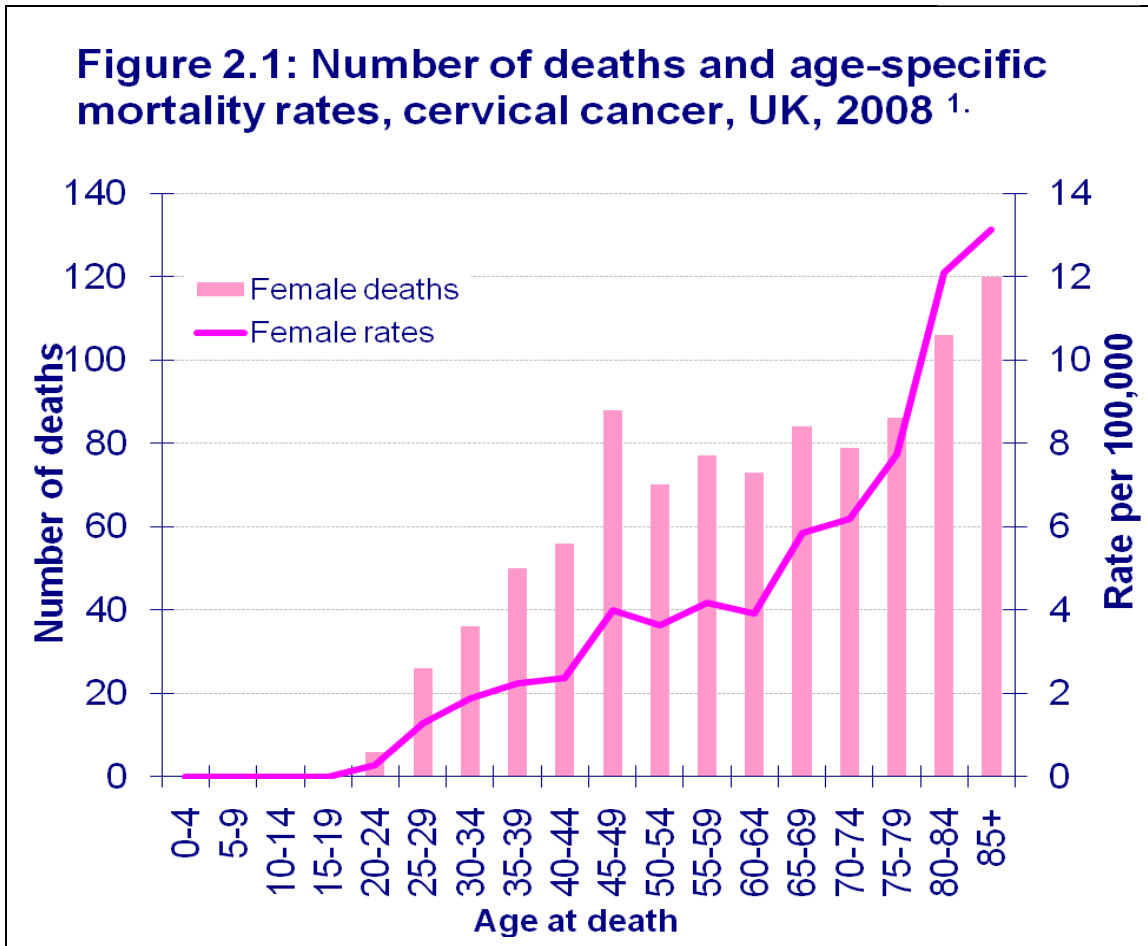


Freda Birrell, Scotland
 March 2011

HPV 2 Cervarix Economic Costs in the United Kingdom

Table 1



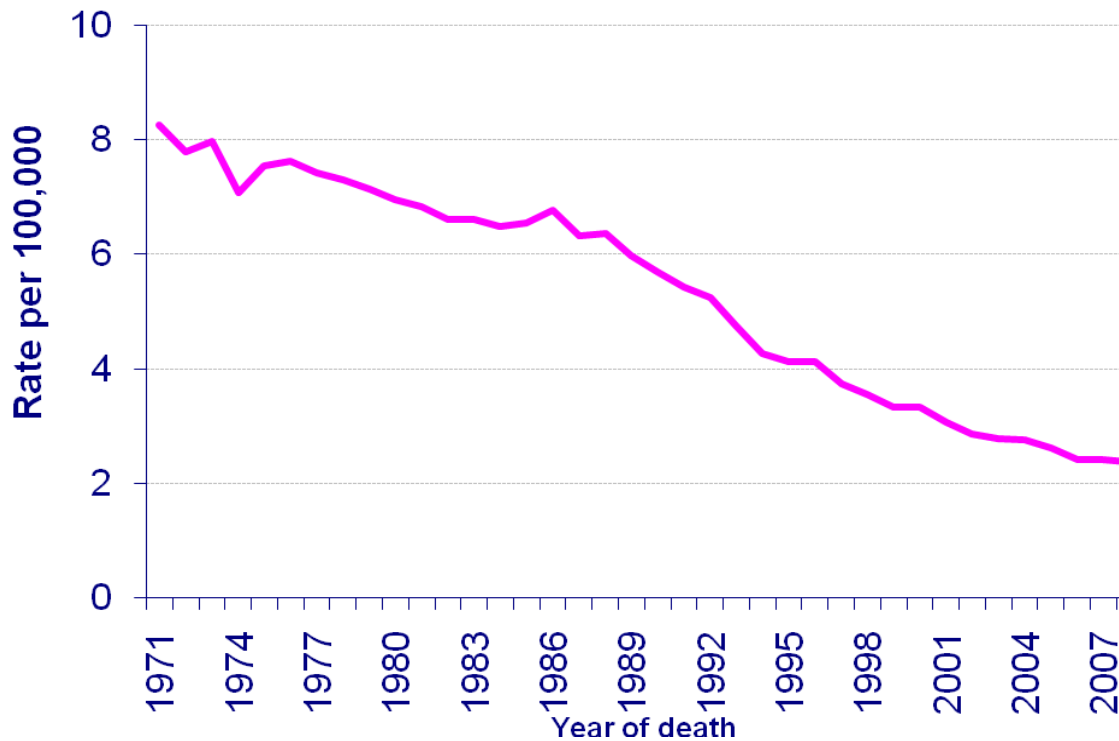
Cervical Cancer (C53), Number of deaths and age-specific mortality rates, UK, 2008
 (Text in black – analysis by Freda Birrell)

Table 2

	Female Deaths	Rate per 100,000 population(Female)	
0-4	0	0.0	Average annual population calculated as the difference between the total and the sum of ages 20 to 85 i.e. 7,187,500, over 19 years or 378,289 per year
5-9	0	0.0	
10-14	0	0.0	
15-19	0	0.0	
20-24	6	0.3	
25-29	26	1.3	2,005,900
30-34	36	1.9	1,910,100
35-39	50	2.2	2,241,500
40-44	56	2.4	2,377,100
45-49	88	4.0	2,207,800
50-54	70	3.6	1,924,800
55-59	77	4.2	1,845,100
60-64	73	3.9	1,861,300
65-69	84	5.9	1,432,500
70-74	79	6.2	1,275,400
75-79	86	7.7	1,112,400
80-84	106	12.1	875,500
85+	120	13.1	913,600
All ages	957	3.1	31,231,900

Table 3

Figure 2.2: Age standardised (European) mortality rates, cervical cancer, UK, 1971-2008 ¹.



Note: Deaths from cervical cancer decreased from 1971 to 2008 from 8.3 to 2.4 deaths per 100,000

Cervical Cancer (C53), Age-standardised (European) mortality rates, UK, 1971-2008



Table 4

Directly age standardised rate (European) per 100,000 population			
Year	Female rate	Year	Female rate
1971	8.2521	1991	5.4200
1972	7.7973	1992	5.2370
1973	7.9807	1993	4.7525
1974	7.0813	1994	4.2572
1975	7.5430	1995	4.1198
1976	7.6345	1996	4.1324
1977	7.4218	1997	3.7360
1978	7.2982	1998	3.5628
1979	7.1344	1999	3.3209
1980	6.9643	2000	3.3235
1981	6.8310	2001	3.0724
1982	6.6142	2002	2.8558
1983	6.6141	2003	2.7892
1984	6.4852	2004	2.7534
1985	6.5467	2005	2.6278
1986	6.7673	2006	2.4084
1987	6.3246	2007	2.4162
1988	6.3680	2008	2.3716
1989	5.9874		
1990	5.6982		

ASSUMPTIONS in ANALYSIS

- Total deaths (Cancer Research UK) to age 84 at 837 per year. *Table 2*
- 75% of deaths saved with the vaccination programme i.e. 628 per year. (70% +5% for other benefits?) *The Cervarix vaccine was introduced to protect against HPV 16 & 18, and those two viruses cover 70% of those strains that can cause cervical cancer. There have been other indications that this vaccine may just have some other benefits.*
- Cost per person vaccination - £200.00 assumed.
- Average no. of vaccinations administered per year (12 year olds) at 378,289. *Table 2*
- The Cancer Research UK deaths/5 year groups have been divided by 5 for an average annual figure. *Table 2*
- JCVI assumes vaccination efficacy will last 10 years. A booster is not included in calculations below.
- It takes 73 years to complete a total cycle of the female population (12 year olds to 84 year olds)

ANALYSIS of the Annual HPV Vaccination Programme

Age	Start Year	No. Vaccinated	Group Deaths (CR UK)	Life's Saved (75%)	Vaccination Cost (each at £200)	End Year	Cumulated Total Cost (A)	Cumulated Total Vaccinated	Yearly Deaths (CR UK)	Yearly Life's Saved (B)	Cumulated Life's Saved	Cost of a Life Saved (A / B)
age 12	2008	378,289	0	0	£75,657,800	1	£75,657,800	378,289	0.0	0.0	0	
13	2009	378,289	0	0	£75,657,800	2	£151,315,600	756,578	0.0	0.0	0	
14	2010	378,289	0	0	£75,657,800	3	£226,973,400	1,134,867	0.0	0.0	0	
15	2011	378,289	0	0	£75,657,800	4	£302,631,200	1,513,156	0.0	0.0	0	
16	2012	378,289	0	0	£75,657,800	5	£378,289,000	1,891,445	0.0	0.0	0	
17	2013	378,289	0	0	£75,657,800	6	£453,946,800	2,269,734	0.0	0.0	0	
18	2014	378,289	0	0	£75,657,800	7	£529,604,600	2,648,023	0.0	0.0	0	
19	2015	378,289	0	0	£75,657,800	8	£605,262,400	3,026,312	0.0	0.0	0	
20	2016	378,289	1.2	0.9	£75,657,800	9	£680,920,200	3,404,601	1.2	0.9	1	£756,578,000
21	2017	378,289	1.2	0.9	£75,657,800	10	£756,578,000	3,782,890	2.4	1.8	3	£280,214,074
22	2018	378,289	1.2	0.9	£75,657,800	11	£832,235,800	4,161,179	3.6	2.7	5	£154,117,741
23	2019	378,289	1.2	0.9	£75,657,800	12	£907,893,600	4,539,468	4.8	3.6	9	£100,877,067
24	2020	378,289	1.2	0.9	£75,657,800	13	£983,551,400	4,917,757	6.0	4.5	14	£72,855,659
25	2021	378,289	5.2	3.9	£75,657,800	14	£1,059,209,200	5,296,046	11.2	8.4	22	£48,365,717
26	2022	378,289	5.2	3.9	£75,657,800	15	£1,134,867,000	5,674,335	16.4	12.3	34	£33,183,246
27	2023	378,289	5.2	3.9	£75,657,800	16	£1,210,524,800	6,052,624	21.6	16.2	50	£24,018,349

		104	£7,868,411,200	39,342,056	837.0	627.8	35,687	£220,482
		105	£7,944,069,000	39,720,345	837.0	627.8	36,315	£218,754
		106	£8,019,726,800	40,098,634	837.0	627.8	36,943	£217,085
		107	£8,095,384,600	40,476,923	837.0	627.8	37,571	£215,472
		108	£8,171,042,400	40,855,212	837.0	627.8	38,198	£213,911
		109	£8,246,700,200	41,233,501	837.0	627.8	38,826	£212,401
		110	£8,322,358,000	41,611,790	837.0	627.8	39,454	£210,940
		111	£8,398,015,800	41,990,079	837.0	627.8	40,082	£209,523
		112	£8,473,673,600	42,368,368	837.0	627.8	40,709	£208,151
		113	£8,549,331,400	42,746,657	837.0	627.8	41,337	£206,820
		114	£8,624,989,200	43,124,946	837.0	627.8	41,965	£205,529
		115	£8,700,647,000	43,503,235	837.0	627.8	42,593	£204,277
		116	£8,776,304,800	43,881,524	837.0	627.8	43,220	£203,060
		117	£8,851,962,600	44,259,813	837.0	627.8	43,848	£201,878
		118	£8,927,620,400	44,638,102	837.0	627.8	44,476	£200,730
		119	£9,003,278,200	45,016,391	837.0	627.8	45,104	£199,614
		120	£9,078,936,000	45,394,680	837.0	627.8	45,731	£198,528
		121	£9,154,593,800	45,772,969	837.0	627.8	46,359	£197,472
		122	£9,230,251,600	46,151,258	837.0	627.8	46,987	£196,444
		123	£9,305,909,400	46,529,547	837.0	627.8	47,615	£195,443
		124	£9,381,567,200	46,907,836	837.0	627.8	48,242	£194,468
		125	£9,457,225,000	47,286,125	837.0	627.8	48,870	£193,518
		126	£9,532,882,800	47,664,414	837.0	627.8	49,498	£192,592
		127	£9,608,540,600	48,042,703	837.0	627.8	50,126	£191,690
		128	£9,684,198,400	48,420,992	837.0	627.8	50,753	£190,809
		129	£9,759,856,200	48,799,281	837.0	627.8	51,381	£189,951
		130	£9,835,514,000	49,177,570	837.0	627.8	52,009	£189,113
		131	£9,911,171,800	49,555,859	837.0	627.8	52,637	£188,295
		132	£9,986,829,600	49,934,148	837.0	627.8	53,264	£187,496
		133	£10,062,487,400	50,312,437	837.0	627.8	53,892	£186,716
		134	£10,138,145,200	50,690,726	837.0	627.8	54,520	£185,954
		135	£10,213,803,000	51,069,015	837.0	627.8	55,148	£185,209
		136	£10,289,460,800	51,447,304	837.0	627.8	55,775	£184,481
		137	£10,365,118,600	51,825,593	837.0	627.8	56,403	£183,769
		138	£10,440,776,400	52,203,882	837.0	627.8	57,031	£183,073
		139	£10,516,434,200	52,582,171	837.0	627.8	57,659	£182,392
		140	£10,592,092,000	52,960,460	837.0	627.8	58,286	£181,725
		141	£10,667,749,800	53,338,749	837.0	627.8	58,914	£181,073
		142	£10,743,407,600	53,717,038	837.0	627.8	59,542	£180,435
		143	£10,819,065,400	54,095,327	837.0	627.8	60,170	£179,810
		144	£10,894,723,200	54,473,616	837.0	627.8	60,797	£179,198
		145	£10,970,381,000	54,851,905	837.0	627.8	61,425	£178,598
		146	£11,046,038,800	55,230,194	837.0	627.8	62,053	£178,010
		147	£11,121,696,600	55,608,483	837.0	627.8	62,681	£177,435
		148	£11,197,354,400	55,986,772	837.0	627.8	63,308	£176,870
		149	£11,273,012,200	56,365,061	837.0	627.8	63,936	£176,317
		150	£11,348,670,000	56,743,350	837.0	627.8	64,564	£175,775
		151	£11,424,327,800	57,121,639	837.0	627.8	65,192	£175,243
		152	£11,499,985,600	57,499,928	837.0	627.8	65,819	£174,721
		153	£11,575,643,400	57,878,217	837.0	627.8	66,447	£174,209
		154	£11,651,301,200	58,256,506	837.0	627.8	67,075	£173,706
		155	£11,726,959,000	58,634,795	837.0	627.8	67,703	£173,213
		156	£11,802,616,800	59,013,084	837.0	627.8	68,330	£172,729
		157	£11,878,274,600	59,391,373	837.0	627.8	68,958	£172,254
		158	£11,953,932,400	59,769,662	837.0	627.8	69,586	£171,787
		159	£12,029,590,200	60,147,951	837.0	627.8	70,214	£171,329
		160	£12,105,248,000	60,526,240	837.0	627.8	70,841	£170,879
		161	£12,180,905,800	60,904,529	837.0	627.8	71,469	£170,436
		162	£12,256,563,600	61,282,818	837.0	627.8	72,097	£170,002
		163	£12,332,221,400	61,661,107	837.0	627.8	72,725	£169,575
		164	£12,407,879,200	62,039,396	837.0	627.8	73,352	£169,155
		165	£12,483,537,000	62,417,685	837.0	627.8	73,980	£168,742
		166	£12,559,194,800	62,795,974	837.0	627.8	74,608	£168,336
		167	£12,634,852,600	63,174,263	837.0	627.8	75,236	£167,937
		168	£12,710,510,400	63,552,552	837.0	627.8	75,863	£167,545
		169	£12,786,168,200	63,930,841	837.0	627.8	76,491	£167,159
		170	£12,861,826,000	64,309,130	837.0	627.8	77,119	£166,779
		171	£12,937,483,800	64,687,419	837.0	627.8	77,747	£166,406
		172	£13,013,141,600	65,065,708	837.0	627.8	78,374	£166,038
		173	£13,088,799,400	65,443,997	837.0	627.8	79,002	£165,677
		174	£13,164,457,200	65,822,286	837.0	627.8	79,630	£165,321
		175	£13,240,115,000	66,200,575	837.0	627.8	80,258	£164,970
		176	£13,315,772,800	66,578,864	837.0	627.8	80,885	£164,625
		177	£13,391,430,600	66,957,153	837.0	627.8	81,513	£164,286
		178	£13,467,088,400	67,335,442	837.0	627.8	82,141	£163,951
		179	£13,542,746,200	67,713,731	837.0	627.8	82,769	£163,622
		180	£13,618,404,000	68,092,020	837.0	627.8	83,396	£163,298
		181	£13,694,061,800	68,470,309	837.0	627.8	84,024	£162,978
		182	£13,769,719,600	68,848,598	837.0	627.8	84,652	£162,663
		183	£13,845,377,400	69,226,887	837.0	627.8	85,280	£162,353
		184	£13,921,035,200	69,605,176	837.0	627.8	85,907	£162,047
		185	£13,996,693,000	69,983,465	837.0	627.8	86,535	£161,746
		186	£14,072,350,800	70,361,754	837.0	627.8	87,163	£161,449
		187	£14,148,008,600	70,740,043	837.0	627.8	87,791	£161,156
		188	£14,223,666,400	71,118,332	837.0	627.8	88,418	£160,868
		189	£14,299,324,200	71,496,621	837.0	627.8	89,046	£160,584
		190	£14,374,982,000	71,874,910	837.0	627.8	89,674	£160,303

		191	£14,450,639,800	72,253,199	837.0	627.8	90,302	£160,027
		192	£14,526,297,600	72,631,488	837.0	627.8	90,929	£159,754
		193	£14,601,955,400	73,009,777	837.0	627.8	91,557	£159,485
		194	£14,677,613,200	73,388,066	837.0	627.8	92,185	£159,220
		195	£14,753,271,000	73,766,355	837.0	627.8	92,813	£158,958
		196	£14,828,928,800	74,144,644	837.0	627.8	93,440	£158,700
		197	£14,904,586,600	74,522,933	837.0	627.8	94,068	£158,445
		198	£14,980,244,400	74,901,222	837.0	627.8	94,696	£158,193
		199	£15,055,902,200	75,279,511	837.0	627.8	95,324	£157,945
		200	£15,131,560,000	75,657,800	837.0	627.8	95,951	£157,700
		201	£15,207,217,800	76,036,089	837.0	627.8	96,579	£157,459
		202	£15,282,875,600	76,414,378	837.0	627.8	97,207	£157,220
		203	£15,358,533,400	76,792,667	837.0	627.8	97,835	£156,985
		204	£15,434,191,200	77,170,956	837.0	627.8	98,462	£156,752
		205	£15,509,849,000	77,549,245	837.0	627.8	99,090	£156,523
		206	£15,585,506,800	77,927,534	837.0	627.8	99,718	£156,296
		207	£15,661,164,600	78,305,823	837.0	627.8	100,346	£156,072
		208	£15,736,822,400	78,684,112	837.0	627.8	100,973	£155,851
		209	£15,812,480,200	79,062,401	837.0	627.8	101,601	£155,633
		210	£15,888,138,000	79,440,690	837.0	627.8	102,229	£155,418
		211	£15,963,795,800	79,818,979	837.0	627.8	102,857	£155,205
		212	£16,039,453,600	80,197,268	837.0	627.8	103,484	£154,994
		213	£16,115,111,400	80,575,557	837.0	627.8	104,112	£154,786
		214	£16,190,769,200	80,953,846	837.0	627.8	104,740	£154,581
		215	£16,266,427,000	81,332,135	837.0	627.8	105,368	£154,378
		216	£16,342,084,800	81,710,424	837.0	627.8	105,995	£154,178
		217	£16,417,742,600	82,088,713	837.0	627.8	106,623	£153,979
		218	£16,493,400,400	82,467,002	837.0	627.8	107,251	£153,784
		219	£16,569,058,200	82,845,291	837.0	627.8	107,879	£153,590
		220	£16,644,716,000	83,223,580	837.0	627.8	108,506	£153,399
		221	£16,720,373,800	83,601,869	837.0	627.8	109,134	£153,210
		222	£16,796,031,600	83,980,158	837.0	627.8	109,762	£153,023
		223	£16,871,689,400	84,358,447	837.0	627.8	110,390	£152,838
		224	£16,947,347,200	84,736,736	837.0	627.8	111,017	£152,655
		225	£17,023,005,000	85,115,025	837.0	627.8	111,645	£152,474
		226	£17,098,662,800	85,493,314	837.0	627.8	112,273	£152,296
		227	£17,174,320,600	85,871,603	837.0	627.8	112,901	£152,119
		228	£17,249,978,400	86,249,892	837.0	627.8	113,528	£151,944
		229	£17,325,636,200	86,628,181	837.0	627.8	114,156	£151,772
		230	£17,401,294,000	87,006,470	837.0	627.8	114,784	£151,601
		231	£17,476,951,800	87,384,759	837.0	627.8	115,412	£151,432
		232	£17,552,609,600	87,763,048	837.0	627.8	116,039	£151,264
		233	£17,628,267,400	88,141,337	837.0	627.8	116,667	£151,099
		234	£17,703,925,200	88,519,626	837.0	627.8	117,295	£150,935
		235	£17,779,583,000	88,897,915	837.0	627.8	117,923	£150,773
		236	£17,855,240,800	89,276,204	837.0	627.8	118,550	£150,613
		237	£17,930,898,600	89,654,493	837.0	627.8	119,178	£150,455
		238	£18,006,556,400	90,032,782	837.0	627.8	119,806	£150,298
		239	£18,082,214,200	90,411,071	837.0	627.8	120,434	£150,143
		240	£18,157,872,000	90,789,360	837.0	627.8	121,061	£149,989
		241	£18,233,529,800	91,167,649	837.0	627.8	121,689	£149,837
		242	£18,309,187,600	91,545,938	837.0	627.8	122,317	£149,687

ANALYSIS RESULTS

(85 > age group not included)

Female population to 84 years of age	30,318,300
Years covered	73 years (12 to 84)
Require to vaccinate every year from 2008	378,289
Price of the vaccination programme / person	£200
Annual cost of the vaccination programme	£75,657,800 (378,289x£200)
Total Current Deaths/Year from Cancer Research UK 2008(pre vaccine)	837 to age 84
HPV 16 and 18 +some other savings, say 75% saved?	Target of 628 lives to save each year.
Target cost of each life saved calculated initially?	£120,474 (£75,657,800 ÷ 628)
Total cost of this programme to a complete cycle of 73 years	£5,523,019,400 over 73 years (12 - 84)
It will take 9 years before 1 life is saved	At an expense of £700 million
It will take 28 years to save 628 lives in total, to meet annual target	At a cost of £3.2 million for each life saved
It will take 73 years to save 628 lives annually, final target	At a cost of £340,360 for each life saved
A total of 16,227 lives will be saved over the first 73 years	An average of only 222 lives saved per annum
It will take 240 years before the cost of a life saved falls below £150,000.	
Current protection before a booster is required?	10 years (approx)
The cost of a booster would be in addition to the above costs.	
Cost of adverse effects and essential PAP screening are not included in the above figures.	
Information on financial benefits from this vaccination programme does not appear to be in the public domain.	

The target cost of saving a life at £120,000 can *only* be reached after writing off the initial £5.5 billion spent over the first 73 years of the vaccination programme.

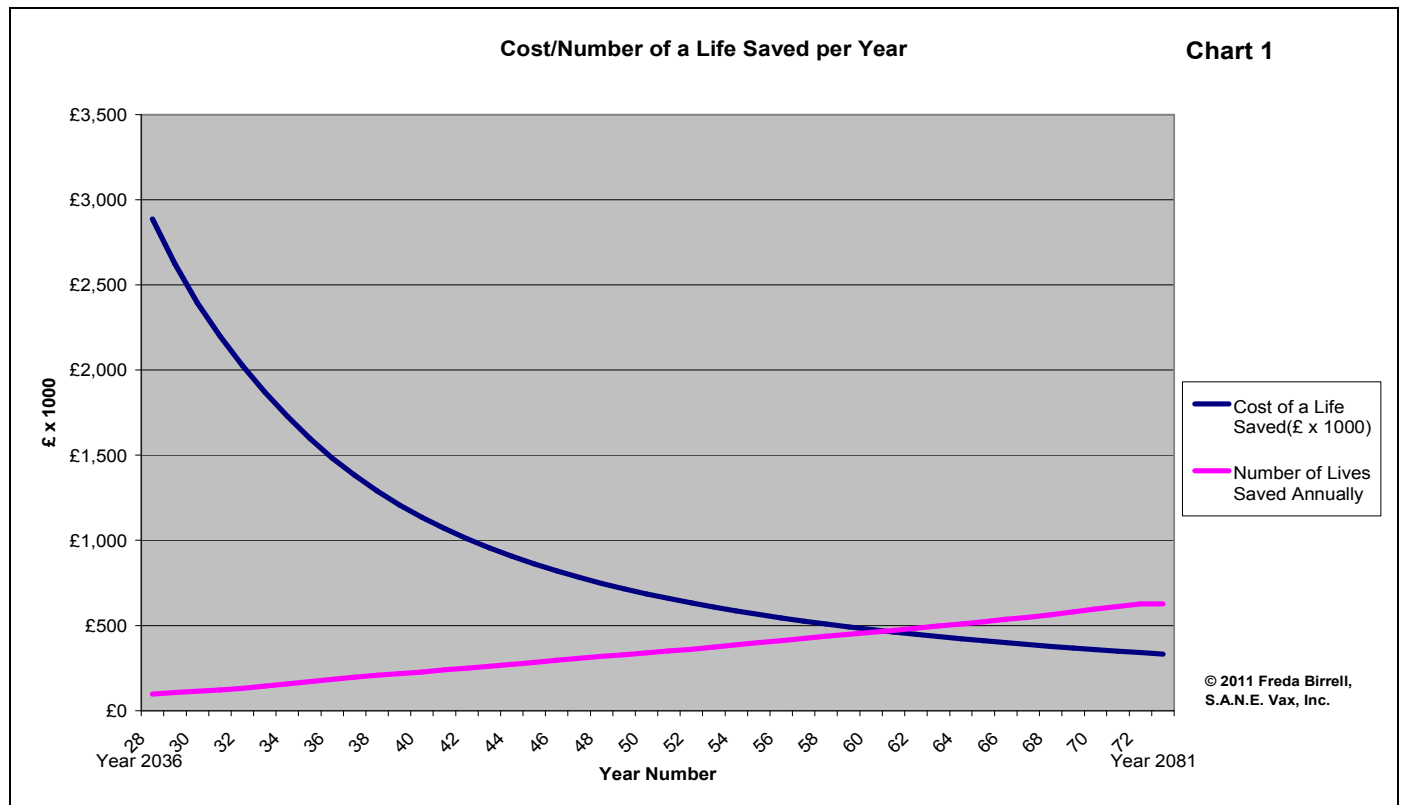


Chart 2

Based on number of deaths and age-specific mortality rates, cervical cancer, UK, 2008(to 85 years of age).

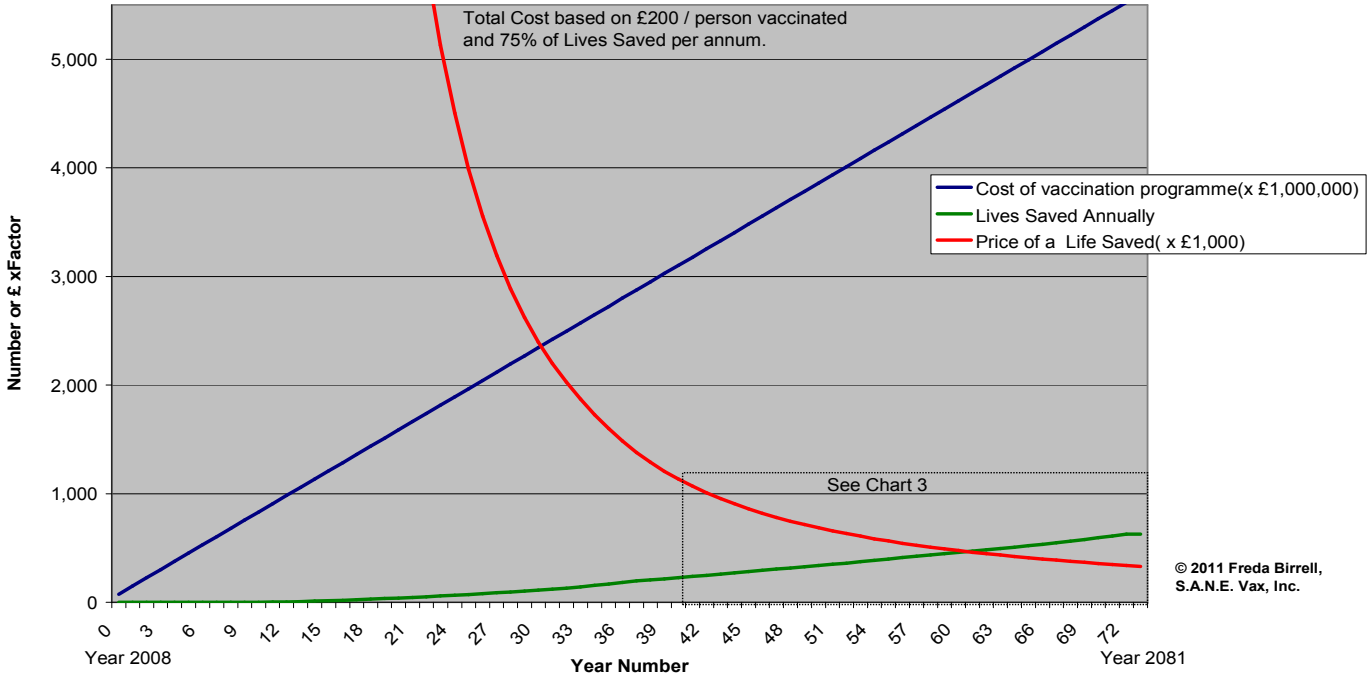


Chart 3

Based on number of deaths and age-specific mortality rates, cervical cancer, UK, 2008(to 85 years of age)

