
Supplementary File 2

Projected health and economic impacts of improving attendance to the NHS Health Check in England: A sex-disaggregated analysis with implications for men's health

Data input tables

Table S1. Colorectal cancer prevalence

Colorectal cancer prevalence per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0.8353733	0.5805964
10-14	0.8199896	0.7138953
15-19	2.3122845	1.9284606
20-24	6.888587	5.7162449
25-29	18.670018	16.834217
30-34	37.716769	33.304685
35-39	64.303405	60.61417
40-44	106.06368	103.74901
45-49	180.14265	167.57138
50-54	348.73589	286.64554
55-59	588.38252	442.08082
60-64	1001.0497	644.79297
65-69	1415.9231	908.4022
70-74	1906.9159	1238.307
75-79	2299.6529	1617.0689
80-84	2495.3125	1807.1373
85-89	2291.0915	1636.5363
90-94	1592.5981	1098.0252
95+	1398.8195	926.26937

Table S2 Colorectal cancer mortality

Colorectal cancer mortality per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0.024945	0.016559
10-14	0.02764	0.022745
15-19	0.059458	0.047018
20-24	0.196029	0.15107
25-29	0.597168	0.481754
30-34	1.382987	1.081924
35-39	2.305152	1.878384
40-44	4.121457	3.50145
45-49	7.836501	6.498347
50-54	15.47521	11.59841
55-59	27.88621	19.20071
60-64	49.95647	30.14295
65-69	76.15488	46.1222
70-74	119.6394	73.385
75-79	182.2311	122.8038
80-84	286.1074	203.8912
85-89	429.7781	319.0801
90-94	605.356	476.0461
95+	808.6245	705.7688

Table S3. Lung cancer incidence

Lung cancer incidence per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0.01556	0.025044
15-19	0.039707	0.084121
20-24	0.119549	0.147924
25-29	0.369877	0.419501
30-34	1.131789	1.1875
35-39	2.707386	2.491906
40-44	5.813075	5.421714
45-49	13.47271	12.87269
50-54	35.85814	32.15957
55-59	69.63827	59.74928
60-64	140.5326	110.3967
65-69	226.4814	173.2422
70-74	337.4479	249.6095
75-79	436.2454	296.5108
80-84	529.8192	343.592
85-89	629.3755	379.3297
90-94	616.9388	329.8627
95+	561.5549	348.5323

Table S4. Lung cancer prevalence

Lung cancer prevalence per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0.035406	0.065287
15-19	0.125807	0.293968
20-24	0.334628	0.450242
25-29	0.895985	1.152408
30-34	2.334034	2.749445
35-39	5.366874	5.639424
40-44	10.63142	11.66698
45-49	26.65452	28.63729
50-54	70.62117	70.8838
55-59	134.9817	127.5609
60-64	259.1345	221.0761
65-69	400.7829	320.7341
70-74	550.3733	425.9358
75-79	626.0261	439.6611
80-84	669.9577	438.7096
85-89	695.4966	434.1304
90-94	506.6388	243.6407
95+	287.6161	177.1179

Table S5. Lung cancer mortality

Lung cancer mortality per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0.01022	0.015331
15-19	0.020977	0.041694
20-24	0.070804	0.081686
25-29	0.238934	0.252453
30-34	0.812524	0.790819
35-39	2.020083	1.735251
40-44	4.570136	3.958424
45-49	10.34566	9.133617
50-54	27.45203	23.00623
55-59	53.36877	43.11395
60-64	109.7669	82.19024
65-69	180.4616	133.2038
70-74	275.8208	199.6897
75-79	376.0732	251.8704
80-84	481.5908	311.1359
85-89	597.6828	359.9153
90-94	656.3457	381.041
95+	770.3301	514.8798

Table S6. CHD incidence

CHD incidence per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0	0
15-19	4.90341	6.583214
20-24	16.2567	20.743302
25-29	29.1294	35.81024
30-34	44.4005	37.903019
35-39	61.9848	27.01552
40-44	141.439	36.855302
45-49	283.148	67.674606
50-54	469.839	121.19865
55-59	701.304	197.36257
60-64	890.428	295.248
65-69	1036.45	414.32927
70-74	1279.67	618.87552
75-79	1624.38	911.44475
80-84	2053.9	1286.0722
85-89	2557.54	1734.5255
90-94	2680.35	1933.1396
95+	2421.66	1877.6707

Table S7. CHD prevalence

CHD prevalence per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0	0
15-19	15.21425413	23.0083114
20-24	36.20193932	51.401068
25-29	105.4042035	140.536318
30-34	234.1900553	280.699111
35-39	445.2542413	414.894482
40-44	825.8285234	565.418494
45-49	1618.146561	818.38682
50-54	2994.657909	1260.21435
55-59	5049.680945	2005.09736
60-64	7723.398766	3108.89728
65-69	11472.99607	4891.05614
70-74	14572.06553	6817.80353
75-79	17583.55106	9144.90652
80-84	19305.85163	11024.9011
85-89	18515.09533	11294.7586
90-94	15813.99262	10194.739
95+	12289.49971	8106.52318

Table S8. CHD mortality

CHD mortality per 100,000		
Age	Males	Females
0	0	0
1-4	0	0
5-9	0	0
10-14	0	0
15-19	0.112968	0.05239605
20-24	0.471405	0.12896956
25-29	2.083316	0.33799042
30-34	5.063482	0.9551216
35-39	9.98235	2.14277976
40-44	19.3513	4.14215315
45-49	34.2002	7.92057376
50-54	66.4955	15.3334432
55-59	108.861	26.17279
60-64	174.422	50.3933095
65-69	260.595	86.7308856
70-74	418.983	166.129429
75-79	691.844	328.936994
80-84	1226.31	692.729817
85-89	2146.48	1405.68186
90-94	3729.21	2799.90864
95+	6001.13	5093.18625

Table S9. Stroke incidence

Stroke incidence per 100,000		
Age	Males	Females
0	8.149421	12.853095
1-4	8.374972	13.130977
5-9	8.179941	12.535308
10-14	7.422348	10.936313
15-19	6.65941	9.3752098
20-24	7.437842	9.9973558
25-29	9.732369	12.785404
30-34	14.28692	18.258084
35-39	21.12258	26.407817
40-44	33.59518	37.574415
45-49	51.74023	51.795938
50-54	76.18944	68.86406
55-59	106.9025	88.800894
60-64	144.1631	118.49675
65-69	187.8009	157.94112
70-74	260.1358	245.06087
75-79	362.0434	380.36591
80-84	552.6776	640.66358
85-89	830.2613	1024.8823
90-94	1106.404	1406.9076
95+	1372.726	1777.8574

Table S10. Stroke prevalence

Stroke prevalence per 100,000		
Age	Males	Females
0	0	0
1-4	0	8.6653838
5-9	28.6265	52.444929
10-14	45.22969	101.18557
15-19	79.16189	169.02917
20-24	107.8666	217.28502
25-29	147.5771	276.3286
30-34	203.2607	364.5259
35-39	291.7563	481.67479
40-44	430.0453	617.38469
45-49	596.9642	824.78991
50-54	832.2759	1061.0608
55-59	1136.675	1335.7858
60-64	1516.677	1663.1731
65-69	2014.903	2114.9579
70-74	2586.58	2697.2001
75-79	3165.65	3397.4634
80-84	3653.839	4174.7653
85-89	3824.605	4914.8792
90-94	3756.122	5327.3779
95+	3677.81	5442.5751

Table S11. Stroke mortality

Stroke mortality per 100,000		
Age	Males	Females
0	0.349942	0.2918577
1-4	0.058227	0.0563248
5-9	0.049325	0.046741
10-14	0.092166	0.0794649
15-19	0.287963	0.2366221
20-24	0.659267	0.4355129
25-29	1.295202	0.8898523
30-34	2.038013	1.4875183
35-39	3.142514	2.5682732
40-44	5.318416	4.1985198
45-49	8.216299	6.5847183
50-54	13.103	10.557053
55-59	21.02781	15.541977
60-64	34.27086	25.08216
65-69	58.70813	43.297961
70-74	121.0111	95.2449
75-79	254.9341	221.20666
80-84	543.8818	518.93832
85-89	1079.343	1118.4958
90-94	2045.406	2241.0513
95+	3357.581	4081.3718

Table S12. COPD incidence

COPD incidence per 100,000		
Age	Males	Females
0	14.5074	14.870329
1-4	16.1541	16.660958
5-9	16.426	16.851236
10-14	16.7239	17.059023
15-19	27.9613	28.417833
20-24	39.6572	40.101844
25-29	40.8203	40.90976
30-34	40.738	40.528085
35-39	42.6844	42.461823
40-44	195.657	188.76732
45-49	377.26948	370.77647
50-54	406.81937	406.71595
55-59	409.78941	408.98456
60-64	856.69366	822.35419
65-69	1343.5224	1301.8056
70-74	1631.7668	1603.5013
75-79	1772.4441	1749.3723
80-84	2053.7121	2013.8741
85-89	2198.1407	2147.7167
90-94	2244.0036	2191.2894
95+	2310.2852	2234.2852

Table S13. COPD prevalence

COPD prevalence per 100,000		
Age	Males	Females
0	7.75260527	7.9210702
1-4	47.9180515	49.336017
5-9	121.235473	124.74797
10-14	204.047952	209.47774
15-19	307.008749	314.27123
20-24	484.737999	494.47608
25-29	686.093205	696.9646
30-34	890.653675	901.07246
35-39	1094.80441	1103.9305
40-44	1569.70987	1567.2169
45-49	3083.02012	3041.6257
50-54	5052.55996	5006.6853
55-59	7033.22516	6999.258
60-64	9751.26451	9671.2373
65-69	15275.3834	15001.603
70-74	22124.555	21786.87
75-79	30103.511	29774.35
80-84	38219.5816	38045.65
85-89	47325.097	47459.386
90-94	56181.2458	56606.84
95+	65382.174	65993.595

Table S14. COPD mortality

COPD mortality per 100,		
Age	Males	Females
0	0	0
1-4	0.02695	0.0395601
5-9	0.01453	0.0203238
10-14	0.01657	0.0236633
15-19	0.05443	0.0620228
20-24	0.08747	0.0860066
25-29	0.16233	0.1287645
30-34	0.30324	0.2276371
35-39	0.6206	0.4389814
40-44	1.44311	1.0000465
45-49	3.12145	2.3943282
50-54	9.13447	7.4732382
55-59	19.4542	16.073473
60-64	50.8031	39.827506
65-69	99.3184	76.081003
70-74	196.769	145.15548
75-79	349.567	252.79126
80-84	607.665	422.7205
85-89	1038.011	658.70122
90-94	1653.891	1031.7257
95+	2572.745	1750.1964

Table S15. Disease survival

Disease	Survival					
	1-year (%)		5-year (%)		10-year (%)	
	Male	Female	Male	Female	Male	Female
Colon cancer	77.1	75.3	57.6	57.6	51.6	52.8
Lung cancer	41.2	49.8	17.4	25.0	7.6	11.3

Table S16. Sources for data

Sources of relative risk data used in the simulation		
Risk Factor	Disease	Reference
Smoking	Colorectal Cancer	Ordóñez-Mena <i>et al.</i> , 2016 (9) (1)
	COPD	Lhachimi <i>et al.</i> , 2012 (10) (2)
	Lung Cancer	
	CHD	
	Stroke	
Blood Pressure	Colorectal Cancer	Xuan <i>et al.</i> , 2021 (11) (3)
	COPD	N/A
	Lung Cancer	
	CHD	Singh <i>et al.</i> , 2013 (12) (4)
	Stroke	
BMI	Colorectal Cancer	Lobstein <i>et al.</i> , 2010 (13) (5)
	COPD	N/A
	Lung Cancer	
	CHD	Bender <i>et al.</i> , 2020 (14) (6)
	Stroke	

Table S17a. Smoking relative risks in the microsimulation

Colorectal Cancer						
Age	Male			Female		
	Never smoked	Former smoker	Current smoker	Never smoked	Former smoker	Current smoker
18-110	1	1.2	1.2	1	1.2	1.2

COPD						
Age	Male			Female		
	Never smoked	Former smoker	Current smoker	Never smoked	Former smoker	Current smoker
<35	1.0	1.0	1.0	1.0	1.0	1.0
35-39	1.0	1.0	1.0	1.0	1.0	1.0
40-44	1.0	1.0	1.0	1.0	1.0	1.0
45-49	1.0	1.0	1.0	1.0	1.0	1.0
50-54	1.0	3.06	8.13	1.0	7.39	12.92
55-59	1.0	8.25	9.8	1.0	5.55	9.47
60-64	1.0	12.65	13.21	1.0	6.63	11.19
65+	1.0	11.92	18.93	1.0	9.73	14.72

Lung Cancer						
Age	Male			Female		
	Never smoked	Former smoker	Current smoker	Never smoked	Former smoker	Current smoker
<35	1.0	1.0	1.0	1.0	1.0	1.0
35-39	1.0	1.0	1.3	1.0	1.0	2.0
40-44	1.0	1.0	1.0	1.0	1.0	1.0
45-49	1.0	2.37	5.78	1.0	8.07	18.08
50-54	1.0	10.7	24.97	1.0	3.28	11.14
55-59	1.0	11.66	34.02	1.0	5.33	17.87
60-64	1.0	11.71	31.47	1.0	4.91	13.32
65+	1.0	9.7	28.4	1.0	5.54	17.49

CHD						
Age	Male			Female		
	Never smoked	Former smoker	Current smoker	Never smoked	Former smoker	Current smoker
<35	1.0	1.0	1.0	1.0	1.0	1.0
35-39	1.0	1.21	3.25	1.0	1.44	1.0
40-44	1.0	1.15	4.71	1.0	2.25	1.89
45-49	1.0	2.03	5.85	1.0	2.08	7.71
50-54	1.0	1.93	3.69	1.0	2.95	5.69
55-59	1.0	1.64	2.71	1.0	1.19	3.06
60-64	1.0	1.58	2.39	1.0	1.08	2.56
65+	1.0	1.4	1.91	1.0	1.22	2.48

Stroke						
Age	Male			Female		
	Never smoked	Former smoker	Current smoker	Never smoked	Former smoker	Current smoker
<35	1.0	1.0	1.0	1.0	1.0	1.0
35-39	1.0	1.0	1.0	1.0	1.0	2.0
40-44	1.0	1.0	1.05	1.0	2.25	5.67
45-49	1.0	1.0	3.75	1.0	1.19	8.22
50-54	1.0	2.24	6.08	1.0	1.38	4.58
55-59	1.0	1.14	3.96	1.0	1.22	5.77
60-64	1.0	1.01	2.55	1.0	1.28	2.76
65+	1.0	1.29	2.69	1.0	1.14	2.58

Table S17b. Blood pressure relative risks in the microsimulation

Colorectal Cancer				
Age	Male		Female	
	No hypertension	Hypertension	No hypertension	Hypertension
18-110	1	1.13	1	1

CHD		
Age	Male	Female
	Per 10 mm Hg	Per 10 mm Hg
25-34	1.0	1.0
35-44	1.68	1.68
45-54	1.56	1.56
55-64	1.45	1.45
65-74	1.33	1.33
75-84	1.26	1.26
85+	1.14	1.14

Stroke		
Age	Male	Female
	Per 10 mm Hg	Per 10 mm Hg
25-34	1.0	1.0
35-44	2.05	2.05
45-54	1.83	1.83
55-64	1.63	1.63
65-74	1.44	1.44
75-84	1.28	1.28
85+	1.1	1.1

Table S17c BMI relative risks in the microsimulation

Colorectal Cancer						
Age	Male			Female		
	Normal	Overweight	Obese	Normal	Overweight	Obese
0-20	1.0	1.0	1.0	1.0	1.0	1.0
21-45	1.0	1.2	1.4	1.0	1.08	1.1
45+	1.0	1.18	1.36	1.0	1.07	1.09

CHD						
Age	Male			Female		
	Normal	Overweight	Obese	Normal	Overweight	Obese
0-20	1.0	1.0	1.0	1.0	1.0	1.0
21-25	1.0	1.25	1.7	1.0	1.25	1.7
26-65	1.0	1.35	2.0	1.0	1.35	2.0
66-75	1.0	1.3	1.8	1.0	1.3	1.8
76-85	1.0	1.25	1.6	1.0	1.25	1.6
86+	1.0	1.2	1.4	1.0	1.2	1.4

Stroke						
Age	Male			Female		
	Normal	Overweight	Obese	Normal	Overweight	Obese
0-20	1.0	1.0	1.0	1.0	1.0	1.0
21-25	1.0	1.1	1.2	1.0	1.1	1.2
26-64	1.0	1.2	1.5	1.0	1.2	1.55
65-69	1.0	1.18	1.45	1.0	1.18	1.5
70-79	1.0	1.16	1.4	1.0	1.16	1.45
80+	1.0	1.13	1.3	1.0	1.13	1.35

Direct Healthcare Costs

Table S18. Direct healthcare cost of colorectal cancer

Cost cited	€1404
Reference	Henderson <i>et al.</i> , 2021 (15) (7)
Definition	Total per-patient direct healthcare costs associated with colorectal cancer
Adjustments	Cost was directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£1,629.05

Table S19. Direct healthcare cost of lung cancer

Cost cited	£163,000,000
Reference	Trueman <i>et al.</i> , 2017 (16) (8)
Definition	Total direct healthcare costs
Adjustments	Total cost above was divided by the number of lung cancer patients in 2014 to get total direct healthcare per-patient cost, then inflated to the current cost year, 2024.
Cost used (2024)	£2,679.58

Table S20. Direct healthcare cost of CHD

Cost cited	€149,694,000 (primary care); €1,236,089,000 (inpatient care); €299,002,000 (outpatient care); €379,036,000 (medications); €102,413,000 (accident and emergency care)
Reference	Wilkins <i>et al.</i> , 2017 (17) (9)
Definition	Total cost of primary care, inpatient and outpatient care, medications and accident and emergency care
Adjustment	Total costs above were divided by the number of CHD patients in 2015 and then summed to get total direct healthcare per-patient cost, directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£1373.64

Table S21. Direct healthcare cost of stroke

Cost cited	€51,448,000 (primary care); €2,091,942,000 (inpatient care); €299,002,000 (outpatient care); €141,429,000 (medications); €68,554,000 (accident and emergency care)
Reference	Wilkins <i>et al.</i> , 2017 (17) (9)
Definition	Total cost of primary care, inpatient and outpatient care, medications and accident and emergency care
Adjustment	Total costs above were divided by the number of stroke patients in 2015 and then summed to get total direct healthcare per-patient cost, directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£4391.86

Table S22. Direct healthcare cost of COPD

Cost cited	£1,847,000,000
Reference	Trueman <i>et al.</i> , 2017 (16) (8)
Definition	Total direct healthcare costs
Adjustment	Total cost above was divided by the number of COPD patients in 2014 to get total direct healthcare per-patient cost, then inflated to the current cost year, 2024.
Cost used (2024)	£514.86

Indirect Healthcare Costs

Table S23. Indirect cost of colorectal cancer

Cost cited	€992,158,000 (morbidity productivity loss); €236,363,000 (informal care costs)
Reference	Henderson <i>et al.</i> , 2021 (15) (7)
Definition	Total productivity loss due to colorectal cancer morbidity; total cost of informal care due to colorectal cancer.
Adjustments	Total costs above were divided by the number of colorectal cancer patients in 2015 and then summed to get total indirect per-patient cost, directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£5,196.65

Table S24. Indirect cost of lung cancer

Cost cited	\$243,000,000 CAD
Reference	Garaszczuk <i>et al.</i> , 2017 (18) (10)
Definition	Total indirect costs of lung cancer.
Adjustments	Cost was divided by the number of lung cancer patients in Canada in 2021, and then inflated to the current cost year, 2024, in GBP.
Cost used (2024)	£2,882.89

Table S25. Indirect cost of CHD

Cost cited	€958,817,000 (morbidity productivity loss); €2,566,012,000 (informal care costs)
Reference	Wilkins <i>et al.</i> , 2017 (17) (9)
Definition	Total productivity loss due to CHD morbidity; total cost of informal care due to CHD.
Adjustments	Total costs above were divided by the number of CHD patients in 2015 and then summed to get total indirect per-patient cost, directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£2,235.16

Table S26. Indirect cost of stroke

Cost cited	€331,719,000 (morbidity productivity loss); €1,945,108,000 (informal care costs)
Reference	Wilkins <i>et al.</i> , 2017 (17) (9)
Definition	Total productivity loss due to stroke morbidity; total cost of informal care due to stroke.
Adjustments	Total costs above were divided by the number of stroke patients in 2015 and then summed to get total indirect per-patient cost, directly converted from EUR to GBP, then inflated to the current cost year, 2024.
Cost used (2024)	£3770.48

Table S27. Indirect cost of COPD

Cost cited	£1,991,776,864
Reference	Asthma + Lung UK, 2023 (19) (11)
Definition	Productivity loss due to COPD.
Adjustments	Cost was divided by the number of COPD patients in 2023, and then inflated to the current cost year, 2024.
Cost used (2024)	£425.00

Table S28. Utility weights

Disease	Utility weight		Reference
	Male	Female	
Colorectal cancer	0.67287867	0.67287867	Sullivan <i>et al.</i> , 2011 (20) (12)
Lung cancer	0.55971993	0.55971993	Sullivan <i>et al.</i> , 2011 (20) (12)
CHD	0.76	0.68	Van Wilder <i>et al.</i> , 2019 (21)(13)
Stroke	0.727	0.727	Sullivan <i>et al.</i> , 2016 (22)(14)
COPD	0.732	0.732	Sullivan <i>et al.</i> , 2016 (22) (14)

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