

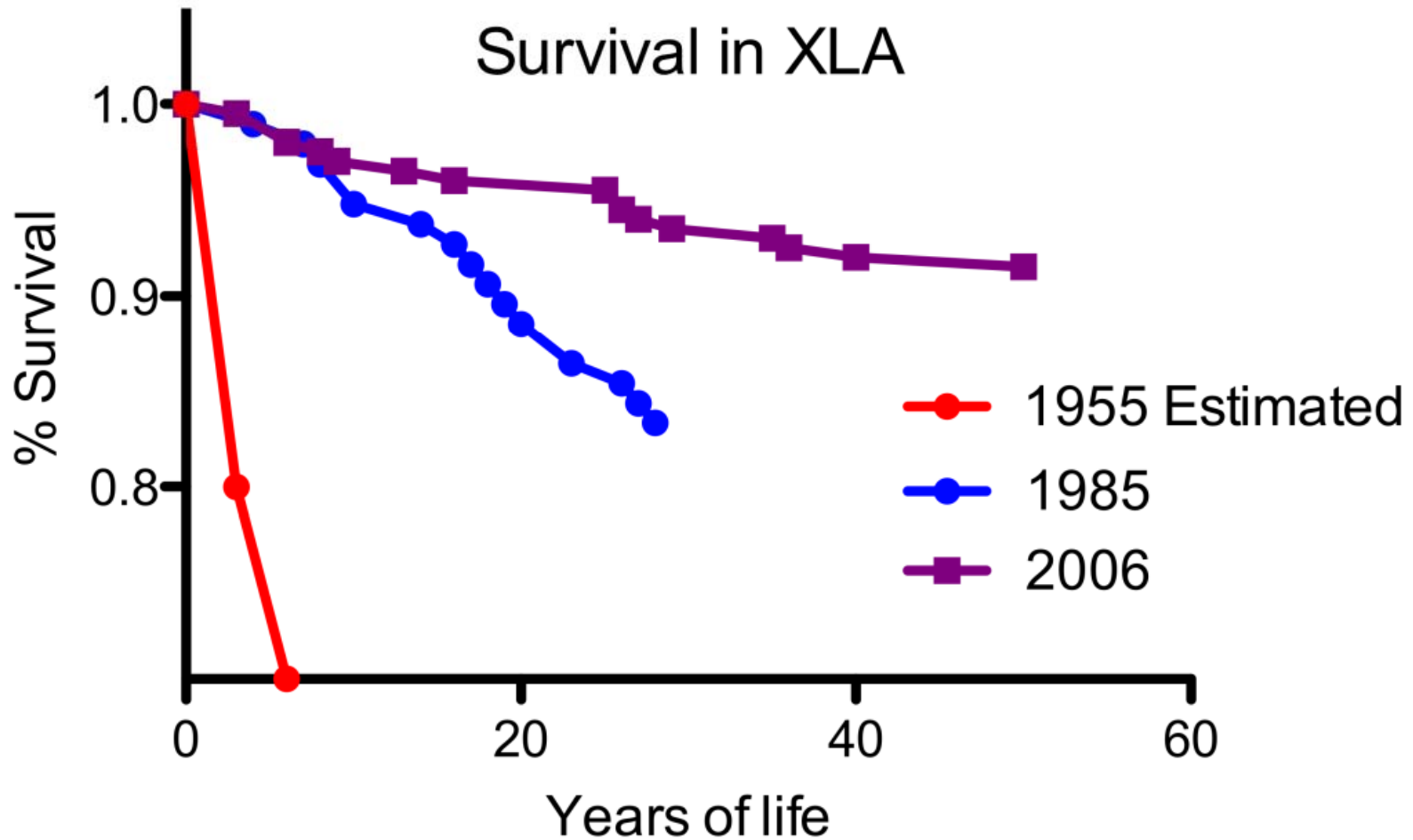


A Decision Analysis Model for estimating Latent Therapeutic Demand for Immunoglobulin therapy in Primary Immune Deficiencies

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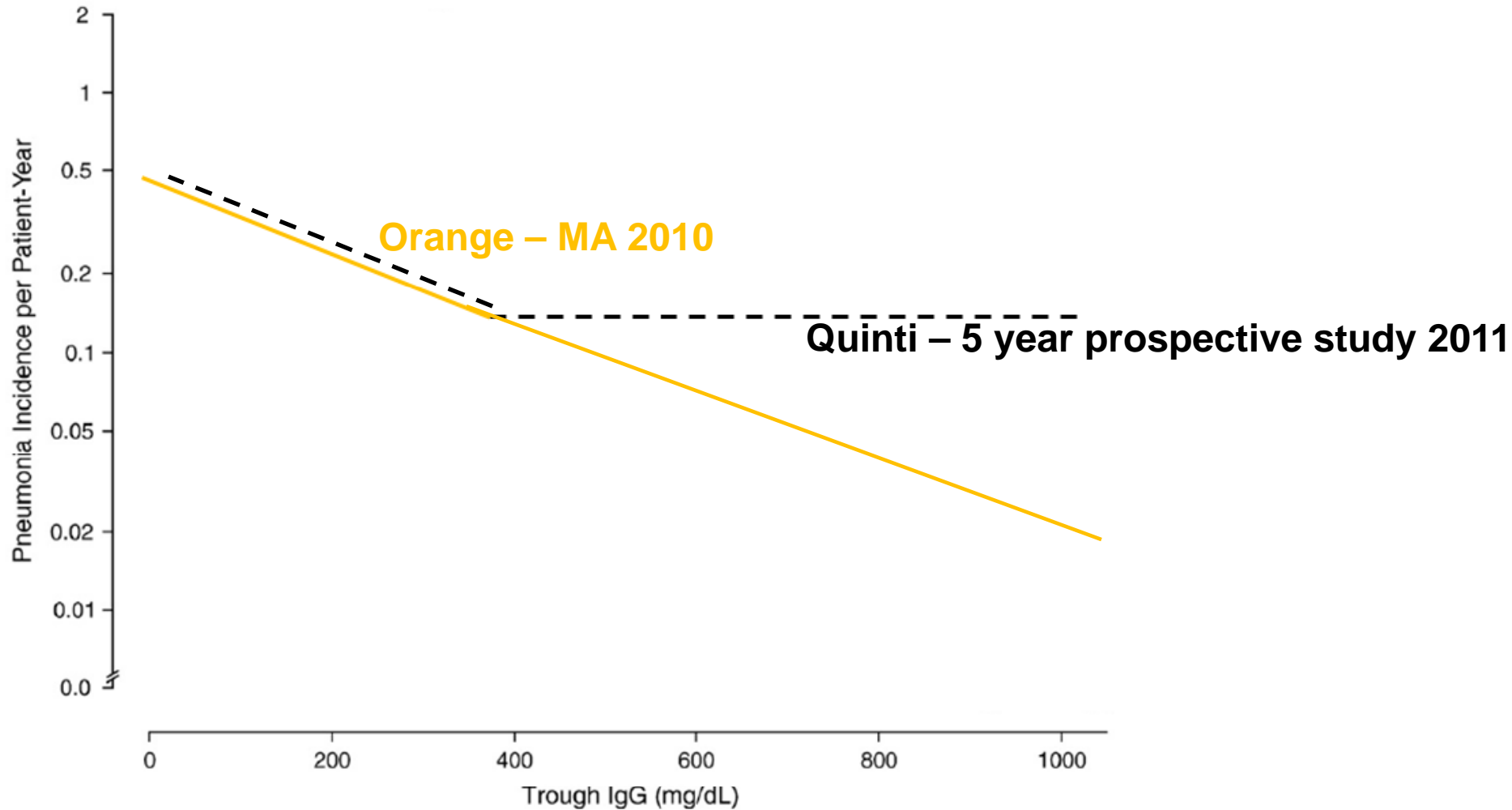




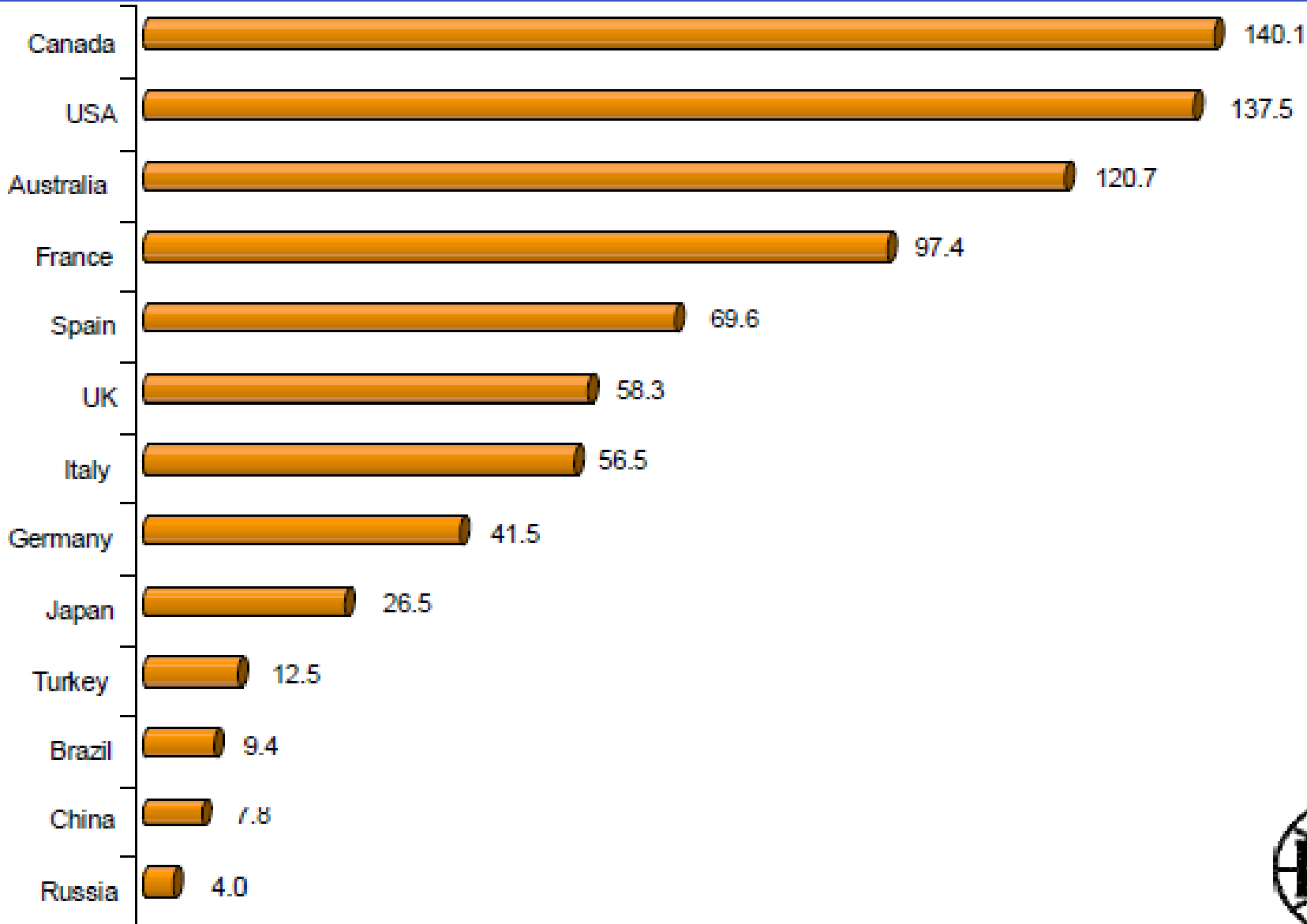
PPTA

Plasma Protein Therapeutics Association

IgG levels and risk of pneumonia



Ig demand – National variations



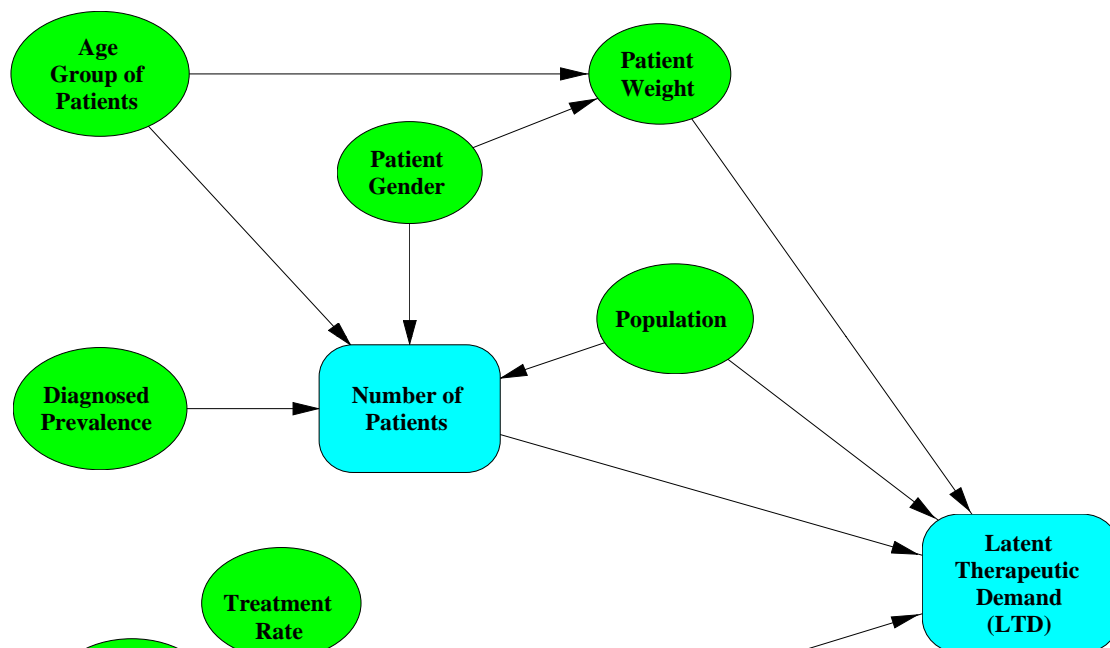
Latent therapeutic demand (LTD) is the underlying demand that represents how physicians would prescribe treatment and how patients would follow or comply with the prescribed treatment if ample supplies of drugs were available and affordable (in this case grams of Ig per 1000 population)

- (1) Focus on Common Variable Immunodeficiency (CVID) and X-Linked Agammaglobulinemia (XLA).**
- (2) Identified and defined the variables impacting LTD for PID through a literature review of PID disease epidemiology and its treatment and discussions with experts.**
- (3) Constructed an influence diagram to model the variables impacting LTD for PID and their interrelationships.**
- (4) Obtained range estimates for each variable from published articles.**
- (5) Conducted sensitivity analysis using a tornado diagram to order variables in terms of their impact on LTD for PID.**
- (6) Modeled the uncertainty surrounding the most sensitive variables.**

Model variables and their integration model

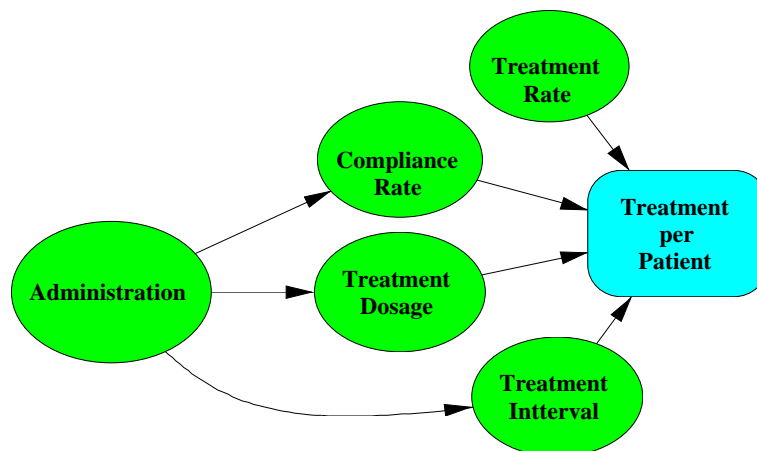
Epidemiology Related Variables

- Diagnosed Prevalence (per 100,000 population)
- Age Group of Patients
- Patient Gender
- Patient Weight
- Population

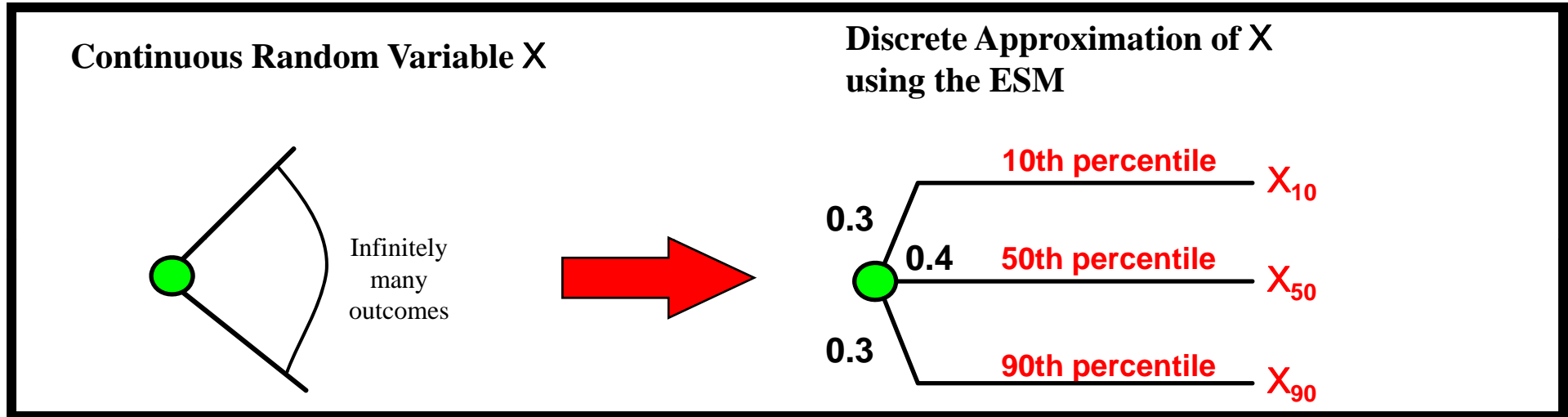


Treatment Related Variables

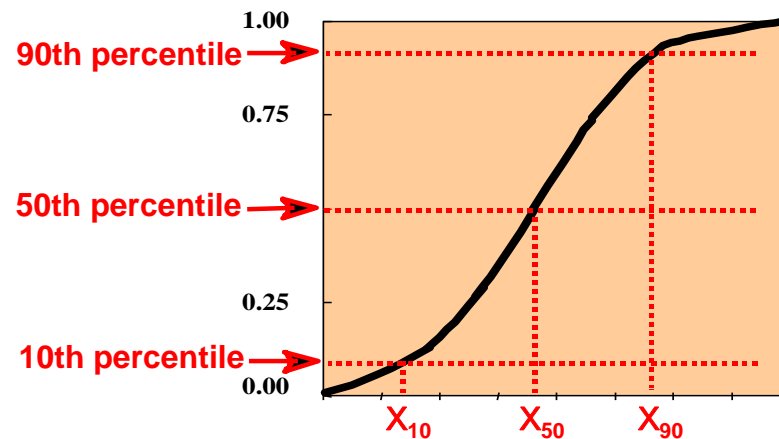
- Treatment Rate
- Administration IVIG vs. SCIG
- Compliance Rate
- Treatment Dosage
- Treatment Interval



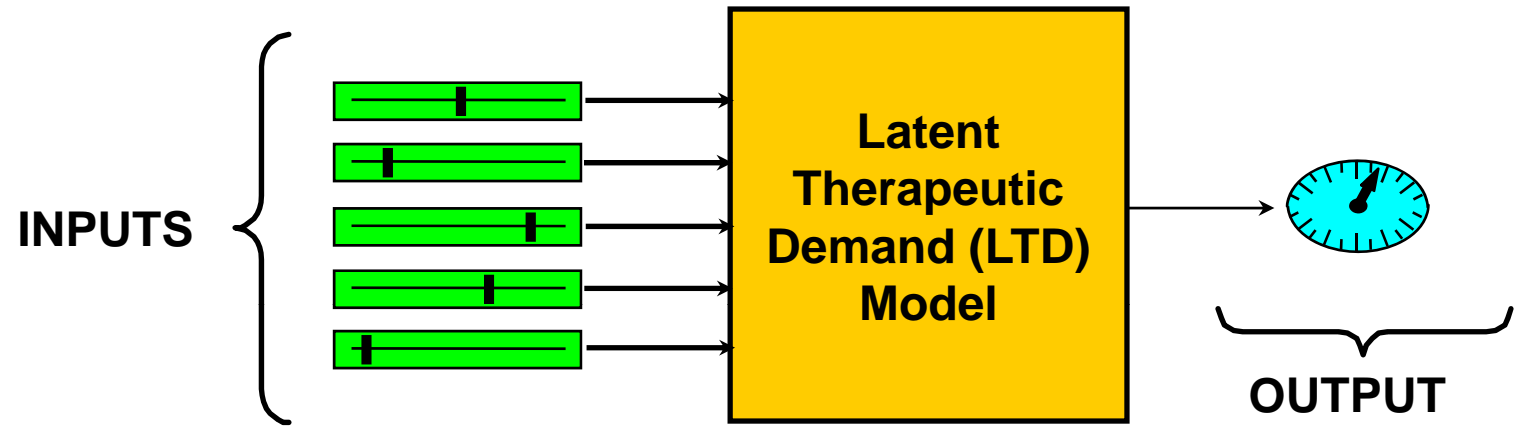
The extended Swanson-Megill (ESM) approximation was used to account for the uncertainty of continuous random variables.



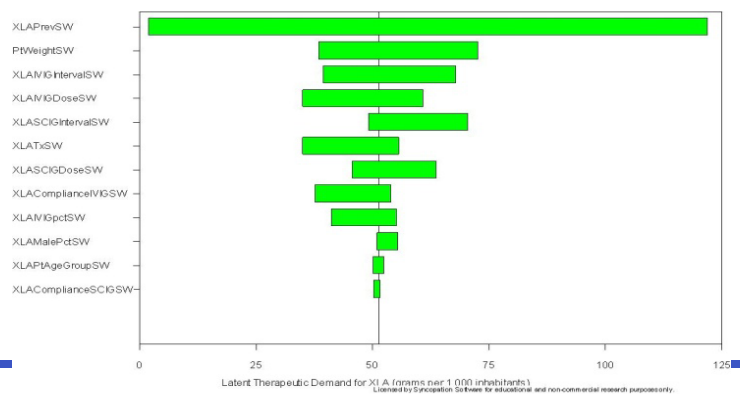
Underlying Cumulative Distribution Function of X:



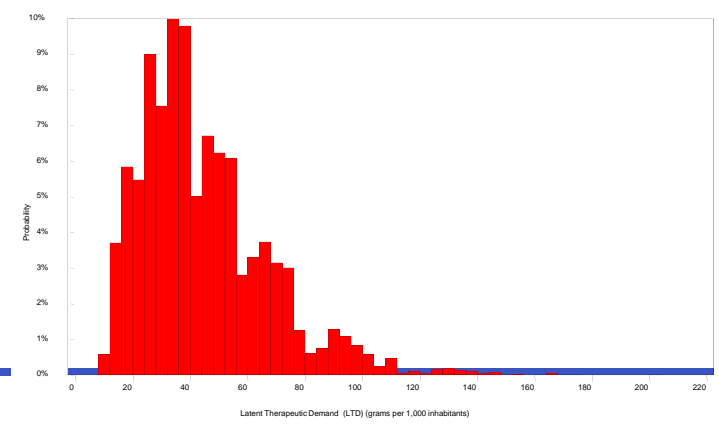
Model inputs and outputs.



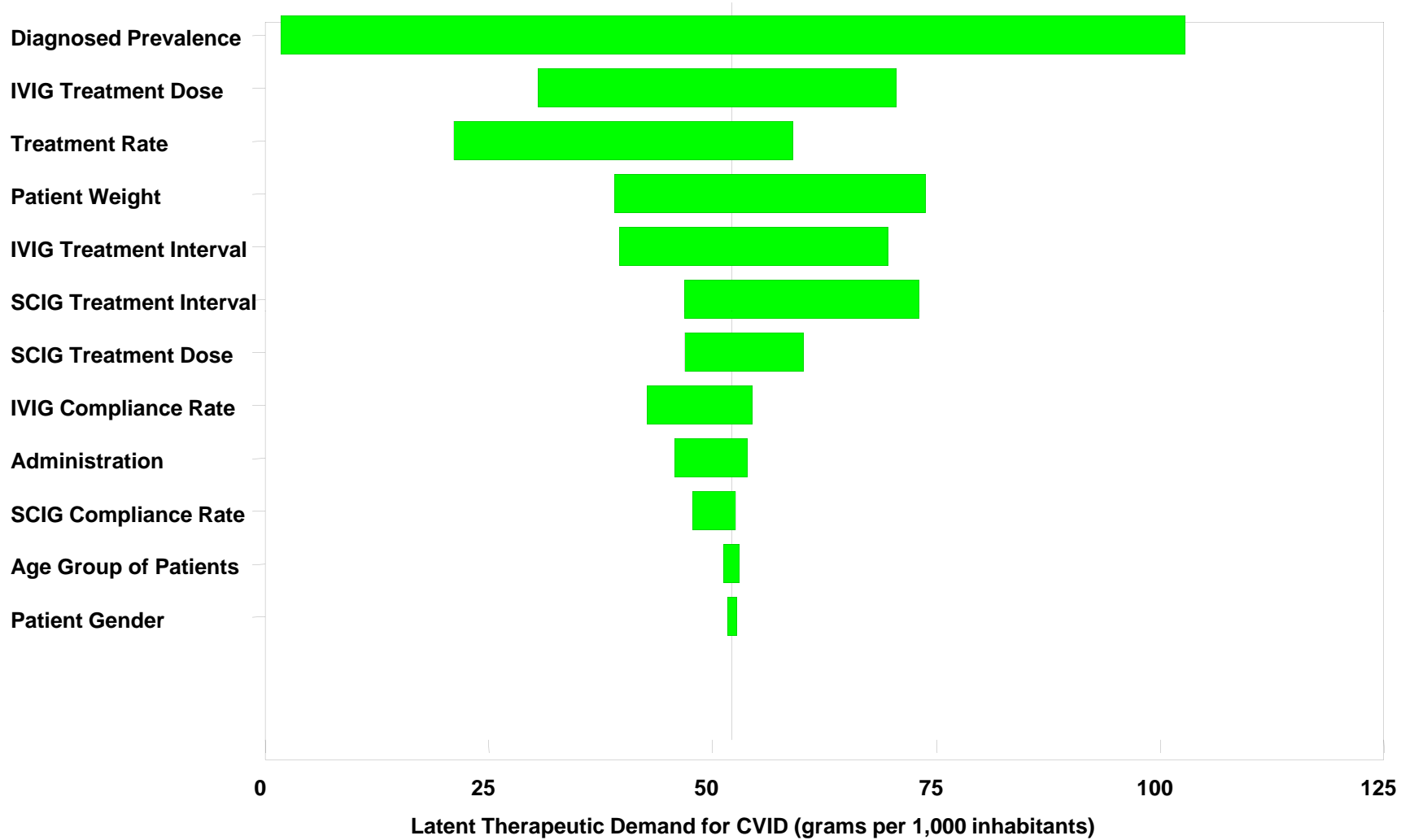
Tornado Diagram



Probability Distribution



LTD Model – Results for CVID



	<u>Low</u>	<u>Base</u>	<u>High</u>
CVID Diagnosed Prevalence	1	15	30

Assumptions & Sources for Estimates

Low Estimate

National Registries

Beauté et al. (2010), Gathmann et al. (2009)

Base Estimate

Population-based study, Omsted County MN

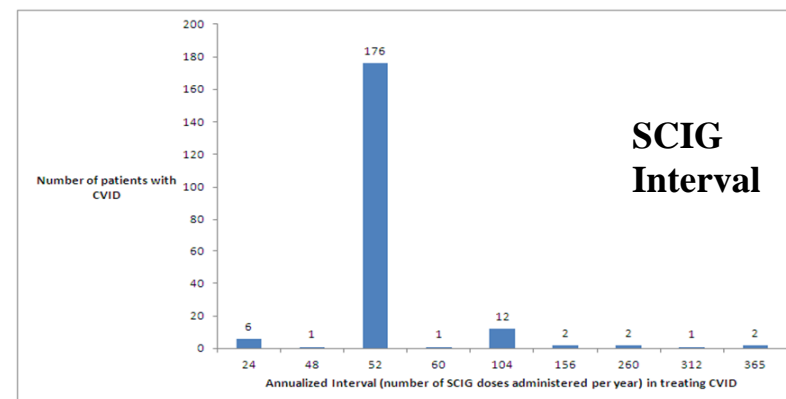
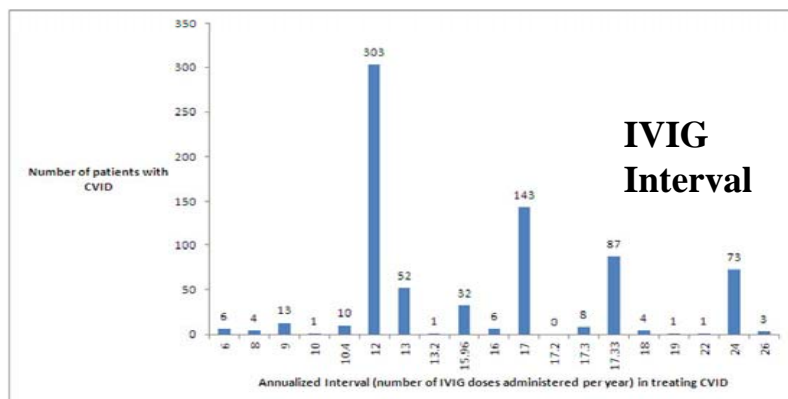
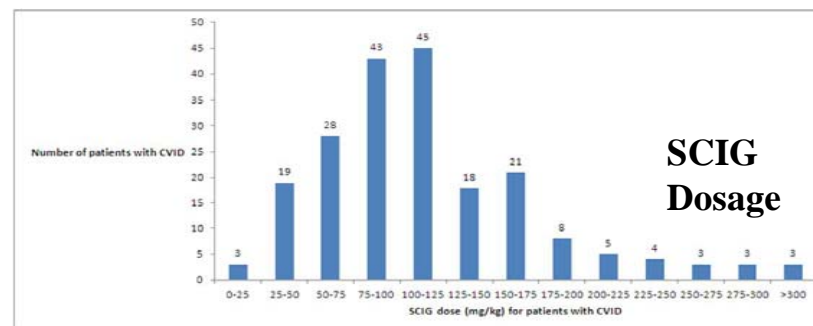
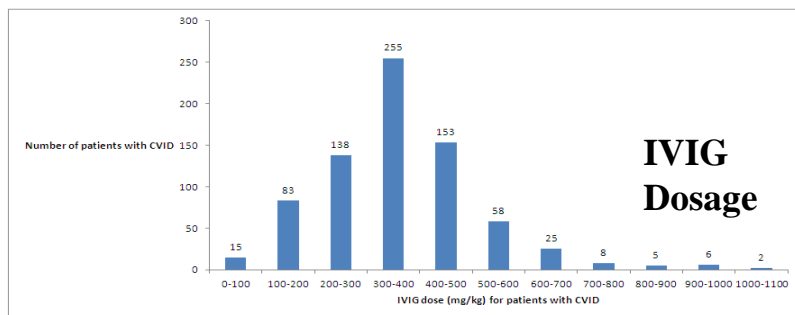
Joshi, et al. (2009)

High Estimate

Telephone survey

Boyle and Buckley (2007)

Besides diagnosed prevalence, another driver of growth is IVIG/SCIG dosage and frequency.



A “snap-shot” of treatment-related data were obtained from the ESID Registry

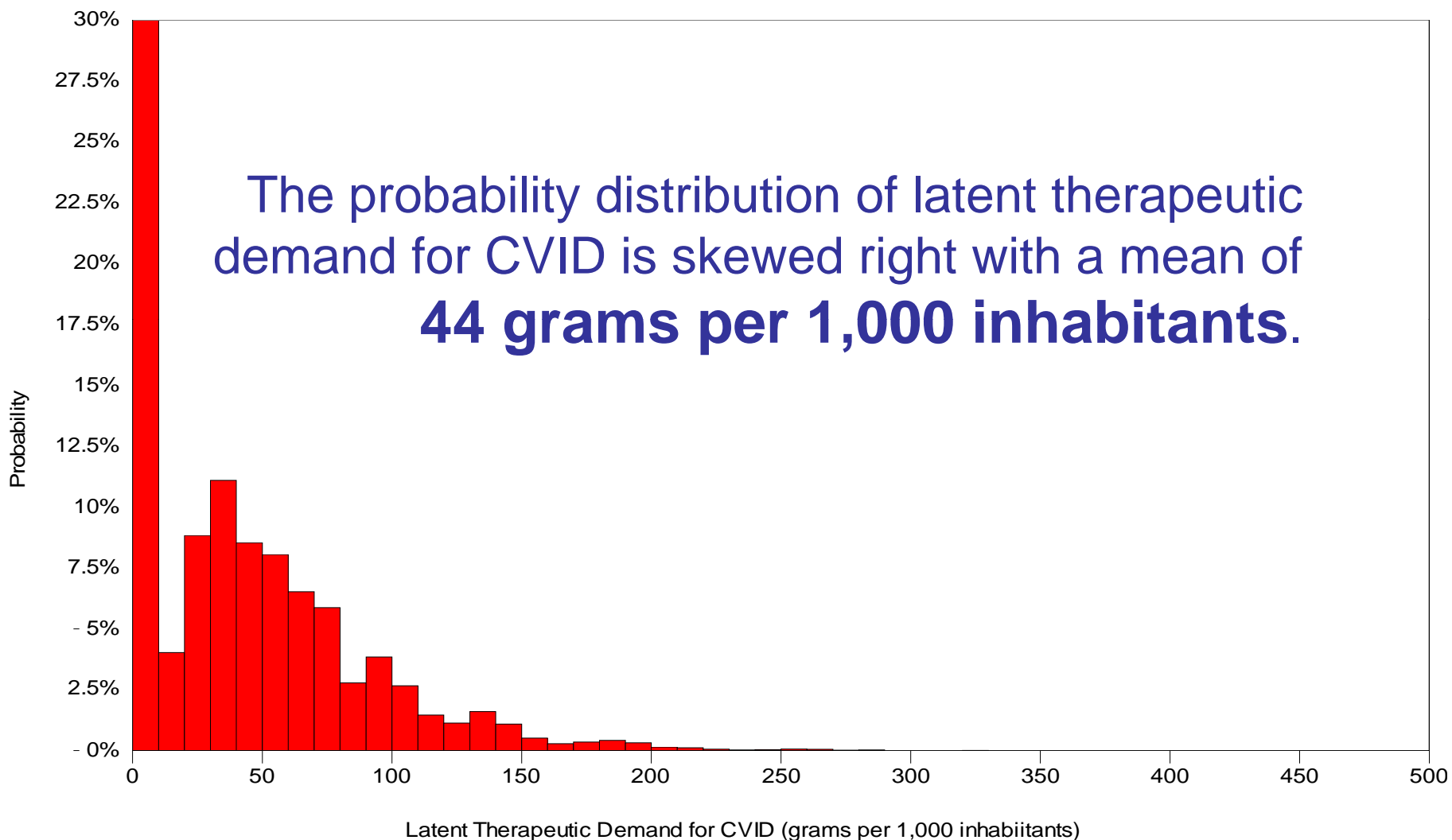
- 2,065 patients with CVID
- 4,016 patient records/entries for CVID patients

Total number of CVID patients treated with IVIG: 748 (78.7%)

Total number of CVID patients treated with SCIG : 203 (21.3%)

Result for CVID

Using all prevalence inputs



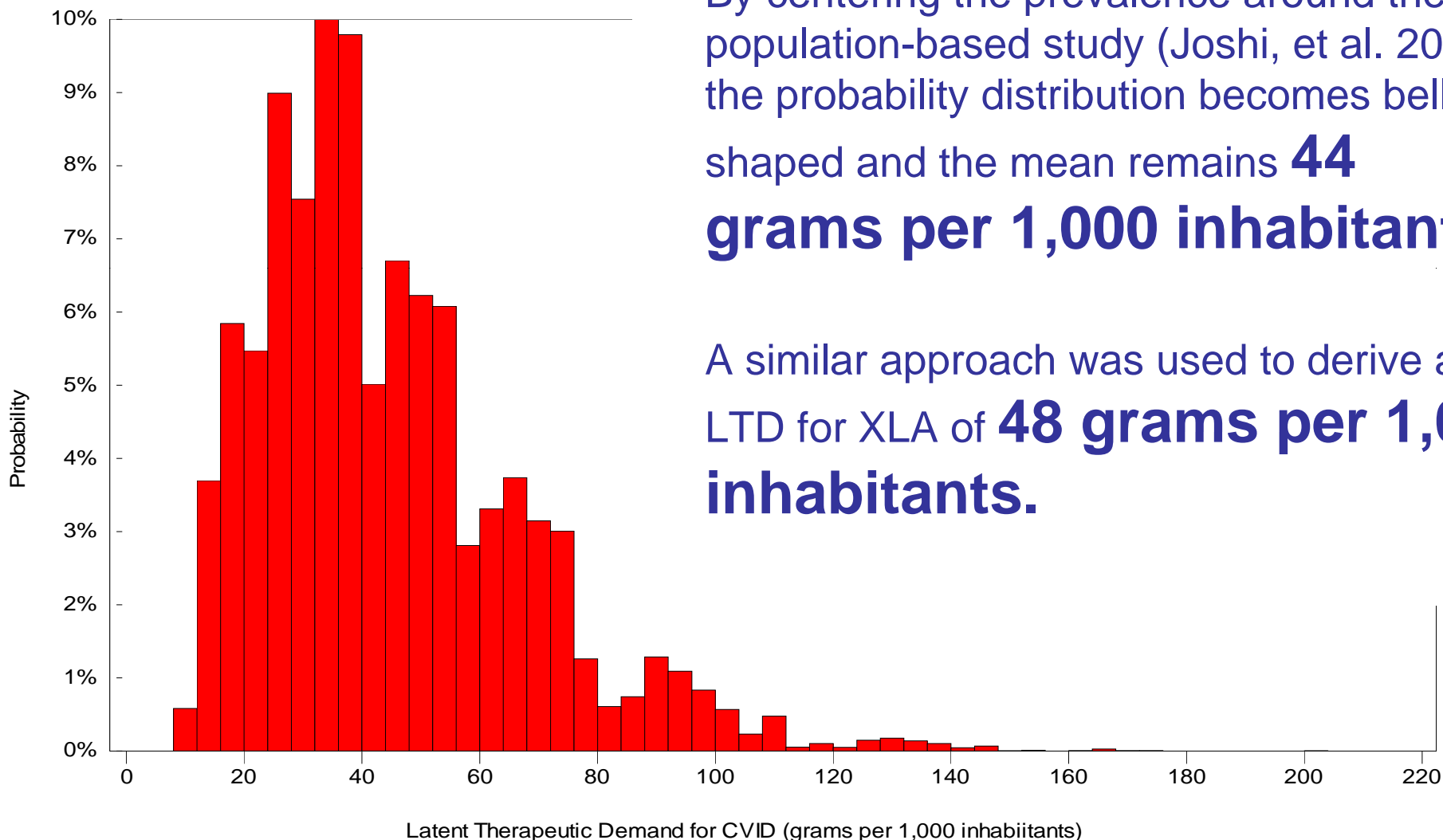
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Result for CVID

Using base case prevalence (Joshi et al)

- By centering the prevalence around the population-based study (Joshi, et al. 2009), the probability distribution becomes bell-shaped and the mean remains **44 grams per 1,000 inhabitants.**

A similar approach was used to derive a LTD for XLA of **48 grams per 1,000 inhabitants.**

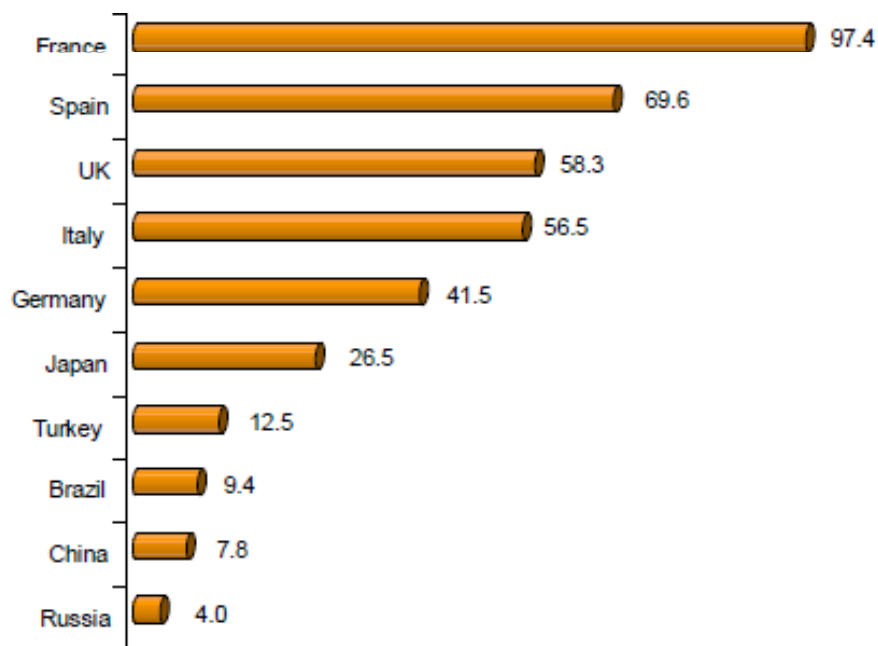
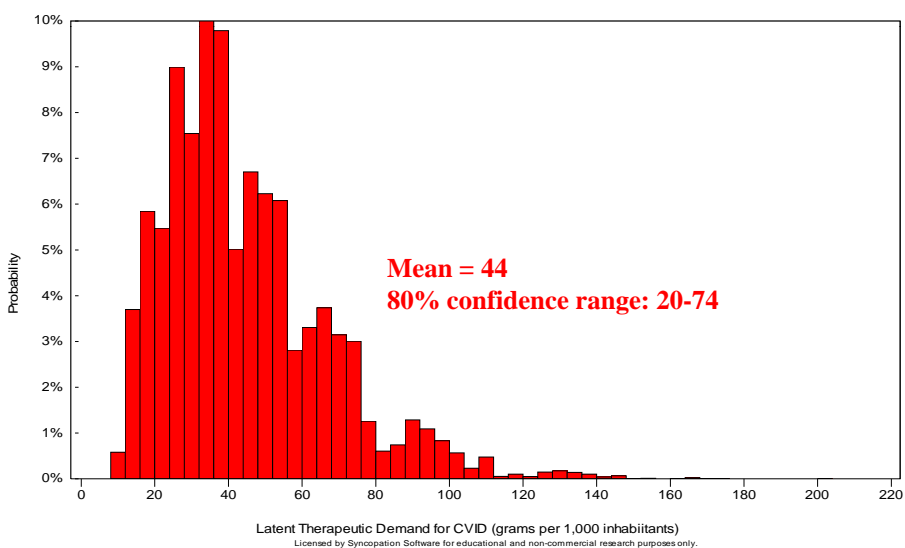


Latent Therapeutic Demand for CVID (grams per 1,000 inhabitants)

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Implications

The IG latent therapeutic demand (LTD) for the treatment of CVID *alone* is larger than most countries' IG consumption across all disease indications.



- Decision analysis has been used to construct a LTD model for IG usage in CVID and XLA
- Data from the literature were used to populate the model
- Prevalence estimates were adjusted to a base case to result in a normal probability distribution of LTD
- Using this model, the usage of IG for PIDs should exceed the total IG consumption of most countries
- These results have implications for demand planning for the treatment of PID patients