Forecasting impact of Aducanumab intervention on the prevalence of Alzheimer's dementia

Aducanumab intervention

The drug Aducanumab is designed to break up amyloid plaques in the hope of preventing a transition to early Alzheimer's disease (AD) dementia from a state of mild cognitive impairment (MCI). Here we estimate the potential impact of the intervention on prevalence and incidence estimates of AD. We use a relative risk (RR) of 0.75 for the intervention effect.

Pre-Alzheimer's states

We see below that the main impact of Aducanumab on prevalence estimates for disease states leading up to AD is a buildup of those in the A + N + MCI state.

Table 1: Prevalence estimates (millions) for pre-AD states up to the year 2060 with no intervention

Year	Normal	A	N	A+N	A+N+MCI	N+MCI
2021	151.47	23.67	9.05	18.01	1.92	0.73
2025	156.36	25.00	9.82	20.05	2.16	0.80
2030	161.07	26.25	10.70	22.65	2.59	0.90
2035	165.26	27.06	11.37	24.86	3.09	0.99
2040	169.42	27.66	11.80	26.38	3.57	1.05
2045	173.30	28.36	12.11	27.28	3.95	1.10
2050	177.53	29.34	12.46	27.91	4.18	1.13
2055	181.72	30.59	12.95	28.77	4.32	1.17
2060	185.44	31.90	13.60	30.18	4.47	1.23

Table 2: Prevalence estimates (millions) for pre-AD states up to the year 2060 with an intervention RR of 0.75

Year	Normal	A	N	A+N	A+N+MCI	N+MCI
2021	151.47	23.67	9.05	18.01	1.92	0.73
2025	156.36	25.00	9.82	20.05	2.52	0.80
2030	161.07	26.24	10.70	22.64	3.11	0.90
2035	165.25	27.05	11.36	24.82	3.72	0.98
2040	169.41	27.66	11.79	26.34	4.31	1.05
2045	173.30	28.35	12.10	27.23	4.78	1.10
2050	177.53	29.33	12.44	27.86	5.08	1.13
2055	181.71	30.58	12.94	28.72	5.26	1.17
2060	185.43	31.89	13.59	30.13	5.43	1.23

Early and late AD prevalence and incidence

Here we see that prevalence estimates for both early and late AD go down with an intervention. Curiously, incidence numbers rise. I'm still working to see if this is a bug in the code or if it's legitimate.

Table 3: Prevalence and incidence estimates (in millions) for AD states up to 2060 with no intervention

Year	Early AD Prevalence	Late AD Prevalence	Total Incidence	Incidence from 5
2021	2.24	1.67	0.59	0.52
2025	2.47	1.82	0.66	0.59
2030	2.90	2.10	0.79	0.71
2035	3.45	2.49	0.93	0.84
2040	4.03	2.92	1.06	0.97
2045	4.52	3.33	1.15	1.06
2050	4.87	3.64	1.21	1.11
2055	5.10	3.86	1.25	1.15
2060	5.29	4.01	1.29	1.18

Table 4: Prevalence and incidence estimates (in millions) for AD states up to 2060 with intervention RR of 0.75

Year	Early AD Prevalence	Late AD Prevalence	Total Incidence	Incidence from 5
2021	2.24	1.67	0.59	0.52
2025	2.19	1.74	0.76	0.69
2030	2.60	1.90	0.93	0.85
2035	3.12	2.24	1.10	1.01
2040	3.65	2.63	1.25	1.16
2045	4.10	3.00	1.37	1.28
2050	4.43	3.28	1.44	1.35
2055	4.63	3.47	1.49	1.39
2060	4.81	3.61	1.54	1.43

Below is a table showing the change in prevalence and incidence estimates from Table 3 to Table 4.

Table 5: Change in prevalence and incidence estimates (in millions) with an intervention with RR of 0.75

Year	Early AD Prevalence	Late AD Prevalence	Total Incidence	Incidence from 5
2021	0.00	0.00	0.00	0.00
2025	-0.28	-0.08	0.10	0.10
2030	-0.30	-0.20	0.14	0.14
2035	-0.33	-0.25	0.17	0.17
2040	-0.38	-0.29	0.19	0.19
2045	-0.42	-0.33	0.22	0.22
2050	-0.44	-0.36	0.23	0.24
2055	-0.47	-0.39	0.24	0.24
2060	-0.48	-0.40	0.25	0.25