Optimizing financial effects of health information exchanges: a multi-party linear programming approach
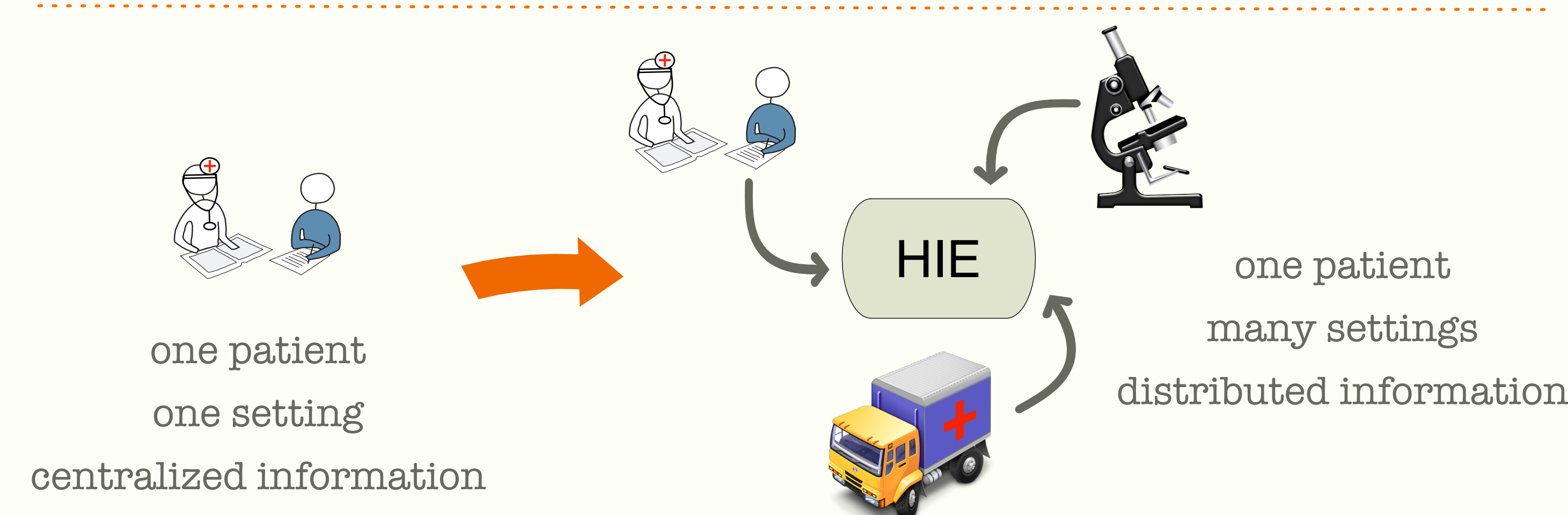
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objective

Is sharing health care data of financial value to an institution?

one patient
one setting
centralized information

one patient
many settings
distributed information

We propose an analytical framework to:

★ quantify **both societal** and **institutional** consequences of health information exchange (HIE)

★ design pricing policies for sustainable HIEs.

background

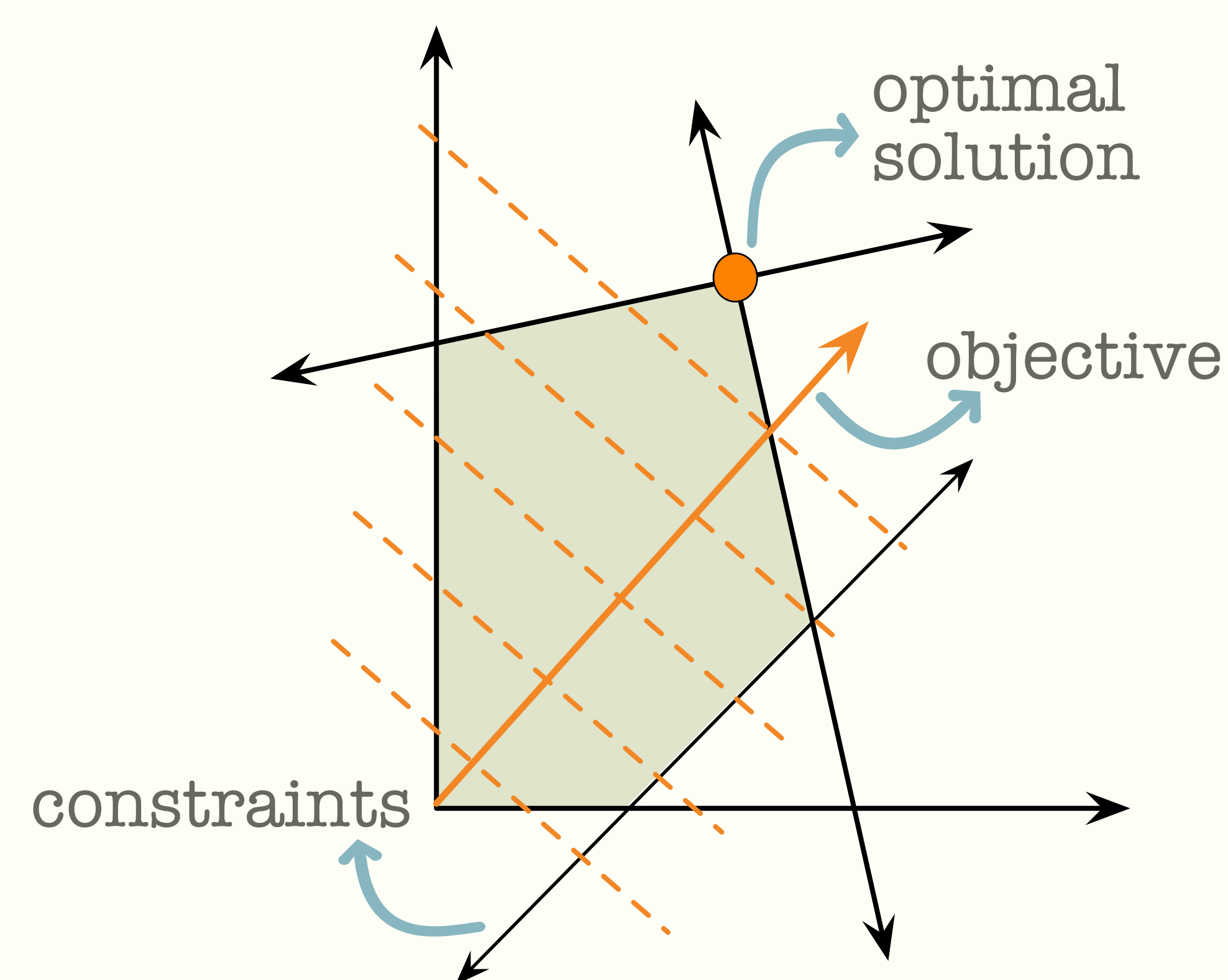HIEs efficiently share health care data across institutions.

Accurate financial models assist **policy making** concerning HIEs

We build on Dixon et al. to address: **cost, effort and value** of an HIE

How can an agent make optimal decisions?

In linear programming (LP) ; an agent seeks to

★ identify the **optimal** decisions maximize an **objective**

★ satisfy a set of **constraints**.

model requirements

Accurate financial models for HIE must address the following issues

★ account for uncoordinated actions of multiple agents

★ acquire enough trustable data to instantiate the model

★ apply to health care systems of different complexities occurring in different geographical regions.
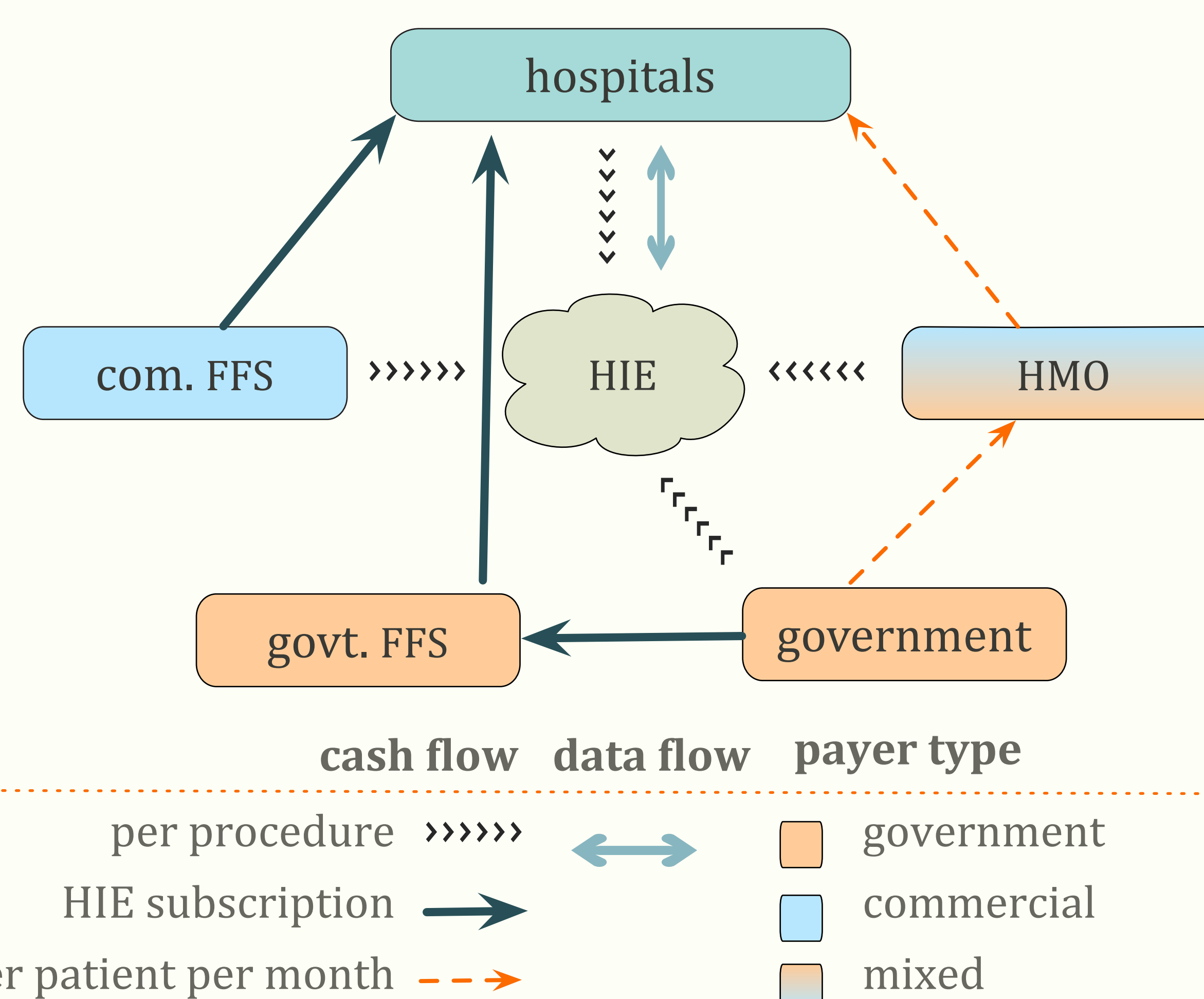
methods

Our LP framework was populated with **patient data**!

We tested robustness against various modeling assumptions.

We considered three desired outcomes of HIE-related emergency care

★ preventing unrequired hospitalizations (UH)

★ reducing duplicative medical work (DUP)

★ reducing repeat emergency department visits (AED)

cash flow   data flow   payer type

per procedure ▶▶▶▶▶   ◆ government
HIE subscription ───▶   ◆ commercial
per patient per month ----▶   ◆ mixed

In our LP model:

★ the **objective** was to maximize financial benefits of HIE.

★ the **decision**s were HIE charging & subscription policies.

★ the **constraints** were financial sustainability of the HIE & minimum financial benefit for each agent in the system.

We considered **three pricing policies** for providers: fixed annual subscription, per-visit or per-lookup charge or subsidy.
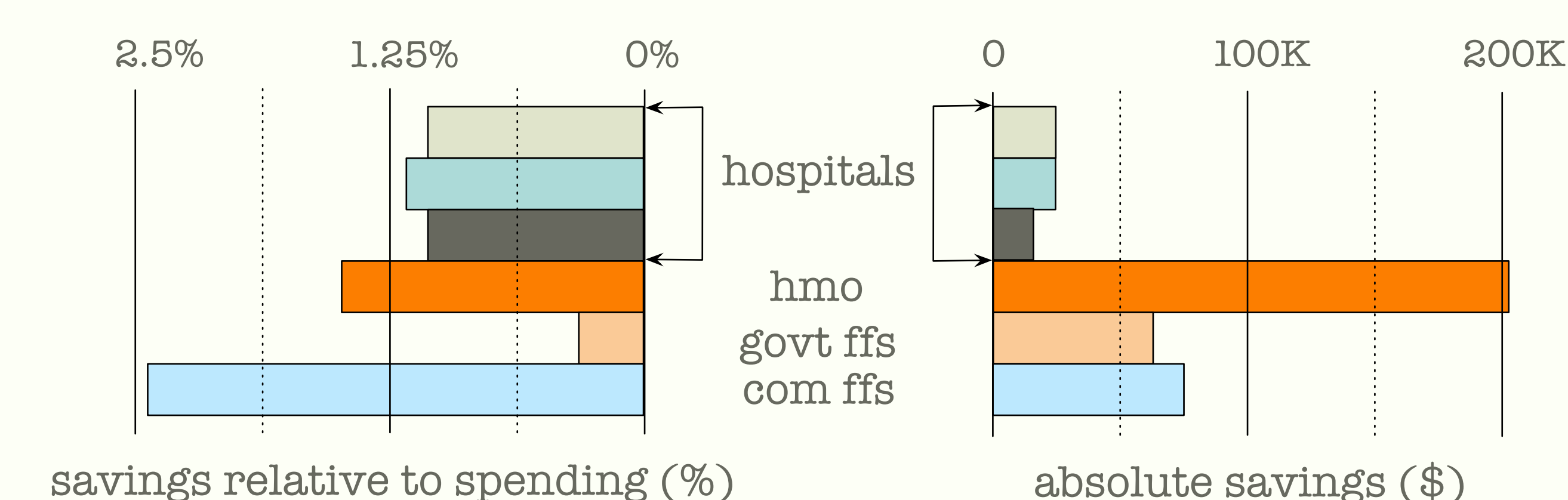
data

We considered **4369 ED** visits in a **12-month** period in **three** large EDs in Milwaukee, Wisconsin.

Our LP framework aggregated **data** from various sources.

claims data

published datasets

LP Model

public hospital reports
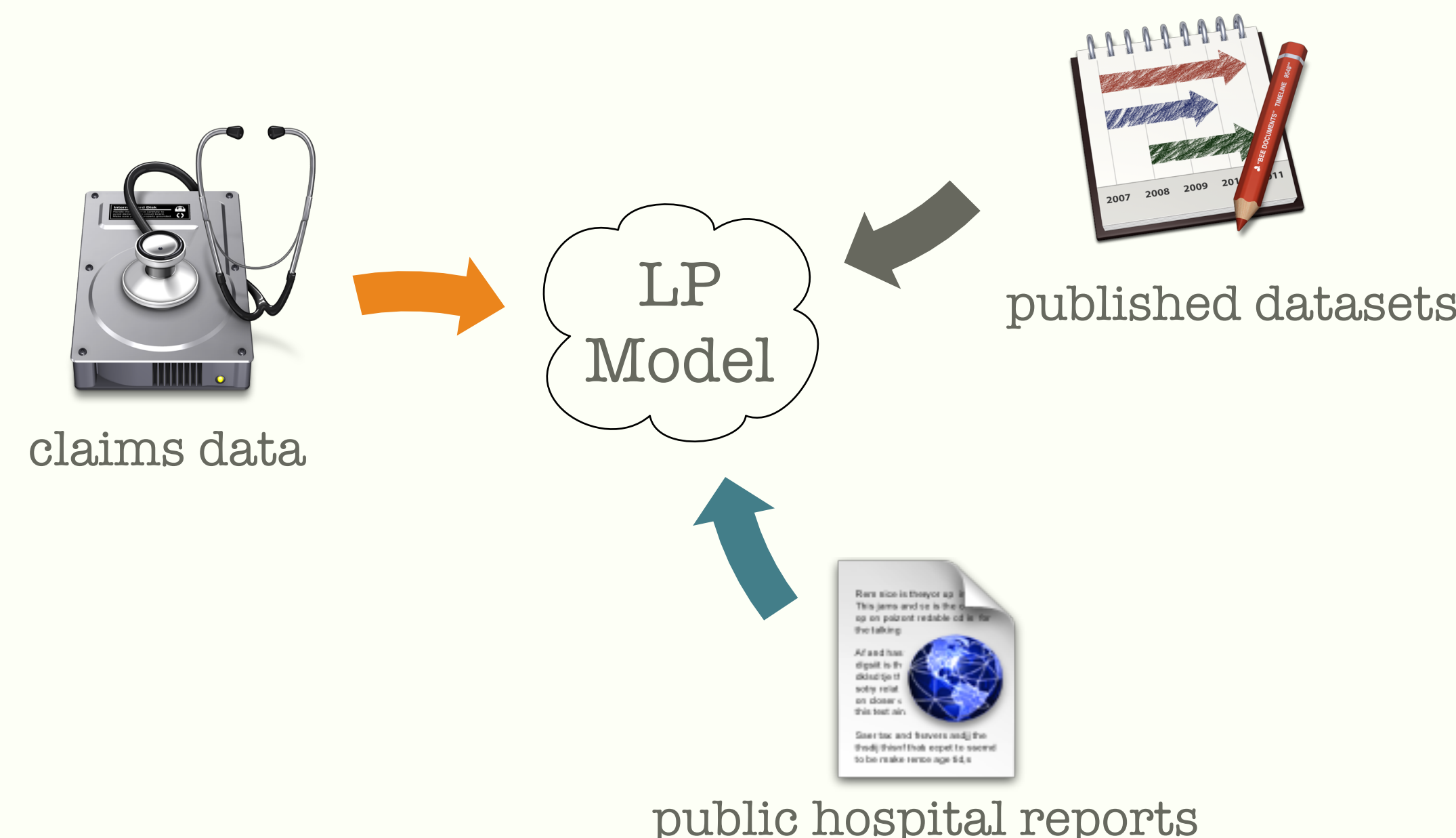
results

Effect of HIE participation of providers and payers
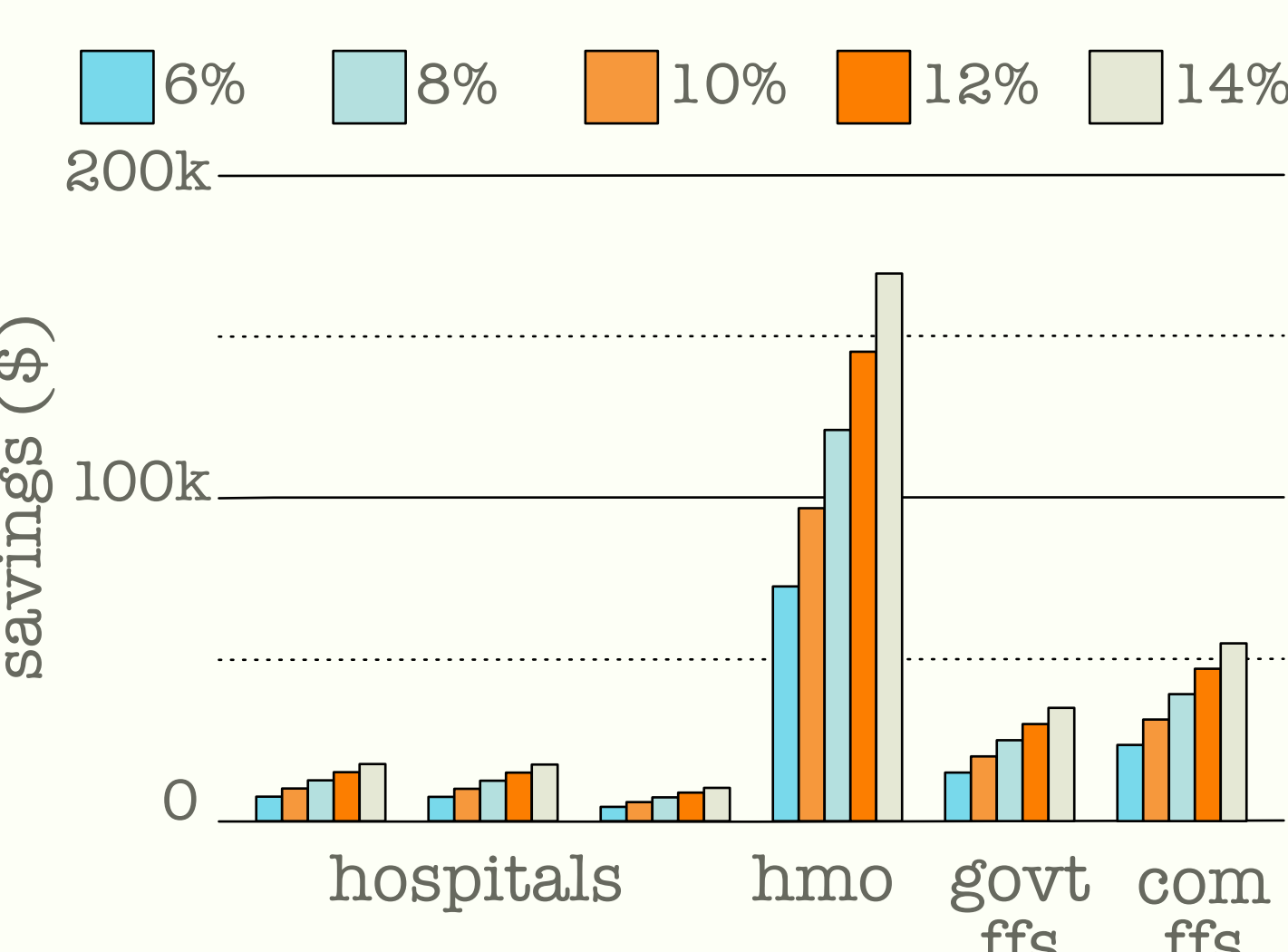

savings relative to spending (%)

absolute savings ($)

★ HIE data produced financial **savings** to **all** agents.

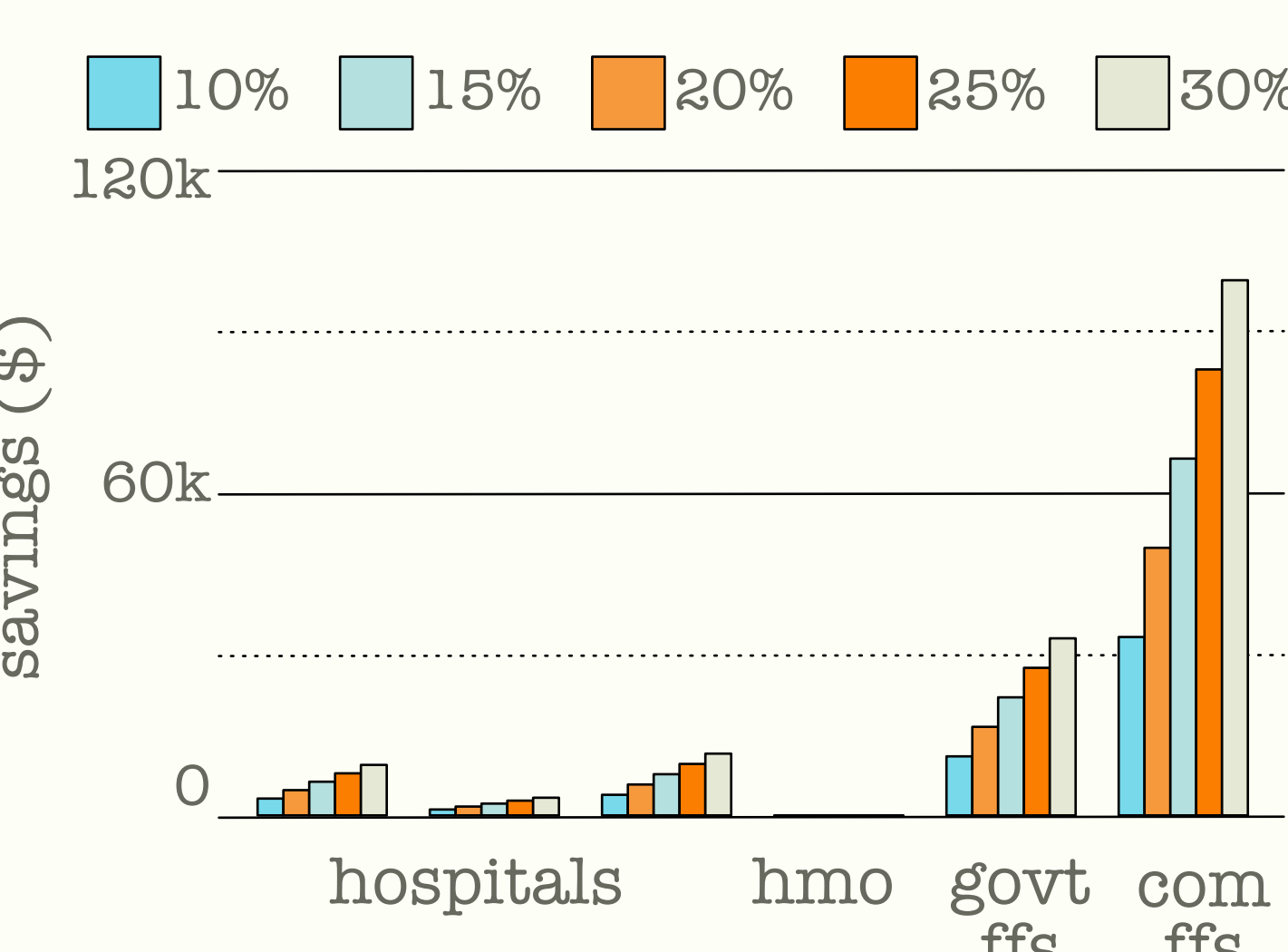★ HIE savings significant for hospitals with **more HMO patients**.

★ AED & UH created **70% of the savings**.
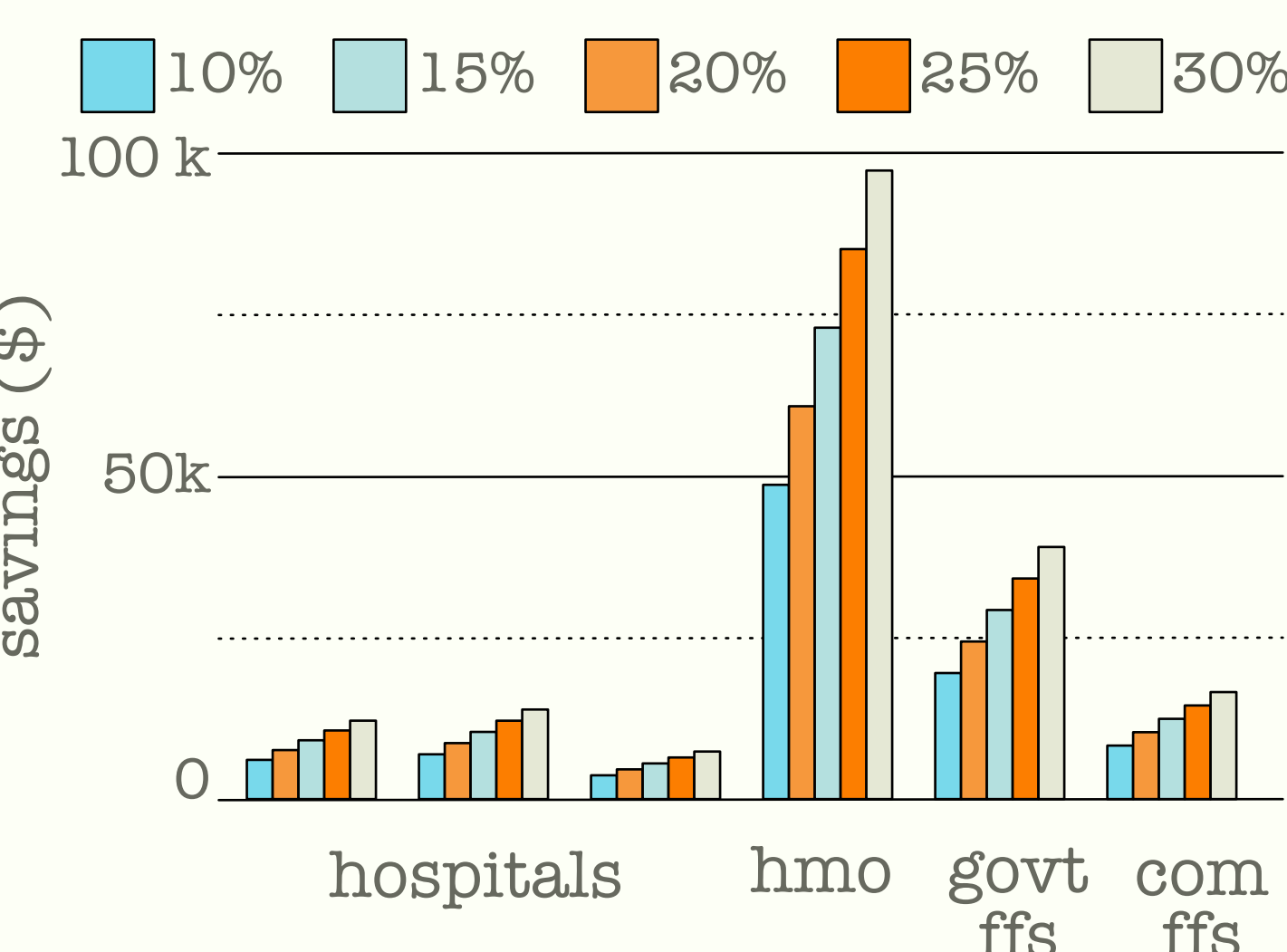
★ Results were robust to modeling uncertainties.

sources of HIE savings

Unrequired hospitalizations

discussion

Fixed annual subscriptions can **sustain this HIE,** while ensuring financial gains to all participants.

Pricing recommendations arise from and apply only to the **study population**.

The **merit** of this study is in the **modeling approach**, which is applicable to other settings

Duplicative medical work

Repeat ED visits

acknowledgements