

Prevalence of Kidney Stones in Patients With Enteric Disorders

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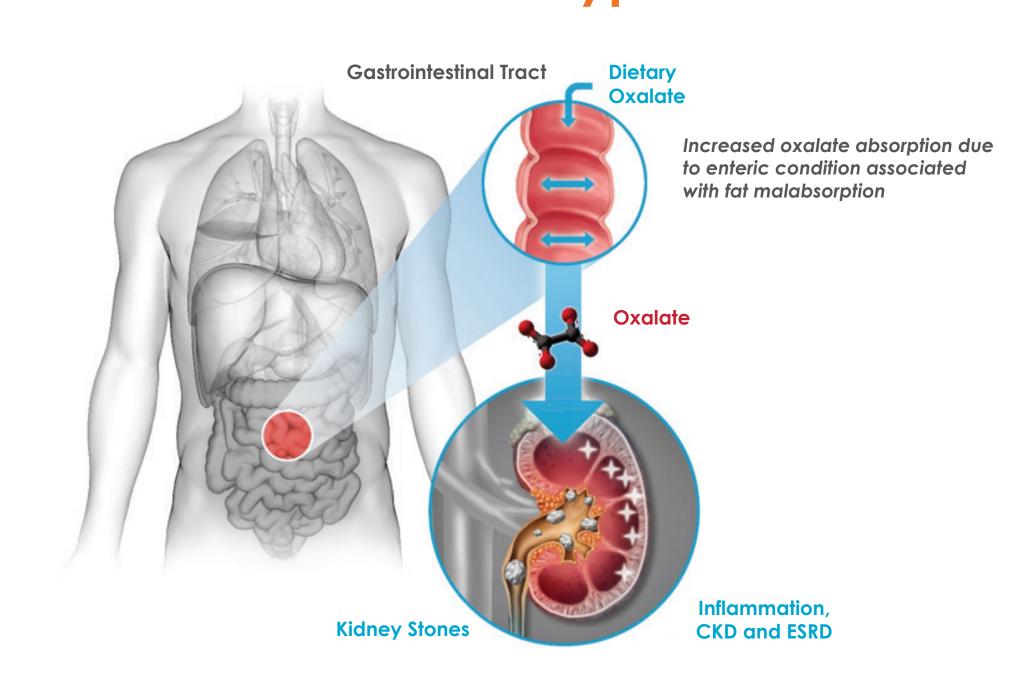
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Background

Enteric hyperoxaluria (EH) is characterized by excessive urine oxalate (UOx) excretion that is a complication of increased oxalate absorption due to an underlying gastrointestinal (GI) condition associated with malabsorption (eg, bariatric surgery, short bowel syndrome [SBS], inflammatory bowel disease [IBD]) (**Figure 1**).^{1,2}

Chronically elevated UOx is a major risk factor for progression of kidney stone (KS) disease. KS and inflammation due to oxalate crystal deposition cause permanent damage to the renal parenchyma, which can lead to chronic kidney disease (CKD) and end-stage renal disease (ESRD). 1,3

Figure 1. Schematic of Enteric Hyperoxaluria



The prevalence of EH is not well described, due in part to infrequent evaluation for risk factors contributing to KS disease, infrequent use of 24-hour urine tests, and the lack of a specific diagnostic code for EH.

Objectives

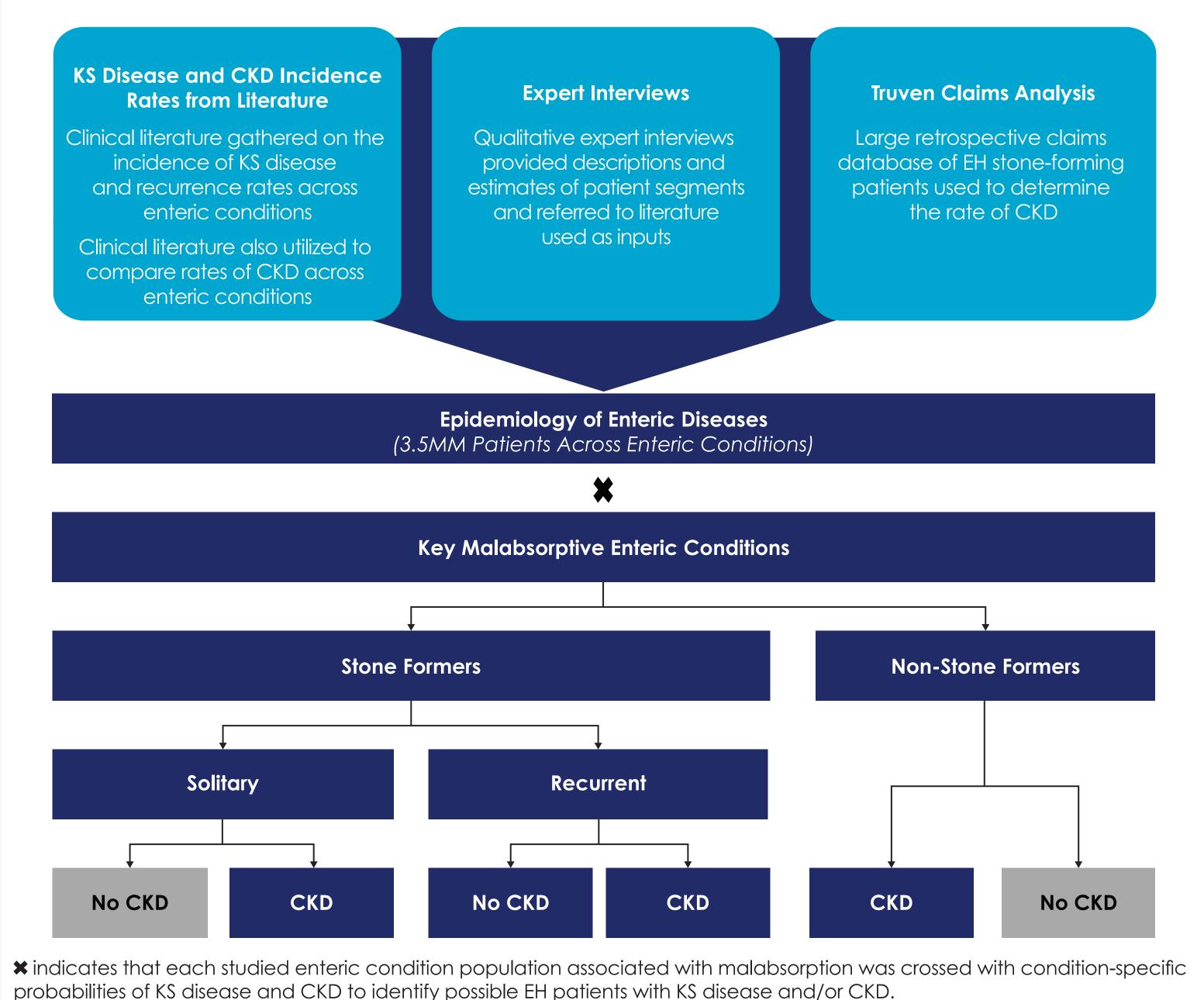
 We sought to estimate the prevalence of EH, the distribution of underlying causes, and the number of individuals with EH and kidney stones and/or CKD

Methods

- We developed a state-transition Markov model to estimate the current US prevalence of malabsorptive enteric disorders and the total number of stone-forming patients in the US.
 Model development included:
- 54 interviews with expert medical specialists who identified
 the commonly accepted enteric conditions associated
 with increased risk of EH and recurrent kidney stones.
 Experts also provided estimates of the strength of those
 associations, and referred the research team to the
 published literature used in this analysis

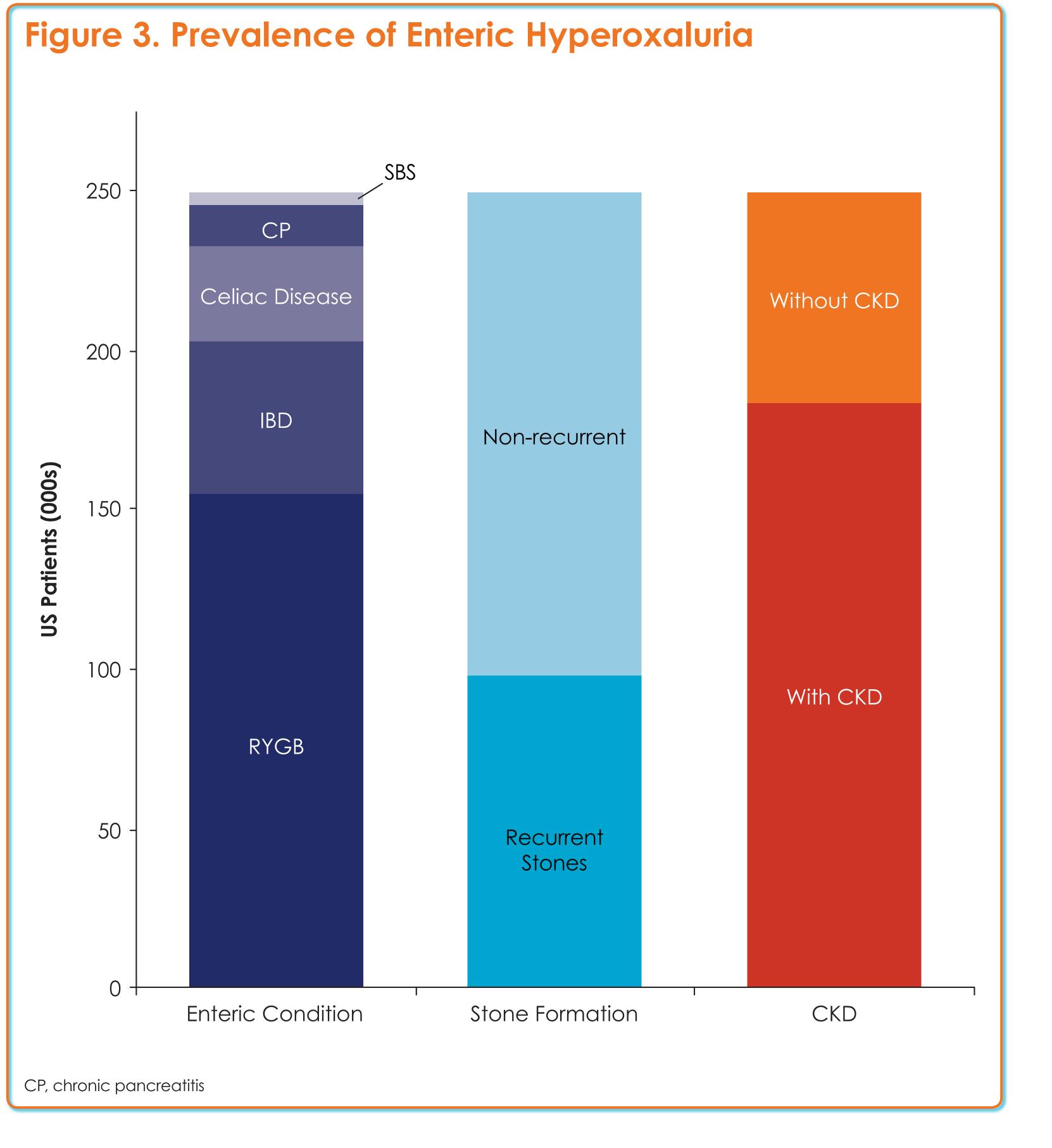
- Published clinical literature on kidney stone incidence and recurrence were used to estimate the stone-forming population within each of the enteric conditions identified
- A 4-year review of claims data (June 2012–June 2016) from the IBM Truven Health Analytics System (Figure 2) generated estimates of the percent of patients with an enteric disorder developing CKD to include those with and without a kidney stone history. Patients with pre-existing history of kidney stones and/or CKD were excluded from the claims analysis
- This model used a stacked incidence flow where the incidence of malabsorptive enteric conditions and competing risk of mortality were modeled over time to estimate:
- Prevalent population with relevant enteric conditions
- The risk and consequent number of stone-forming patients
- Solitary (1 stone event in lifetime) or
- Recurrent kidney stones (2+ stone events in lifetime)
- For every new patients with an incident enteric condition, the model incorporated assumptions about the probability of CKD and stone formation to estimate the prevalent population of patients developing recurrent kidney stones and CKD (Figure 2)

Figure 2. Methodology for Estimating the Prevalence of Malabsorptive Enteric Disorders and Stone-Forming Patients (with and without CKD)



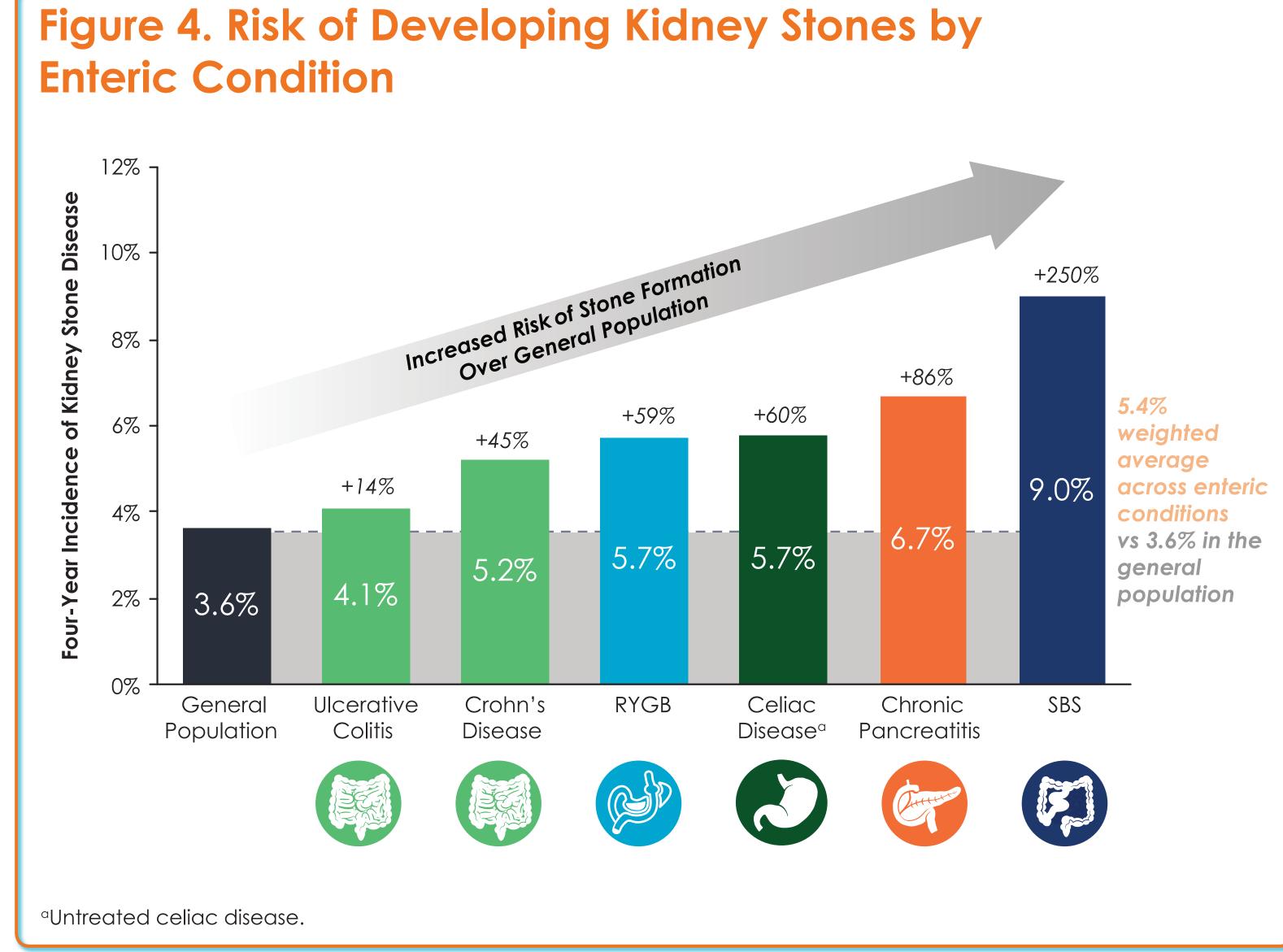
Results

- The 2019 US prevalence of patients with enteric conditions associated with CKD and/or recurrent kidney stones was estimated to be approximately 250,000
- The most frequent malabsorptive enteric conditions were Roux-en-Y gastric bypass (RYGB) and IBD (Figure 3)

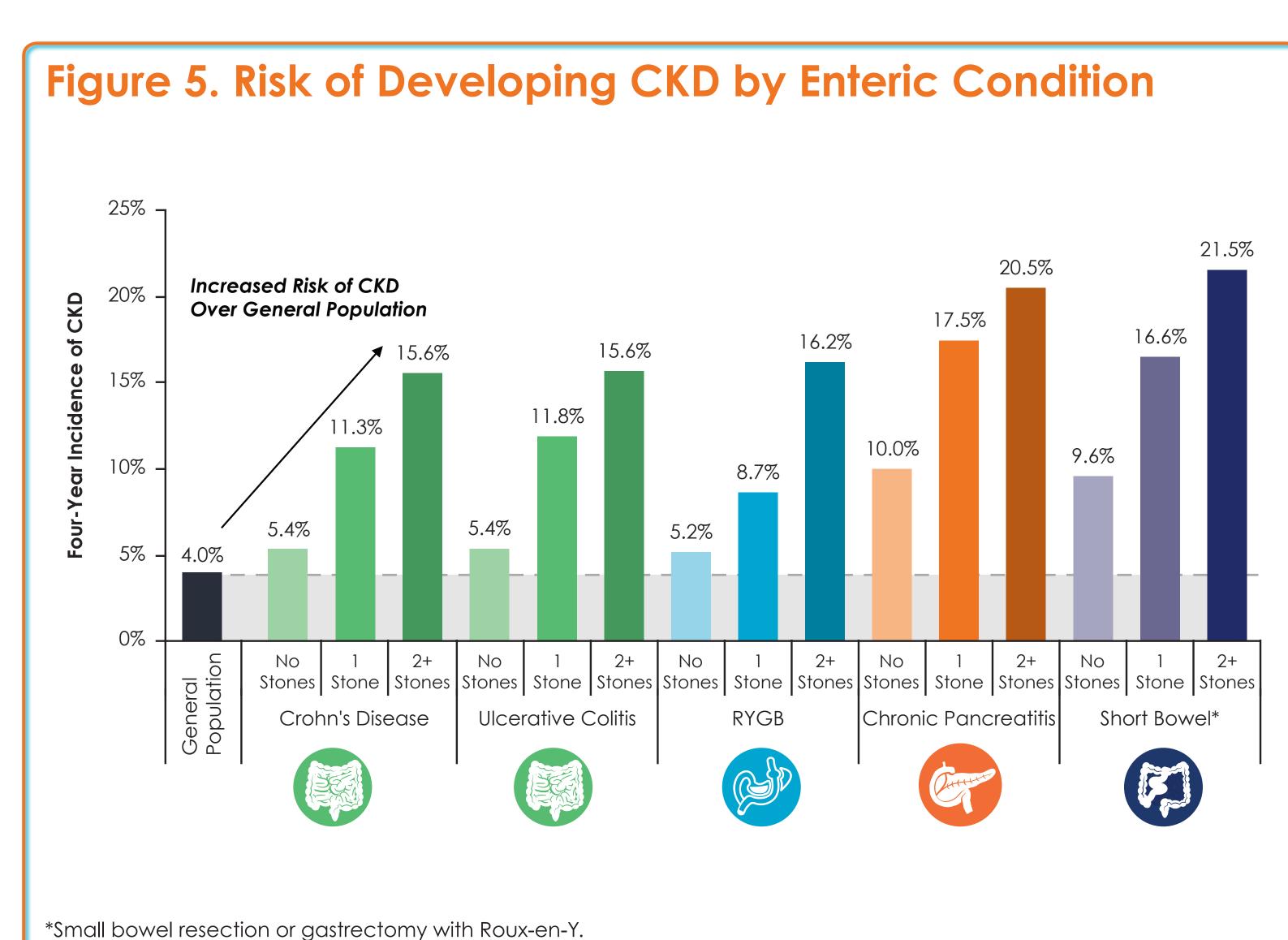




- Over 4 years, a weighted average of 5.4% of patients with enteric disease developed kidney stones, ~40% of whom eventually became recurrent stone formers
- Among the enteric conditions, the risk of developing kidney stones was highest (nearly 10%) in patients with short bowel syndrome



- Furthermore, patients with enteric disease, particularly those with a history of kidney stones, are more likely to develop CKD
- The risk of CKD was directly proportional to stone occurrence across all enteric disease populations (Figure 5)



Discussion

- This model provides prevalence and incidence estimates of EH and its underlying causes, along with the estimated prevalence of recurrent kidney stones and CKD within the EH population
- The limitations include:
- Some patients with relevant enteric conditions may have been misclassified based on accuracy of clinical diagnostic coding. This study did not review subject medical records
- Although the model accounted for the competing risk of mortality, competing risks of other non-enteric causes of kidney stones and CKD were not accounted for in this model. Enteric conditions were analyzed in isolation
- Future research comparing the relative rates of kidney stone events and the relationship with urinary oxalate excretion are needed to confirm these findings

Conclusions

- Based on this analysis of data across various sources, there are approximately 250,000 EH patients with KS disease and/ or CKD in the US
- Approximately 100,000 patients have recurrent KS disease
- A large proportion (70%) have CKD
- Additional epidemiological research and a specific diagnostic code could further improve efforts to understand and improve the recognition of EH

References

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