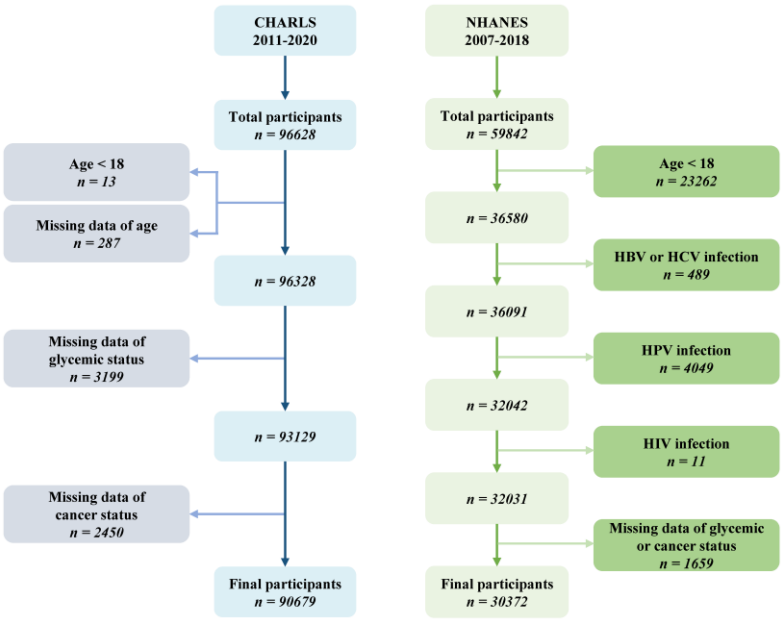
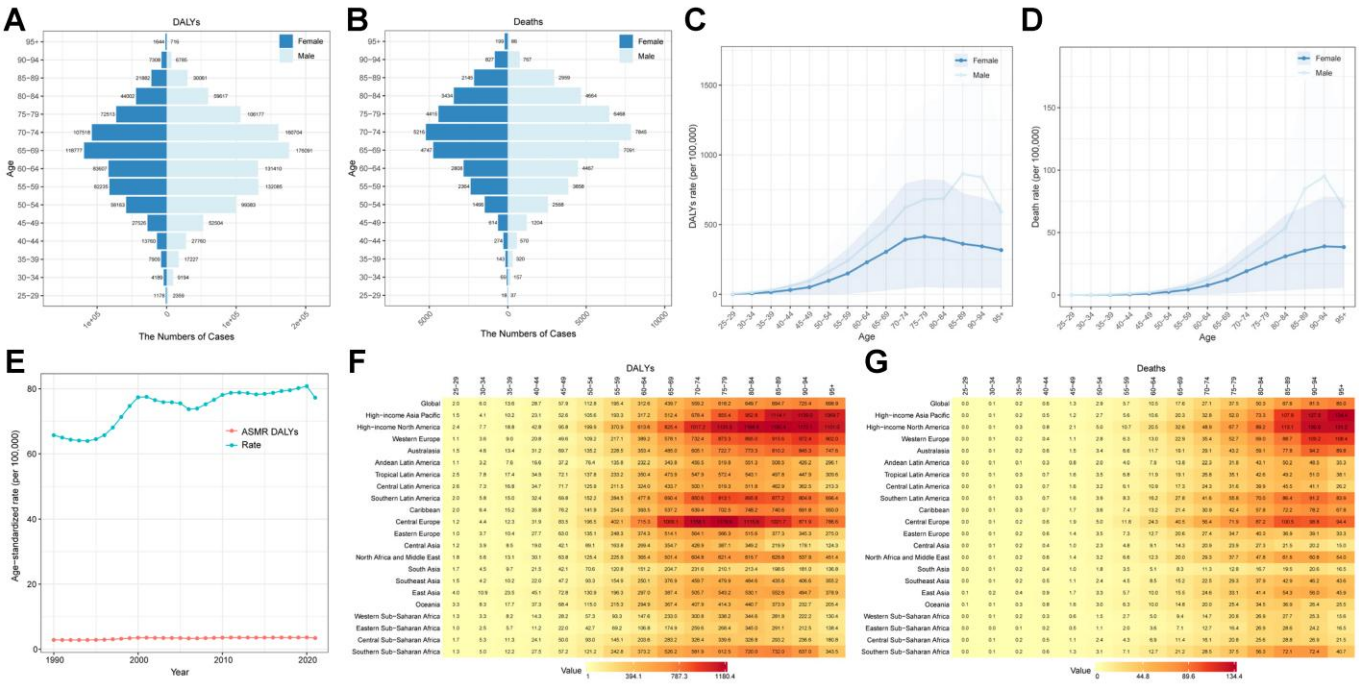
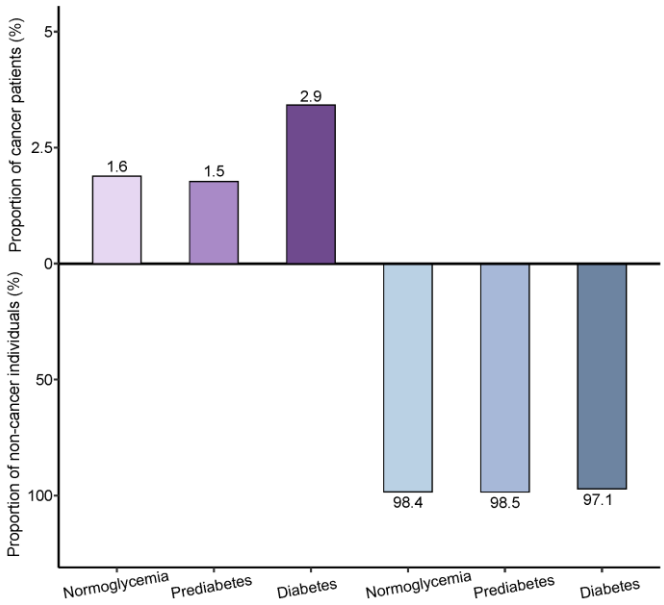


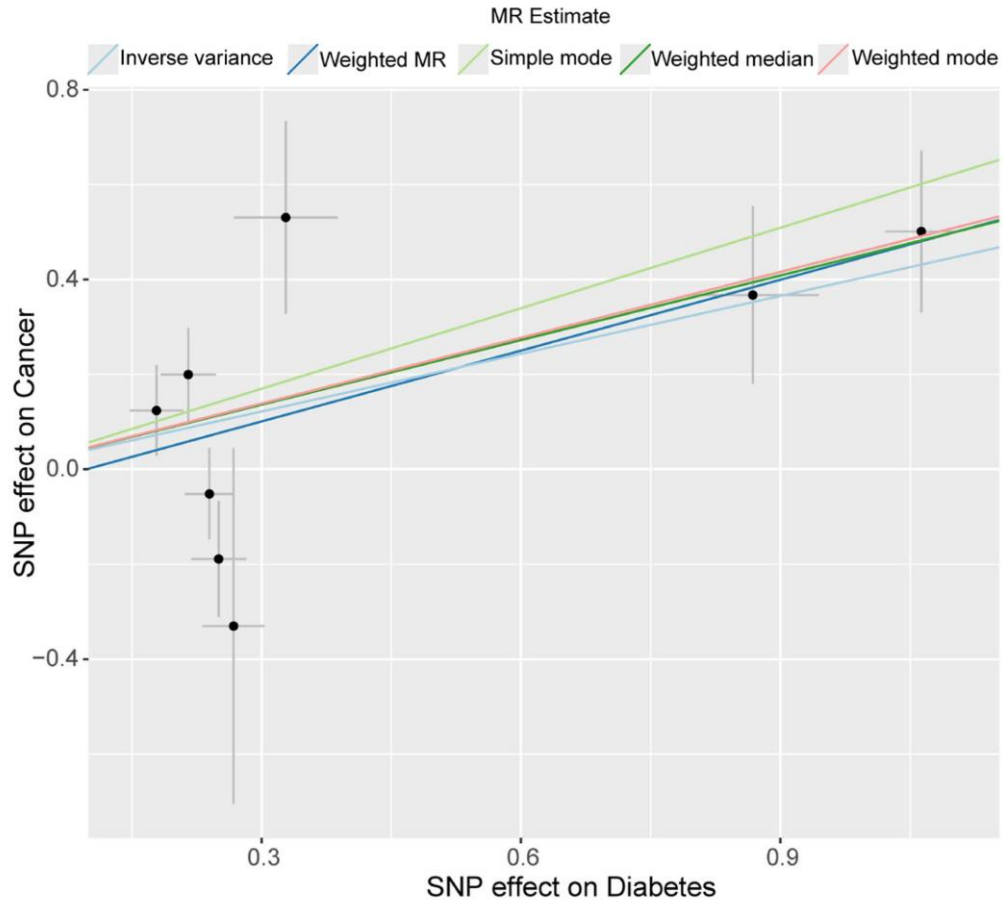
Supplementary Figure 1 Flow chart of study participants.



Supplementary Figure 2 China cancer burden attributable to high FPG across age, gender, and region. A and B: Age-sex population pyramids of DALYs and deaths in 2021; C and D: ASR of DALYs and deaths by sex; E: Time trends in age-standardized DALY rate and ASMR from 1990 to 2021; F and G: Regional heatmaps showing temporal changes in DALY rates and mortality rates across GBD super-regions and regions.



Supplementary Figure 3 Proportion of cancer patients and non-cancer individuals stratified by diabetic status in the China Health and Retirement Longitudinal Study cohort.



Supplementary Figure 4 Scatter plots for causal effects of diabetes on cancer.

Supplementary Table 1 Definitions of diabetic status.

Item	Indicator	Normoglycemia	Prediabetes	Diabetes
Definition in CHARLS	FPG	< 100 mg/dL	≥ 100 mg/dL, < 126 mg/dL	≥ 126 mg/dL
	HbA1c	< 5.7%, < 39 mmol/mol	≥ 5.7%, < 6.5%, ≥ 39 mmol/mol, < 48 mmol/mol	≥ 6.5%, ≥ 48 mmol/mol
	Self-report diagnosis	No	No	Diagnosis of diabetes
	Diagnosis based on blood examination	No	No	Diagnosis of diabetes
Definition in NHANES	FPG	< 5.6 mmol/L	≥ 5.6 mmol/L, < 7.0 mmol/L	≥7.0 mmol/L
		< 100 mg/dL	≥ 100 mg/dL, < 126 mg/dL	≥126 mg/dL
	HbA1c	< 5.7%	≥ 5.7%, < 6.5%	≥ 6.5%
	Self-report diagnosis	No	Diagnosis of prediabetes	Diagnosis of diabetes
	Self-report insulin use	No	Either yes or no	Yes
	Self-report oral hypoglycemic agents use	No	Either yes or no	Yes

Supplementary Table 2 Trends in cancer burden attributable to high fasting plasma glucose in China, 1990-2021

Cancer burden	Gender	ASR 1990, per 100000 (95% UI)	ASR 2021, per 100000 (95% UI)	PC, 1990-2021, %	AAPC, % (95% UI)
Mortality	Male	3.56 (0.44,4.52 (0.56, 9.01) 6.85)	27.00	1.13% (0.91, 1.36)	

	Female	2.38 (0.28,2.6 4.69)	(0.23, 5.41)	9.20	0.29% 0.48)	(0.10,
	Both	2.88 (0.35,3.45 5.65)	(0.38, 6.70)	19.80	0.81% 1.00)	(0.61,
DALYs	Male	77.32 (9.69,96.03 151.35)	(12.72, 190.92)	24.20	1.06% 1.24)	(0.88,
	Female	53.89 (5.71,56.42 108.45)	(4.15, 117.97)	4.70	0.13% 0.30)	(-0.04,
	Both	64.71 (7.65,75.16 128.70)	(8.18, 146.25)	16.10	0.69% 0.85)	(0.53,

PC: Percent change; AAPC: Average annual percent change; UI: Uncertainty interval.

Supplementary Table 3 Trends in cancer disability-adjusted life years attributable to high fasting plasma glucose in China, 1990-2021

Cancer DALYs	**Gender**	**ASR 1990, per 100000 (95% UI)**	**ASR 2021, per 100000 (95% UI)**	**PC, 1990-2021, %**	**AAPC (95% UI)**	
YLDs	Male	1.06 (0.20,2.23 2.06)	(0.61, 4.33)	110.40	2.97% 3.14%)	(2.81%,
	Female	1.00 (0.07,2.02 2.15)	(0.07, 4.23)	102.00	2.52% 2.63%)	(2.41%,
	Both	1.02 (0.13,2.10 2.00)	(0.34, 4.16)	105.90	2.77% 2.89%)	(2.64%,
YLLs	Male	77.32 (9.69,96.03 151.35)	(12.72, 190.92)	24.20	1.06% 1.24%)	(0.88%,
	Female	53.89 (5.71,56.42 108.45)	(4.15, 117.97)	4.70	0.13% 0.30%)	(-0.04%,
	Both	64.71 (7.65,75.16 128.70)	(8.18, 146.25)	16.10	0.69% 0.85%)	(0.53%,

Supplementary Table 4 Baseline characteristics of participants in the National

Health and Nutrition Examination Survey, *n* (%)/mean ± SD

Characteristic	Diabetic status (unweighted, *n* = 30372)			*P* value
	Normoglycemia (*n* = 14281)	Prediabetes (*n* = 10354)	Diabetes (*n* = 5737)	
Gender				< 0.001
Female	6728 (47.1)	4575 (44.2)	2593 (45.2)	
Male	7553 (52.9)	5779 (55.8)	3144 (54.8)	
Age (years)	44.5 ± 17.7	54.7 ± 16.7	62.4 ± 13.1	< 0.001
Race				< 0.001
Mexican American	1996 (14.0)	1574 (15.2)	1014 (17.7)	
Other Hispanic	1431 (10.0)	1085 (10.5)	634 (11.1)	
Non-Hispanic White	6319 (44.2)	4248 (41.0)	1968 (34.3)	
Non-Hispanic Black	2595 (18.2)	2133 (20.6)	1441 (25.1)	
Other Race	1940 (13.6)	1314 (12.7)	680 (11.9)	
Education				
Lower education	3004 (21.0)	2693 (26.0)	1979 (34.5)	< 0.001
High school and equivalent	3160 (22.1)	2426 (23.4)	1319 (23.0)	
Postsecondary education	4256 (29.8)	2874 (27.8)	1499 (26.1)	
Higher education	3845 (26.9)	2346 (22.7)	928 (16.2)	
Family poverty income ratio	2.6 ± 1.7	2.6 ± 1.6	2.3 ± 1.5	< 0.001
BMI (kg/m^2)	27.4 ± 6.1	29.8 ± 6.8	32.3 ± 7.6	< 0.001
Alcohol consumption				< 0.001
Moderate	4547 (53.7)	3700 (59.7)	1747 (65.9)	
Mild	2276 (26.9)	1513 (24.4)	557 (21.0)	
Heavy	1642 (19.4)	986 (15.9)	345 (13.0)	
Cigarette use				< 0.001
Not at all	2857 (49.8)	394 (8.3)	144 (5.1)	
Some days	618 (10.8)	68 (7.9)	46 (6.8)	
Every day	2263 (39.4)	1592 (33.4)	723 (25.6)	
Physical activity				< 0.001
No	8223 (57.6)	6014 (58.1)	3931 (68.5)	

Moderate work	2994 (21.0)	2210 (21.3)	1018 (17.7)	
Vigorous work	3064 (21.5)	2129 (20.6)	787 (13.7)	
Dietary patterns				< 0.001
Poor	684 (4.8)	611 (5.9)	374 (6.5)	
Fair	3114 (21.8)	2397 (23.2)	1502 (26.2)	
Good	5945 (41.6)	4232 (40.9)	2385 (41.6)	
Very good	3152 (22.1)	2190 (21.2)	1041 (18.2)	
Excellent	1378 (9.7)	923 (8.9)	431 (7.5)	
Hypertension				< 0.001
No	10872 (76.1)	6080 (58.7)	1893 (33.0)	
Yes	3396 (23.8)	4259 (41.1)	3830 (66.8)	

Supplementary Table 5 Baseline characteristics of participants in the China Health and Retirement Longitudinal Study, *n* (%)/mean ± SD

Characteristic	**Diabetic status**			***P* value**
	Normoglycemia (*n* = 73162)	**Prediabetes (*n* = 6127)**	**Diabetes (*n* = 11390)**	
Age	60.7 ± 10.5	61.8 ± 9.4	63.3 ± 9.5	< 0.001
Gender				< 0.001
Female	37971 (51.9)	3354 (54.7)	6373 (56.0)	
Male	35191 (48.1)	2773 (45.3)	5017 (44.0)	
Ethnicity				< 0.001
Han Chinese	5138 (8.0)	394 (7.2)	610 (6.1)	
Non-Han Chinese	59131 (92.0)	5105 (92.8)	9359 (93.9)	
Education				< 0.001
Low education level	48791 (66.7)	4285 (69.9)	7470 (65.6)	
High education level	24341 (33.3)	1842 (30.1)	3913 (34.4)	
Family income	38738.07	±19542.08	±40323.34	±< 0.001
	209550.86	53900.96	76688.84	
BMI (kg/m^2)	23.5 ±3.9	23.9 ± 4.1	25.1 ± 4.0	< 0.001
Alcohol consumption				< 0.001

No	31197 (55.2)	3460 (56.6)	4927 (57.8)	
Yes	25301 (44.8)	2658 (43.4)	3592 (42.2)	
Cigarette use				< 0.001
No	42177 (57.7)	3537 (57.7)	6861 (60.3)	
Yes	30870 (42.3)	2590 (42.3)	4518 (39.7)	
Physical activity				< 0.001
No	5107 (10.4)	310 (10.4)	991 (12.6)	
Yes	43917 (89.6)	2669 (89.6)	6845 (87.4)	
Hypertension				< 0.001
No	44780 (61.4)	3000 (49.3)	3972 (35.0)	
Yes	28157 (38.6)	3085 (50.7)	7388 (65.0)	

Supplementary Table 6 Cancer prevalence stratified by diabetic status in the National Health and Nutrition Examination Survey, *n* (%)

Characteristic	**Diabetic status**							**P value**
	Unweighted, *n* = 30372			***P***	**weighted, *n* = 1188769788.1**			
	Normoglycemia (*n* = 14281)	**Prediabetes (*n* = 10354)**	**Diabetes (*n* = 5737)**	**value**	**Normoglycemia (*n* = 608391705.6)**	**Prediabetes (*n* = 412604931.6)**	**Diabetes (*n* = 167773150.9)**	
Cancer status				< 0.001				< 0.001
Cancer-free	13202 (92.4)	9190 (88.8)	4879 (85.0)		560466027.1 (92.1)	361365037.7 (87.6)	138577095.6 (82.6)	
Single cancer type	965 (6.8)	1028 (9.9)	766 (13.3)		42971787.2 (7.1)	45200566.9 (11.0)	25929778.5 (15.5)	
Two distinct cancer types	102 (0.7)	128 (1.2)	73 (1.3)		4529172.2 (0.7)	5601137.9 (1.4)	2445453.3 (1.5)	
Three distinct cancer types	11 (0.1)	7 (0.1)	15 (0.3)		424719.1 (0.1)	426565.7 (0.1)	633140.8 (0.4)	
Multiple cancer types	1 (0.0)	1 (0.0)	4 (0.1)		0.0 (0.0)	11623.5 (0.0)	187682.7 (0.1)	

Supplementary Table 7 Survival outcomes in cancer patients stratified by diabetic status in the National Health and Nutrition Examination Survey, *n* (%)/mean ± SD

Characteristic	Diabetic status							
	Unweighted, *n* = 3101			*P* value	weighted, *n* = 128361627.7			*P* value
	Normoglycemia (*n* = 1079)	Prediabetes (*n* = 1164)	Diabetes (*n* = 858)		Normoglycemia (*n* = 47925678.5)	Prediabetes (*n* = 51239893.9)	Diabetes (*n* = 29196055.3)	
Survival status				< 0.001				< 0.001
Alive	776 (71.9)	919 (79.0)	579 (67.5)		40048886.2 (83.6)	43057799.7 (84.0)	21557316.9 (73.8)	
Deceased	303 (28.1)	245 (21.0)	279 (32.5)		7876792.3 (16.4)	8182094.1 (16.0)	7638738.4 (26.2)	
Follow-up person-months	71.64 ± 42.81	72.00 ± 41.56	65.59 ± 40.70	0.001	74.05 ± 40.85	70.01 ± 40.01	64.67 ± 39.87	0.006

Supplementary Table 8 Strength of the genetic instruments for diabetes in the finn-b-E4_DMNAS dataset

SNP	β	SE	*F* statistic
rs6679677	0.2676	0.0359	55.56
rs7903146	0.2152	0.0319	45.51
rs689	0.2504	0.0318	62.00
rs76236532	0.3280	0.0602	29.69
rs3129054	−0.1785	0.0307	33.81
rs2395042	0.2397	0.0281	72.77
rs2849017	0.8681	0.0765	128.77
rs9275095	1.0630	0.0420	640.57