

In June 2013 we resubmitted a revised version of the draft HTA report that had been first submitted to HTA in January 2013.

Following our resubmission in June, prompted by other comments and discussion during the peer review process, we re-examined the assumption made when allocating an overall change in expenditure to the 23 PBCs. This was relevant to the analysis conducted in Section 4.4.2 and 4.4.3 where the estimated proportionate impact on burden from the 11 PBCs with outcome equations is applied to measures of QALY burden in the other 11 PBCs. Since this analysis provides the best estimate of a cost per QALY threshold, the re-analysis in Section 4.4 also required changes to the Summary, Chapter 5 and relevant sections of Appendix C. The effects of these changes are explained below and are summarised in Tables 1, 2 and 3. The overall effect of this improved allocation of a change in overall expenditure (see column 1 and 3 in Table 2) is to reduce our central estimate from £18,317 to £12,936 per QALY for 2008 expenditure.

The issue was identified and discussed in the original draft and revised report and concerns how a residual change on overall spend is allocated to the PBCs.

In section 4.4.2 expenditure elasticities are estimated for all 23 PBCs (see column 2 of Table C8 in Appendix C). However, it is not possible to estimate expenditure equations for all 23 PBCs simultaneously (see Section 4.4.2 and 5.8), so the 23 independently estimated expenditure elasticities do not account for all of a change in overall spend, i.e., the sum of changes in PBC expenditure based on the estimated PBC expenditure elasticities accounts for less than a 1% change in total spend. Previously in section 4.4.2 the remaining change in total spend was not allocated to PBC 23 or the 11 PBCs where outcome elasticities could be estimated, but assigned to the other 11 PBCs and allocated between them to reflect their relative share of changes in expenditure, based on their estimated expenditure elasticities. As a consequence, proportionally more of the share of a change in total spend was allocated to these other 11 PBCs. These PBCs tend to have a lower QALY burden and therefore higher implied PBC cost per QALY ratios.

We correctly identified that the qualitative effect of this approach would be conservative with respect to the health effects of changes in expenditure (e.g., see item 7 in Box 5.1 of Section 5.4 in the first resubmission; CHE RP81, June 2013).

Prompted by other comments and discussion during the peer review process we explored the quantitative impact of adopting a more credible assumption of how this ‘residual’ change in expenditure should be allocated to all PBCs.

In particular, the original analysis suggested that approximately 25% of a change in overall expenditure would be allocated to the mental health PBC (see column 5 in Table 1 below). If this was applied to changes in total expenditure in subsequent years it would predict a rise in the proportion of total expenditure allocated to the mental health PBC. However, the proportionate share of total spend on this PBC has been almost constant over this period. This posed the question of whether the apparent inconsistency was an artefact of how the residual change in expenditure had been allocated.¹

¹ Since we have not constructed or estimated a predictive model it was also possible that this inconsistency might arise if the cross sectional analysis was a poor approximation to a fully specified predictive model. We discuss the possibility of developing a predictive model in the case for support (available on CHE web) and make clear the considerable challenges, which include access to sufficient panel data with sufficient observations in the cross section and time variant instruments, none of which were available to us (see Section 5.8). We do not infer changes over time from the cross section but estimate the expected health effects if the NHS had less or more resources

Therefore, we quantified the effect of adopting a more credible assumption when allocating the residual change in total spend to the PBCs, i.e., that the remaining change in total spend is allocated between all 23 PBCs reflecting their relative share of changes in expenditure based on their estimated expenditure elasticities (see column 4 of Table C8 in Appendix C).

This more credible allocation of residual spend was consistent with the observed stability in mental health spend as a proportion of total expenditure (see column 6 in Table 1 below). The qualitative effect of this allocation of changes in spend on the overall cost per QALY threshold was as anticipated. Since the quantitative effect was known following this exploration and the new allocation is based on more credible assumptions it was important that a second resubmission to HTA be made (August 2013) where this re-analysis formed the central or best estimates that we report in Section 4.4.3 and Chapter 5.

The effect of how changes in expenditure are allocated between PBCs is reported in Table 1 below. The overall effect of this improved allocation (see column 1 and 2 in Table 2) is to reduce our central estimate from £18,317 to £13,276 per QALY for 2008 expenditure (see Table 2 below).

In quantifying the effect of improving the way residual changes in spend are allocated to PBCs we also identified a typo in the excel code ² that implemented the extrapolation of proportionate effects observed in the first PBCs to the other 11 PBCs where mortality based outcome elasticities could not be estimated.³ The effect of this correction is to reduce the central estimate from £13,276 to £12,936 per QALY for 2008 expenditure (see column 2 and 3 in Table 2 below).⁴ This correction changes the implied PBC cost per QALY ratios as well as the overall threshold (see Table 3 below).

It should be noted that this change in allocation of expenditure only has implications for the estimate of the threshold which uses measures of QALY burden as the basis of the analysis (in Section 4.4.2 and 4.4.3). Since estimates based on QALY burden do provide the best estimates, they are discussed in Chapter 5 so revisions were also made to Sections 5.1 to 5.4, and 5.6 to 5.10.

(based on variation in resource use and health effects). This provides an estimate of the threshold in that period. A different question is how this might inform a judgement about an appropriate threshold in the next and subsequent periods. This requires consideration of other things that might change over time and what we know about their effects. These issues are examined and discussed in Section 5.6.

² Implied PBC cost per QALY ratios should not change with different allocation of changes in spend across PBCs. A comparison of columns 3 and 6 in Table 3 reveals the effect of the typo.

³ The effect of the typo was to wrongly implement the extrapolation by using the proportionate effect on burden of a change in total expenditure, rather than of change PBC expenditure. This meant that calculations of QALY changes in the other 11 PBCs did not properly account for the expenditure elasticity specific to the PBC when deriving QALY changes; generating an inconsistency with calculations of change in spend. The corrected calculations use the proportionate effect of a change in PBC expenditure in the extrapolation, i.e., proportionate effects that are conditional on changes in PBC expenditure. The spend elasticities for PBCs where mortality effects could not be estimated provide the estimated change in PBC expenditure, which, in combination with the conditional effects, are used to derive QALY changes in these other PBCs.

⁴ Throughout the preparation for submission of the first draft report in Jan 2013 each section of analysis, once checked and signed off by the member of the research team undertaking it, was then audited by another member of the research team. Since undertaking the reanalysis described above all sections of the analysis (including the code required) in chapter 4 and 5 have been subject to a complete audit by a researcher who was not a member of the original research team.

Table1: Spend elasticities and allocation methods (2008) [from Table C.55 in updated report]

PBC	PBC description	Total spend 2008/09, £m [1]	Spend elasticities			Change in spend, £m (% share)	
			unadjusted [2]	Original analyses [3]	New allocation [4]	Original analyses [5]	New allocation [6]
2	Cancer	£4,843	0.525	0.525	0.724	£25 (3.2%)	£35 (4.5%)
10	Circulatory problems	£6,655	0.648	0.648	0.894	£43 (5.5%)	£59 (7.6%)
11	Respiratory problems	£3,994	0.652	0.652	0.900	£26 (3.3%)	£36 (4.6%)
13	Gastro-intestinal problems	£3,989	0.456	0.456	0.629	£18 (2.3%)	£25 (3.2%)
	<i>Big 4</i>	£19,481				£113 (14.4%)	£156 (17.3%)
1	Infectious diseases	£1,201	1.545	1.545	2.132	£19 (2.4%)	£26 (3.3%)
4	Endocrine problems	£2,222	0.484	0.484	0.668	£11 (1.4%)	£15 (1.9%)
7	Neurological problems	£3,466	0.980	0.980	1.352	£34 (4.3%)	£47 (6.0%)
17	Genito-urinary problems	£3,779	0.697	0.697	0.962	£26 (3.4%)	£36 (4.6%)
16	Trauma & injuries*	£3,255	1.344	1.344	1.854	£44 (5.6%)	£60 (7.7%)
18+19	Maternity & neonates*	£3,978	0.975	0.975	1.345	£39 (5.0%)	£54 (6.8%)
	<i>First 11 PBC's</i>	£37,382				£285 (36.3%)	£393 (43.7%)
3	Disorders of Blood	£998	1.171	2.291	1.616	£23 (2.9%)	£16 (2.1%)
5	Mental Health Disorders	£9,794	1.036	2.027	1.429	£198 (25.3%)	£140 (17.9%)
6	Learning Disability	£2,874	0.205	0.401	0.283	£12 (1.5%)	£8 (1.0%)
8	Vision	£1,688	0.654	1.279	0.902	£22 (2.8%)	£15 (1.9%)
9	Hearing	£417	1.191	2.330	1.643	£10 (1.2%)	£7 (0.9%)
12	Dental problems	£3,198	0.513	1.003	0.708	£32 (4.1%)	£23 (2.9%)
14	Problems of the Skin	£1,657	0.674	1.318	0.930	£22 (2.8%)	£15 (2.0%)
15	Musculo-skeletal system	£4,081	0.505	0.988	0.697	£40 (5.1%)	£28 (3.6%)
20	Poisoning and AE	£938	0.562	1.099	0.775	£10 (1.3%)	£7 (0.9%)
21	Healthy Individuals	£1,831	1.097	2.146	1.514	£39 (5.0%)	£28 (3.5%)
22	Social Care Needs	£1,874	0.911	1.782	1.257	£33 (4.3%)	£24 (3.0%)
23	Other	£11,666	0.494	0.494	0.682	£58 (7.4%)	£80 (10.1%)
	<i>All (23 PBCs)</i>	£78,398				£784 (100%)	£784 (100%)

* without the negative sign

Table 2: Summary of the cost per QALY threshold, burden based approach (2008)

	Original allocation, Uncorrected [1]	New allocation, Uncorrected [2]	New allocation, Corrected [3]
big 4 PBC's	£4,872	£4,872	£4,872
11 PBCs (with mortality)	£8,308	£8,308	£8,308
All 23 PBCs	£18,317	£13,276	£12,936

Table 3: Breakdown of the cost per QALY threshold, burden based approach (2008)

PBC	PBC description	Original allocation, Uncorrected			New allocation, Uncorrected			New allocation, Corrected		
		Change in spend, £m [1]	Change in QALY [2]	Cost per QALY gained, £ [3]	Change in spend, £m [4]	Change in QALY [5]	Cost per QALY gained, £ [6]	Change in spend, £m [7]	Change in QALY [8]	Cost per QALY gained, £ [9]
2	Cancer	£25	1 496	£16,997	£35	2 064	£16,997	£35	2 064	£16,997
10	Circulatory problems	£43	6 127	£7,038	£59	8 453	£7,038	£59	8 453	£7,038
11	Respiratory problems	£26	13 032	£1,998	£36	17 981	£1,998	£36	17 981	£1,998
13	Gastro-intestinal problems	£18	2 494	£7,293	£25	3 441	£7,293	£25	3 441	£7,293
	<i>Big 4</i>			£4,872			£4,872			£4,872
1	Infectious diseases	£19	891	£20,829	£26	1 229	£20,829	£26	1 229	£20,829
4	Endocrine problems	£11	3 442	£3,124	£15	4 749	£3,124	£15	4 749	£3,124
7	Neurological problems	£34	6 198	£5,480	£47	8 551	£5,480	£47	8 551	£5,480
17	Genito-urinary problems	£26	601	£43,813	£36	829	£43,813	£36	829	£43,813
16	Trauma & injuries*	£44	0	NA	£60	0	NA	£60	0	NA
18+19	Maternity & neonates*	£39	13	£2,969,208	£54	18	£2,969,208	£54	18	£2,969,208
	<i>First 11 PBC's</i>			£8,308			£8,308			£8,308
3	Disorders of Blood	£23	808	£28,305	£16	1 114	£14,470	£16	1 712	£9,419
5	Mental Health Disorders	£198	3 983	£49,835	£140	5 495	£25,477	£140	7 469	£18,744
6	Learning Disability	£12	146	£78,854	£8	202	£40,312	£8	54	£149,883
8	Problems of Vision	£22	281	£76,850	£15	388	£39,287	£15	333	£45,788
9	Problems of Hearing	£10	509	£19,070	£7	703	£9,749	£7	1 098	£6,239
12	Dental problems	£32	574	£55,916	£23	792	£28,585	£23	533	£42,472
14	Skin	£22	125	£174,775	£15	172	£89,349	£15	152	£101,042
15	Musculo skeletal system	£40	1 990	£20,254	£28	2 746	£10,354	£28	1 819	£15,628
20	Poisoning and AE	£10	63	£163,766	£7	87	£83,721	£7	64	£113,546
21	Healthy Individuals	£39	26	£1,483,012	£28	37	£758,146	£28	53	£526,771
22	Social Care Needs	£33	0	NA	£24	0	NA	£24	0	NA
23	Other	£58	0	NA	£80	0	NA	£80	0	NA
	<i>All (23 PBCs)</i>			£18,317			£13,276			£12,936