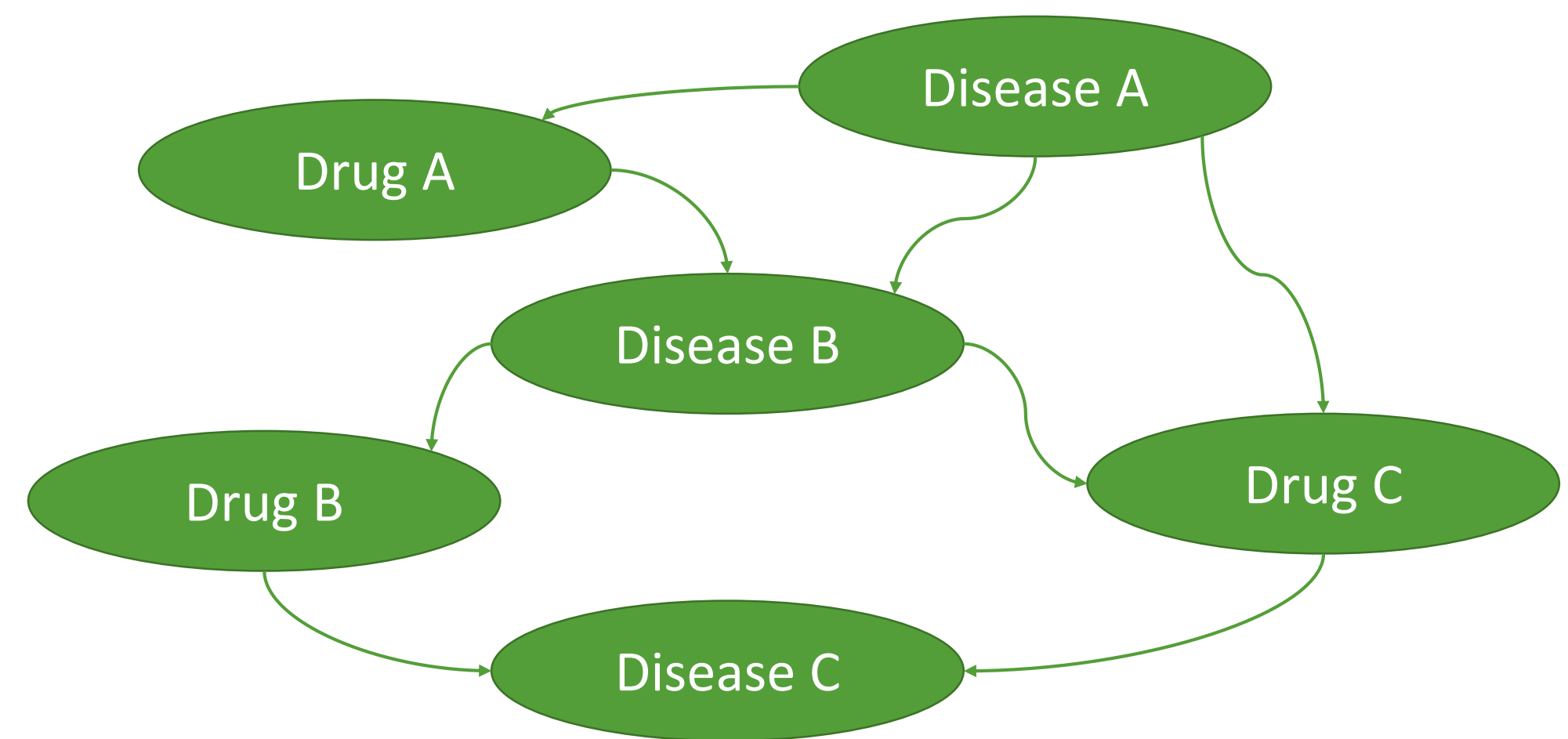
Which questions can be efficiently answered?
This depends on tractable representation.

Our method

- Bayesian network: Structure and parameters are understandable doctors
- Complex questions that require counts → Sentential Decision Diagrams (SDDs)
- Tractable ordering-based search



Tractable representation (SDD)



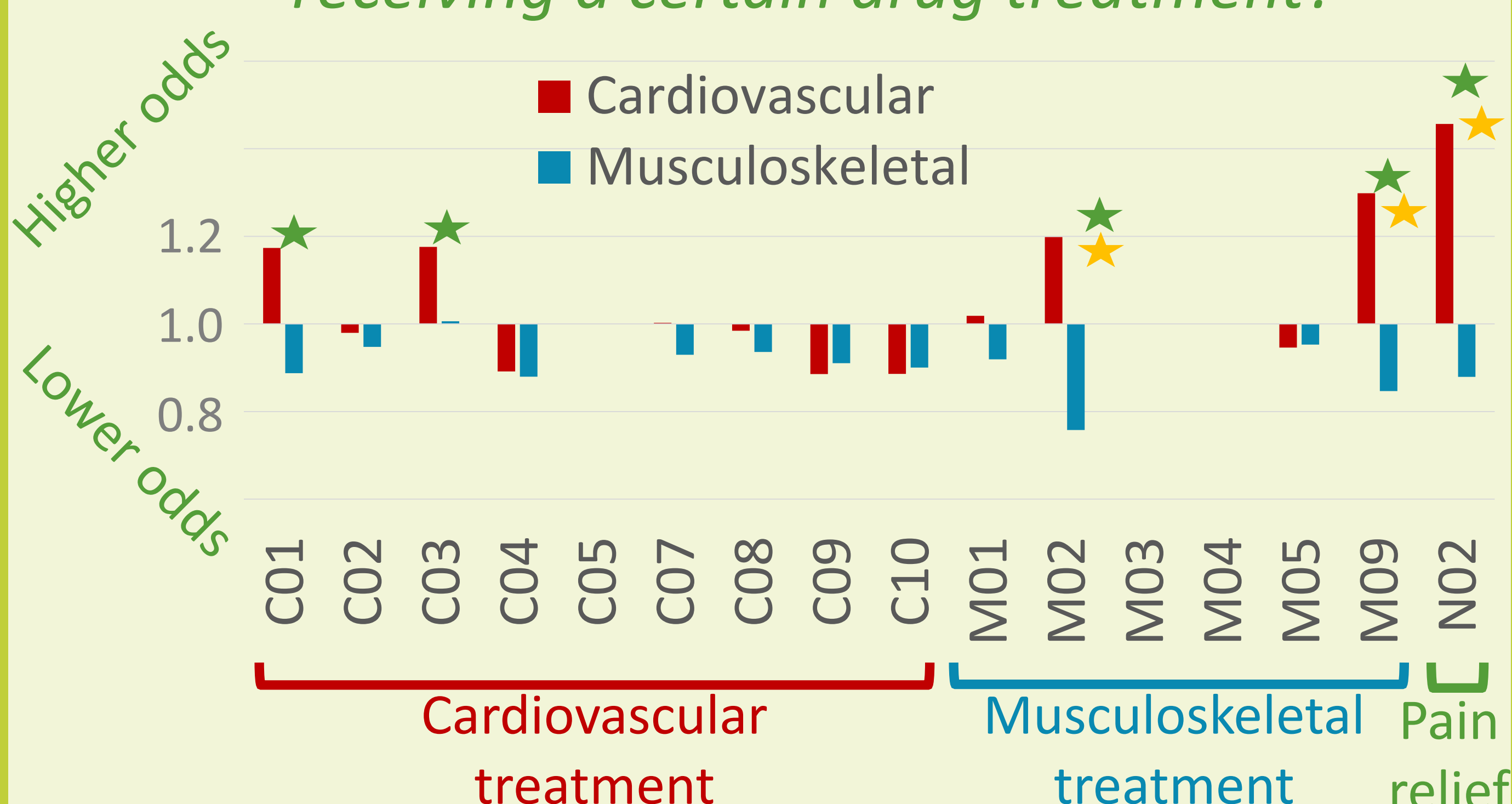
Bayesian network

Answer questions

Understandable



What are the odds of suffering from additional diseases within a group, after receiving a certain drug treatment?



Results

- Relationship between drugs and cardiovascular diseases *
- Prescriptions may affect diseases in different subgroup from the disease that is being treated *

● **Multidisciplinary approach needed to research multimorbidity**