

Advancing Quantitative Systems Pharmacology (QSP) Disease Progression Modeling with Real World Data: Applications for Patients with Unintentional Weight Loss

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INTRODUCTION

- Unintentional weight loss is a symptom of serious disease or illness and can cause muscle weakness, fatigue, poor quality of life and higher mortality rates¹
- Despite its prevalence, there are few drugs to address unintentional weight loss in populations such as cachexia in cancer patients
- Among the challenges to develop therapies for the treatment of unintentional weight loss is the very limited trial data evaluating the time-course of weight loss and disease progression in patients

OBJECTIVES

- To leverage available body weight data from real world databases, such as electronic health records, to parameterize a QSP model of body composition²
- To aid in clinical trial design by predicting weight gain responses in a virtual patient population in response to a potential therapy for cachexia in cancer patients

METHODS

Fig 1. Strategy to simulate a clinical trial for cachexia in patients with non-small cell lung cancer

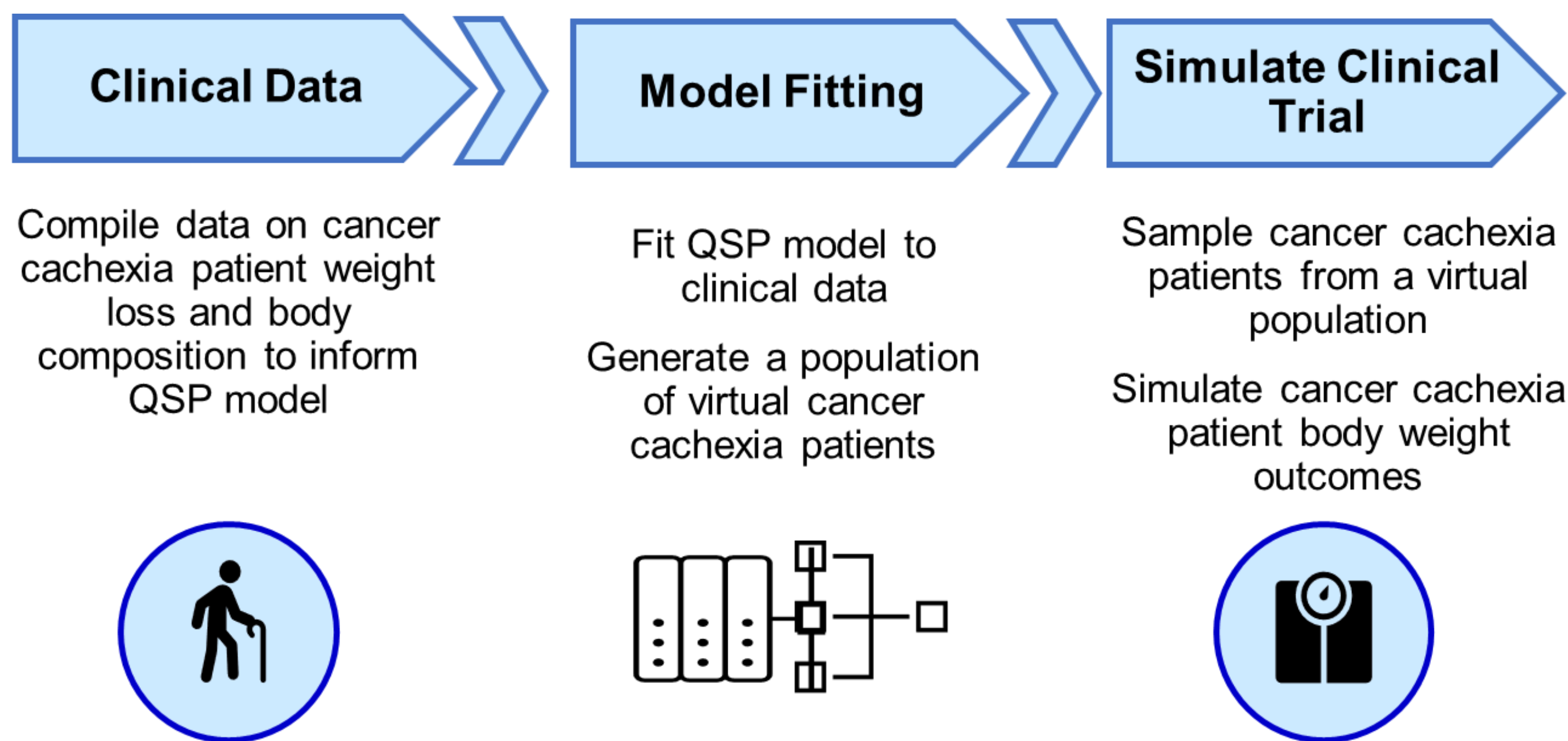
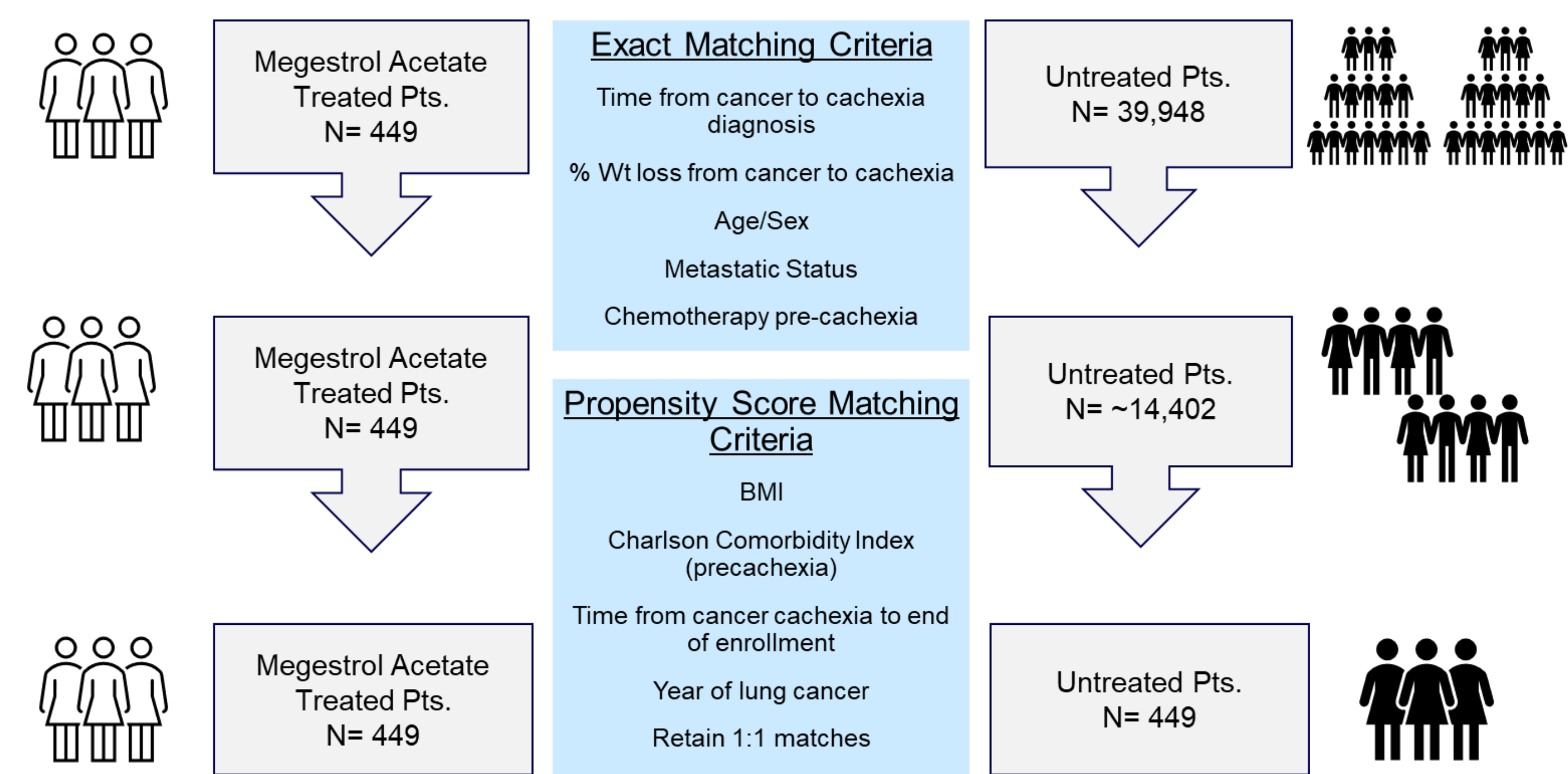


Fig 2. Propensity score matching on de-identified data obtained the *Optum Market Clarity Claims Database* to generate comparable clinical trial populations



REFERENCES

1. S. von Haehling, et al. J Cachexia Sarcopenia Muscle, 2010. 1(1): p.1-5
2. Hall, K.D. Am J Physiol Endocrinol Metab, 2010. 298(3): p. E449-66.
3. Temel, J.S., et al. Lancet Oncol, 2016. 17(4): p. 519-31.
4. Takayama, K., et al. Support Care Cancer, 2016. 24(8): p. 3495-505.
5. Katakami, N., et al. Cancer, 2018. 124(3): p. 606-16.

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RESULTS

Fig 3. Plausible virtual patient generation

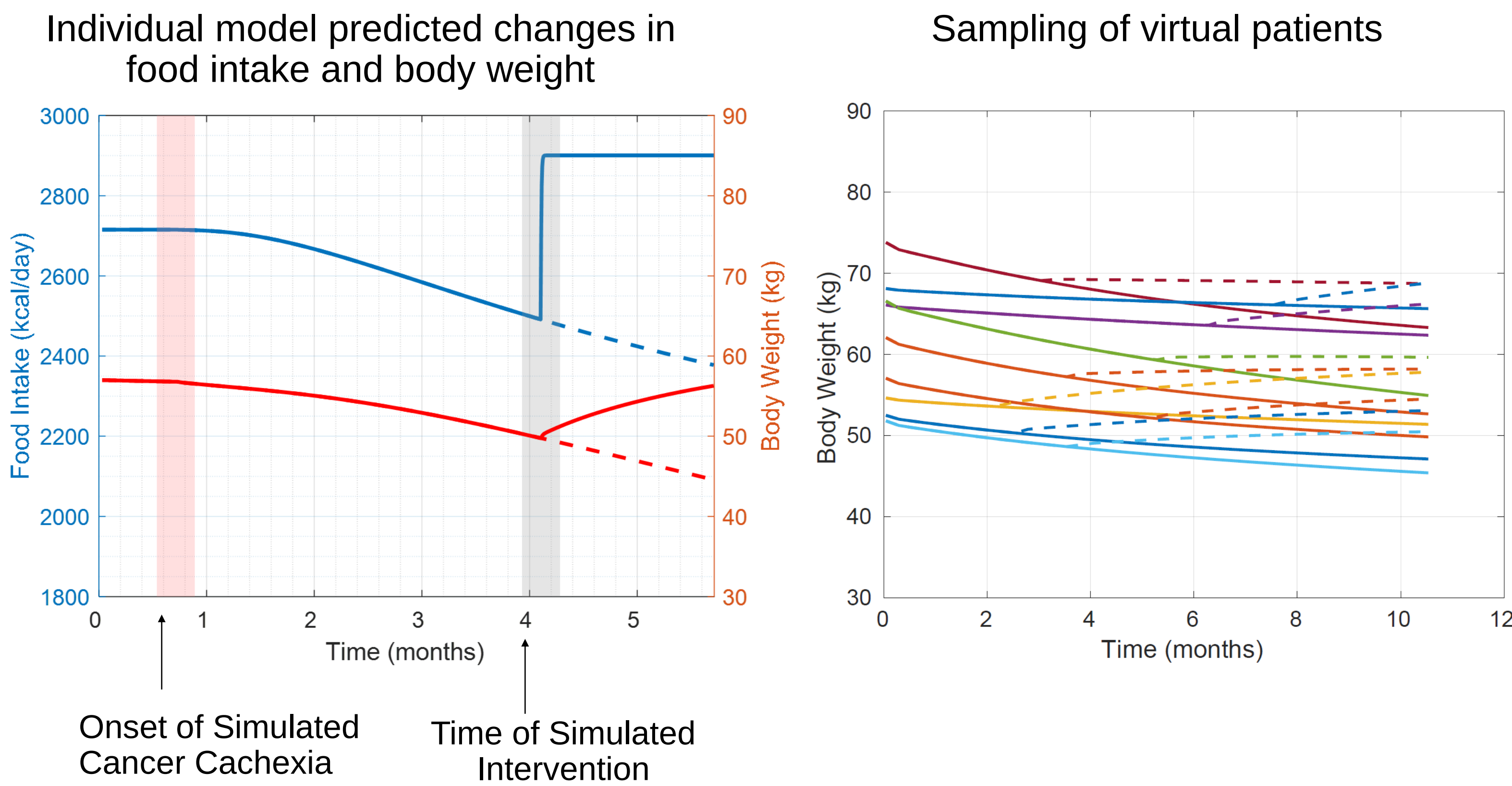


Fig 4. Virtual population optimized to match de-identified electronic health records from the US were obtained from the *Optum Market Clarity Claims Database*

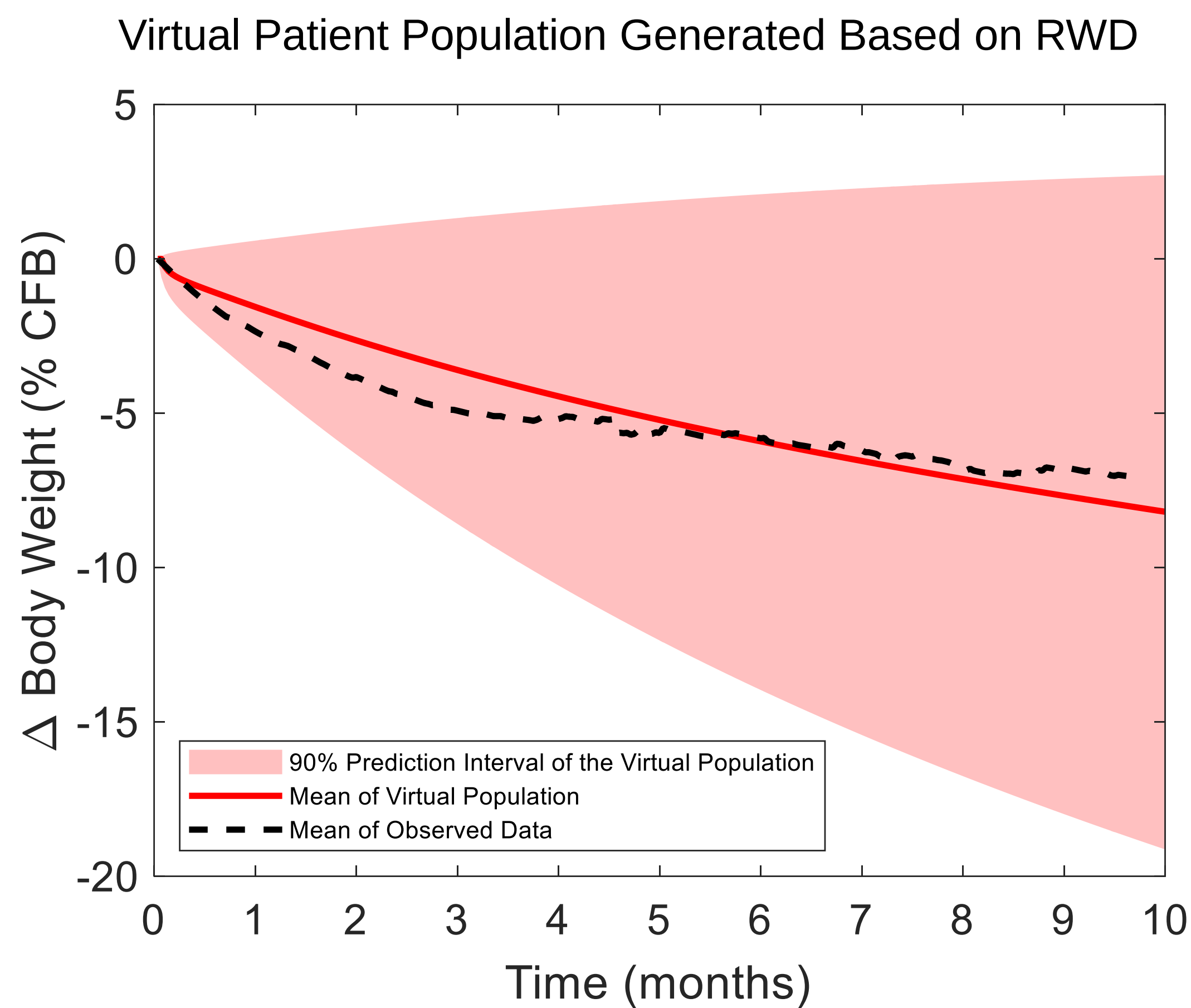
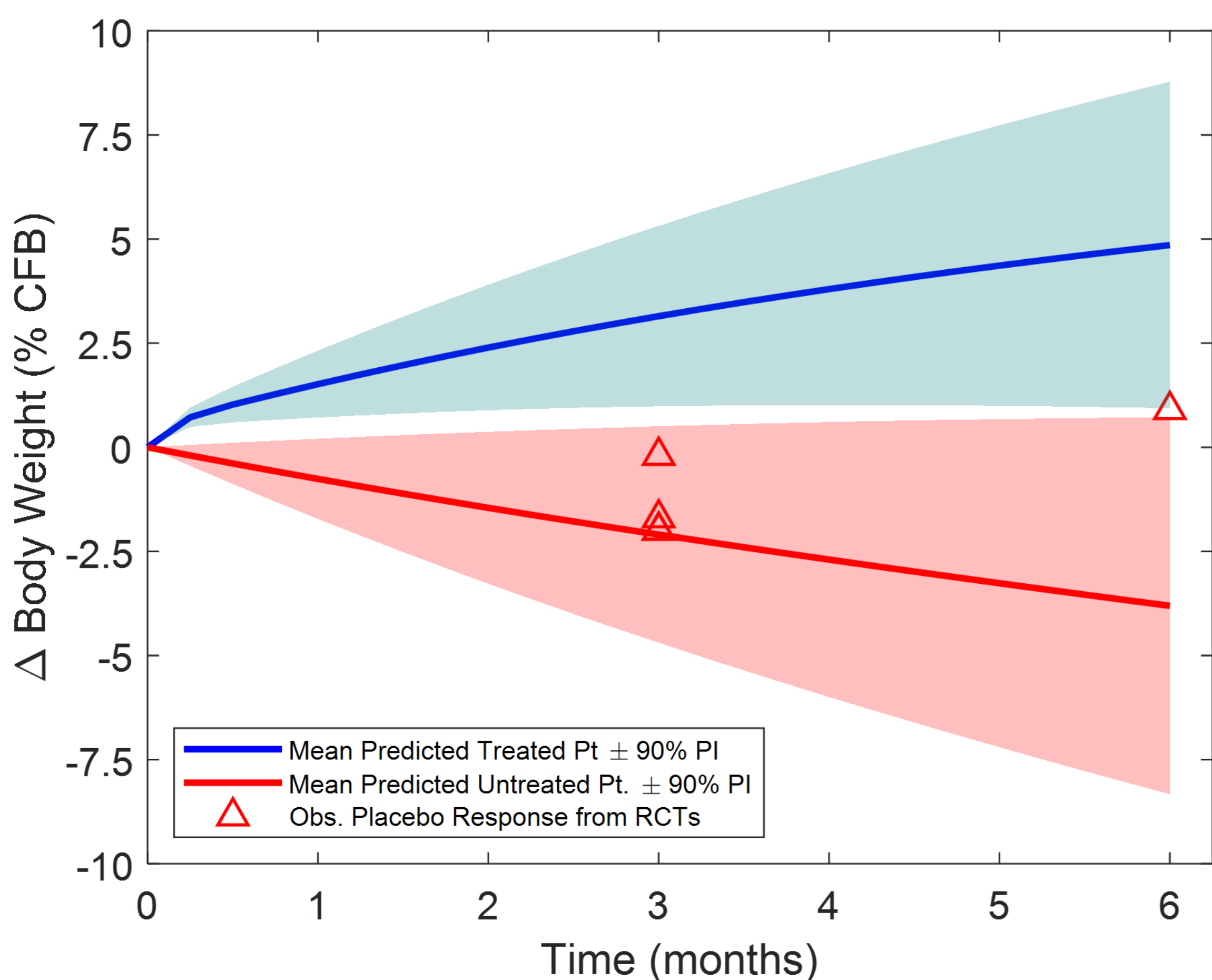


Fig 5. Clinical Trial Simulation compared to observed data from literature³⁻⁵



CONCLUSIONS

- ✓ Used real-world data to fill gaps in knowledge about the time-course of disease progression in patients with unintentional weight loss
- ✓ Generated virtual patients using a QSP model with metabolic features that represent patients from real-world data obtained from the *Optum Market Clarity Claims Database*
- ✓ Validated disease progression for patients with unintentional weight loss with published literature
- ✓ Model projections suggest ~230 kcal/day is needed to overcome the mean caloric deficit
- ❖ QSP modeling of cachexia real-world data allows us to prospectively simulate therapies to enable optimal clinical trial design