Supplementary Table 1 Model parameter in mortality among United States adults with IBD between 2006 and 2019

		ARMA (ARIMA) (RMSE)	Polynomial regression (RMSE)
Overall			
Total	IBD	ARIMA (0,0,0) (0.045)	$y = 1.32 + 0.004x$ (0.042)
	UC	ARIMA (0,0,0) (0.028)	$y = 0.79 + 0.02x - 0.01x^2 + 0.0002x^3$ (0.023)
	CD	ARIMA (0,0,0) (0.022)	$y = 0.50 + 0.003x$ (0.019)
Age			
25-64 yr	IBD	ARIMA (0,0,0) (0.013)	$y = 0.49 + 0.03x - 0.005x^2 + 0.0002x^3$ (0.012)
	UC	ARIMA (0,1,0) (0.012)	$y = 0.14 + 0.002x$ (0.008)
	CD	ARIMA (0,0,0) (0.014)	$y = 0.36 + 0.03x - 0.004x^2 + 0.0002x^3$ (0.011)
≥ 65 yr	IBD	ARIMA (0,0,0) (0.18)	$y = 4.74 - 0.09x + 0.007x^2$ (0.14)
	UC	ARIMA (0,0,0) (0.083)	$y = 1.92 + 0.06x - 0.01x^2 + 0.0007x^3$ (0.062)
	CD	ARIMA (0,0,0) (0.12)	$y = 2.69 - 0.06x + 0.005x^2$ (0.098)
Sex			
Female	IBD	ARIMA (0,0,0) (0.049)	$y = 1.20 + 0.05x - 0.008x^2 + 0.0004x^3$ (0.040)
	UC	ARIMA (0,0,0) (0.025)	$y = 0.39 + 0.03x - 0.005x^2 + 0.0002x^3$ (0.019)
	CD	ARIMA (0,0,0) (0.030)	$y = 0.81 + 0.02x - 0.003x^2 + 0.0002x^3$ (0.027)
Male	IBD	ARIMA (0,0,0) (0.048)	$y = 1.39 + 0.04x - 0.008x^2 + 0.0004x^3$ (0.029)
	UC	ARIMA (0,0,0) (0.026)	$y = 0.63 - 0.01x + 0.0009x^2$ (0.019)
	CD	ARIMA (0,0,0) (0.033)	$y = 0.78 + 0.04x - 0.0037x^2 + 0.0004x^3$ (0.023)
Race and ethnicity			
Non-Hispanic Whites	IBD	ARIMA (1,1,0) (0.059)	$y = 1.46 + 0.05x - 0.009x^2 + 0.0005x^3$ (0.038)
	UC	ARIMA (0,1,0) (0.030)	$y = 0.55 + 0.02x - 0.003x^2 + 0.0002x^3$ (0.015)
	CD	ARIMA (0,0,0) (0.040)	$y = 0.91 + 0.04x - 0.007x^2 + 0.0003x^3$ (0.028)
Non-Hispanic Blacks	IBD	ARIMA (0,1,0) (0.060)	$y = 0.69 + 0.04x - 0.005x^2 + 0.0003x^3$ (0.042)
	UC	ARIMA (0,0,0) (0.039)	$y = 0.14 + 0.08x - 0.012x^2 + 0.0005x^3$ (0.025)
	CD	ARIMA (0,1,0) (0.046)	$y = 0.56 - 0.04x + 0.007x^2 - 0.0003x^3$ (0.032)
Hispanics	IBD	ARIMA (0,0,0) (0.051)	$y = 0.49 + 0.03x - 0.006x^2 + 0.0003x^3$ (0.042)
	UC	ARIMA (0,1,0) (0.057)	$y = 0.33 - 0.002x - 0.002x^2 + 0.00001x^3$ (0.034)

CD   ARIMA (0,0,0) (0.046) $y = 0.16 + 0.03x - 0.004x^2 + 0.0002x^3$ (0.042)

RMSE: Root Mean Square Error; where y means ASMR, x means time points.

Supplementary Table 2 Observed and predicted age-standardized mortality rates (per 100000 persons) of top three cause of death among CD and UC in 2020 and 2021

	2006	2019	2020			2021		
			Observed	Predicted (95%CI)	Increase %	Observed	Predicted (95%CI)	Increase %
CD								
Digestive System	0.35	0.33	0.35	0.32 (0.28-0.37)	7.74	0.37	0.33 (0.26-0.41)	11.66
Circulatory System	0.15	0.14	0.17	0.15 (0.12-0.18)	11.18	0.16	0.17 (0.12-0.22)	-3.40
Neoplasms	0.12	0.15	0.16	0.16 (0.12-0.20)	-2.76	0.18	0.17 (0.11-0.23)	5.92
UC								
Digestive System	0.20	0.20	0.18	0.21 (0.17-0.26)	-14.53	0.20	0.24 (0.16-0.31)	-13.76
Circulatory System	0.11	0.10	0.12	0.10 (0.08-0.12)	20.42	0.11	0.10 (0.08-0.12)	5.77
Neoplasms	0.08	0.11	0.13	0.12 (0.10-0.14)	8.08	0.14	0.13 (0.10-0.16)	3.00
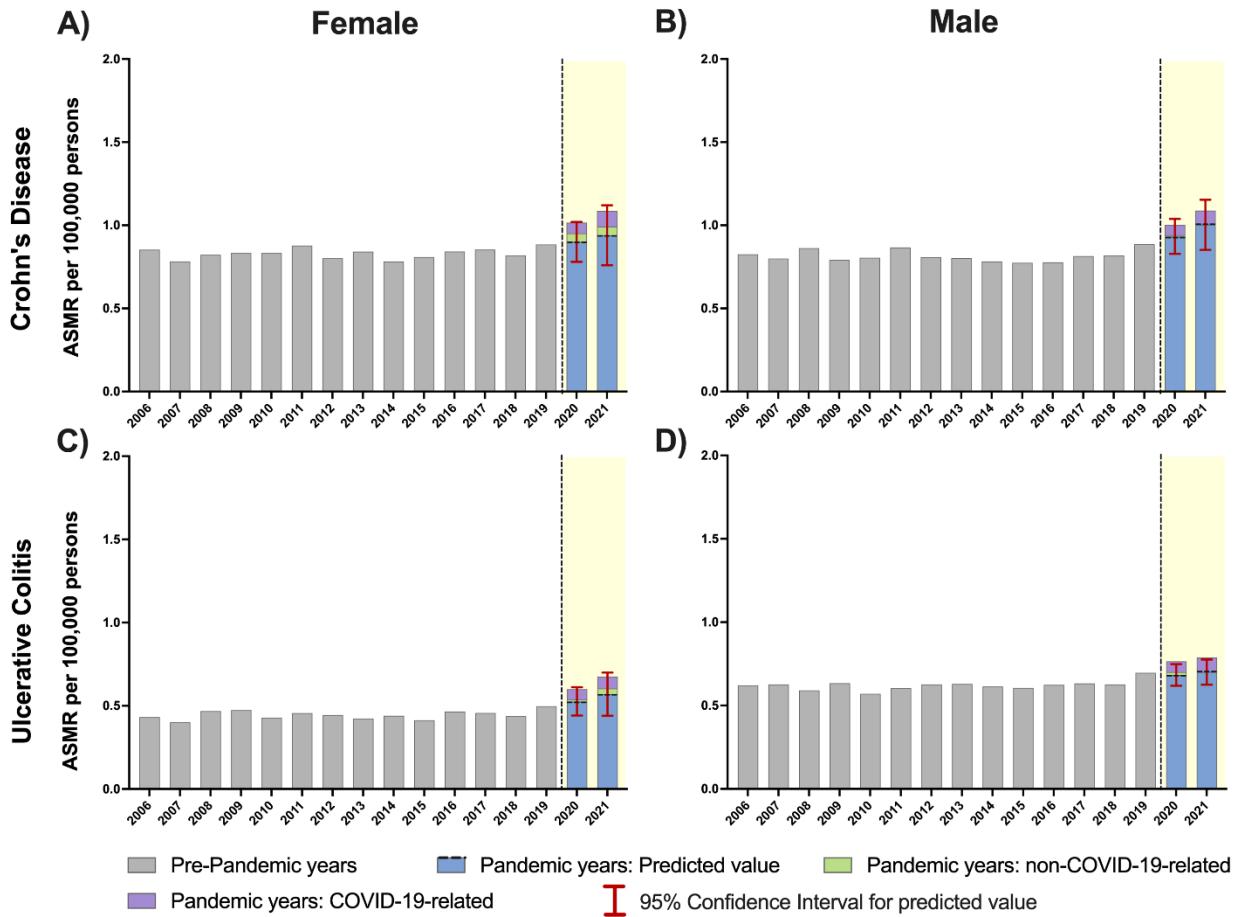
Supplementary Figure 1 Observed COVID-19-related, Non-COVID-19-related, and Predicted Age-Standardized Mortality Rate Trends Among UC and CD Decedents Stratified by Sex from 2006 to 2021. Trends in ASMR per 100,000 persons are shown among female CD decedents (A), male CD decedents (B), female UC decedents(C), and male UC decedents (D). Error bars represent the 95% confidence intervals for predicted ASMR. ASMR: Age-standardized mortality rate; CD: Crohn's disease; COVID-19: Coronavirus disease 2019; UC: Ulcerative colitis.

Top Three Causes of Death

A) **Crohns's Disease Non-Hispanic Black**
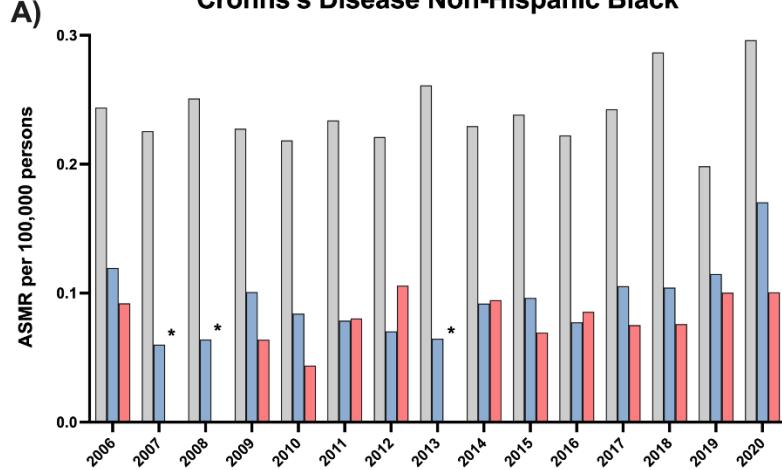
B) **Ulcerative Colitis 25-64 Years Old**

Diseases of the Digestive System | Diseases of the Circulatory System
Neoplasms
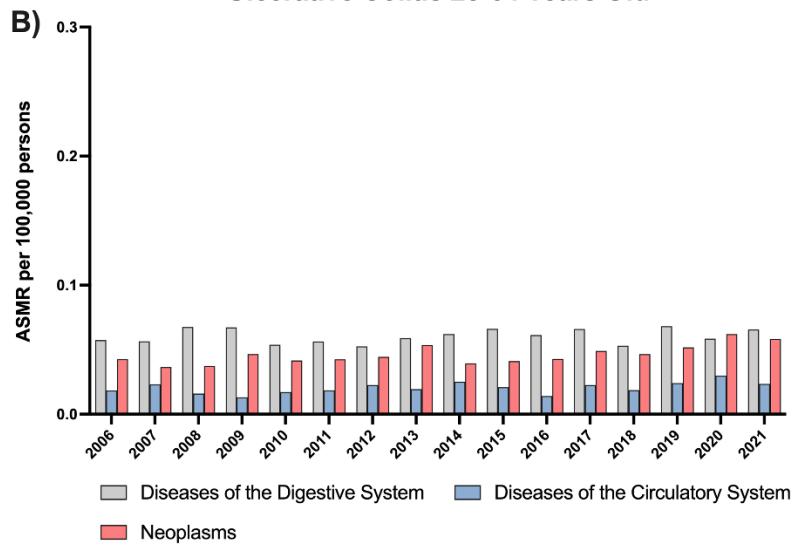
Supplementary Figure 2 Age-Standardized Mortality Rate Trends Among Non-Hispanic Black CD Decedents and Young UC Decedents by Top Three Causes of Death from 2006 to 2021. Trends in ASMR per 100000 persons are shown among the top three causes of death of Non-Hispanic Black CD decedents (A) and UC decedents aged 25-64 years old (B). ASMR: Age-standardized mortality rate; CD: Crohn's disease; UC: Ulcerative colitis.