

Supplementary material file 1

Economic evaluation supplementary tables & figures

Table S 1: Summary of responses to the STAR questionnaire

	Conservative mgmt. (N=69)		Tonsillectomy (N=79)	
	Mean (sd)	n	Mean (sd)	n
Number of sore throat episodes	5.04 (4.20)	69	4.72 (3.72)	79
Proportion of sore throat episodes - mild	0.33 (0.32)	69	0.40 (0.33)	79
Proportion of sore throat episodes - moderate	0.38 (0.34)	69	0.34 (0.30)	79
Proportion of sore throat episodes - severe	0.29 (0.32)	69	0.25 (0.29)	79
Proportion of sore throat episodes requiring over-the-counter medications	1.47 (8.57)	69	0.97 (0.91)	79
Proportion of sore throat episodes requiring prescribed medications	0.22 (39)	69	0.54 (0.81)	79
Proportion of sore throat episodes requiring time away from paid work	0.49 (0.85)	69	0.88 (1.23)	79
Proportion of sore throat episodes requiring time away from usual activities	1.06 (1.29)	69	1.13 (1.38)	79
Utility score (SF-6D) – mild sore throat	0.75 (0.13)	101 ^a	0.75 (0.13)	150 ^a
Utility score (SF-6D) – moderate sore throat	0.69 (0.12)	121 ^a	0.67 (0.11)	115 ^a
Utility score (SF-6D) – severe sore throat	0.59 (0.11)	96 ^a	0.55 (0.11)	87 ^a
Healthcare resource use				
Proportion of sore throat episodes requiring a visit with the GP	0.28 (0.74)	69	0.46 (1.68)	79
Proportion of sore throat episodes requiring a visit to a walk-in centre	0.02 (0.08)	69	<0.01 (0.02)	79

Proportion of sore throat episodes requiring a visit to a pharmacy	0.22 (0.71)	69	0.10 (0.34)	79
Proportion of sore throat episodes requiring a visit to A&E	0.01 (0.04)	69	0.06 (0.18)	79
Proportion of sore throat episodes requiring a hospital admission	0.08 (0.60)	69	0.13 (0.41)	79
Proportion of sore throat episodes requiring a call to NHS111	0.01 (0.03)	69	0.01 (0.05)	79
Proportion of sore throat episodes requiring a visit to a nurse	<0.01 (0.01)	69	<0.01 (0.02)	79

^an is based on the number of STAR questionnaires with utility and soreness data

Table S 2: Unit costs

Resource use	Unit cost	Source	Notes
GP consultation	£34.00	PSSRU 2019	
Practice nurse consultation	£10.50	PSSRU 2019 PSSRU 2015	Assumed to be a 15min consultation
Nurse telephone consultation	£4.20	PSSRU 2019 PSSRU 2015	Assumed to be a 6min consultation
GP telephone consultation	£8.00	PSSRU 2019	
NHS 111/NHS 24	£15.05	PSSRU 2019 PSSRU 2011	Inflated the cost from 2011 using PSSRU inflation rates
GP home visit	£49.02	PSSRU 2019 PSSRU 2015	Assumed to be an 11.4min consultation
Nurse home visit	£17.50	PSSRU 2019 PSSRU 2015	Assumed to be a 25 minute consultation
Emergency/out of hours doctor/clinic	£73.96	PSSRU 2019 PSSRU 2015	Assumed to be a 17.2min consultation
Walk-in clinic	£34.00	PSSRU 2019	Assumed to be the same as a GP consultation
A&E visit	£166.00	NHS reference costs 2018/19	
Outpatient visit	£107.00	NHS reference costs 2018/19	Assumed to be in ENT dept.
Hospital admission (inpatient or day patient)	£341.00	NHS reference costs 2018/19	Assumed to be regular day/night admission
Emergency ambulance service	£209.00	NHS reference costs 2018/19	Assumed to be see and treat/refer
Pharmacist	£14.00	NHS England and NHS Improvement	https://www.england.nhs.uk/wp-content/uploads/2019/11/nhs-cpcs-toolkit.pdf
Tonsillectomy	£1492.00	NHS reference costs 2018/19	

Prescription medications for sore throats			
Mild sore throat	£0.05	STAR / LET and BNF	Cost per sore throat day
Moderate sore throat	£0.14	STAR / LET and BNF	Cost per sore throat day
Severe sore throat	£0.71	STAR / LET and BNF	Cost per sore throat day
PARTICIPANT COSTS			
Over the counter medications for sore throats			
Mild sore throat	£1.17	STAR / LET and BNF	Cost per sore throat day
Moderate sore throat	£1.88	STAR / LET and BNF	Cost per sore throat day
Severe sore throat	£1.55	STAR / LET and BNF	Cost per sore throat day
Time away from work due to sore throat			
Paid work day rate	£109	ONS	
Mild sore throat	£24.15	STAR / LET	Cost per sore throat episode
Moderate sore throat	£105.76	STAR / LET	Cost per sore throat episode
Severe sore throat	£425.94	STAR / LET	Cost per sore throat episode
Time away from usual activities due to sore throat			
Usual activities day rate	£44	AA and PSSRU	Inflated the cost from 2011 using PSSRU inflation rates
Mild sore throat	£33.96	STAR / LET	Cost per sore throat day
Moderate sore throat	£117.74	STAR / LET	Cost per sore throat day
Severe sore throat	£288.10	STAR / LET	Cost per sore throat day
Time and travel costs			
Total inpatient time & travel cost	£75.92	Time and travel questionnaire (18mths)	
Total outpatient time & travel cost	£42.43	Time and travel questionnaire	

		(18mths)	
Total GP time & travel cost	£16.91	Time and travel questionnaire (18mths)	
Total walk-in clinic time & travel cost	£29.54	Time and travel questionnaire (18mths)	
MICRO-COSTING			
Tonsillectomy costs			
Consultant	£109	PSSRU 2019	Cost per hour
Associate specialist	£108	PSSRU 2019	Cost per hour
Specialist registrar	£47	PSSRU 2019	Cost per hour
Staff grade	£47	PSSRU 2019	Cost per hour
Core Trainee	£33	PSSRU 2019	Cost per hour
ST 3-5	£33.47	https://www.bma.org.uk/pay-and-contracts/pay/junior-doctors-pay-scales/pay-scales-for-junior-doctors-in-england	Cost per hour
ST 6-8	£35.51	https://www.bma.org.uk/pay-and-contracts/pay/junior-doctors-pay-scales/pay-scales-for-junior-doctors-in-england	Cost per hour
Operating department practitioner – band 5	£34	Agenda for change	Cost per hour
Nurse – band 2/3	£14.61	Agenda for change	Cost per hour
Nurse – band 5	£34	Agenda for change	Cost per hour

Nurse – band 6	£45	Agenda for change	Cost per hour
Theatre costs	£825.25	Personal communication	Cost per surgery
Consumables	£49.14	Personal communication	Cost per surgery
Consumables – anaesthetic	£46.15	Personal communication	Cost per surgery
Pre-op assessment (with a band 5)	£17	Personal communication & Agenda for change	Cost per 30 mins
Bed cost - daycase	£60	Personal communication	*£240 for 24 hours assumed 6 hours for day case
Bed cost – inpatient	£341	NHS reference costs 2018/19	Assumed to be regular day/night admission

Table S 3: Micro-costing resources

Resource use	Unit cost	Source
Scrub consumables	£7.14	Personal communication
Yankuer	£0.28	Personal communication
Suction tubing	£0.59	Personal communication
Sterile gloves	£2.82	Personal communication – assume 2 pairs
Gallipots	£0.12	Personal communication
Sterile gauze	£0.30	Personal communication
Sterile tonsil mops	£0.25	Personal communication
Silk ties	£2.33	Personal communication
Gloves	£0.45	Personal communication – assume 4 pairs
Tonsil tray	£40	Personal communication
Anaesthetic consumables	£46.15	Personal communication

Table S 4: STAR/LET over-the-counter and prescribed medication names

Medication name	Frequency	Medication name	Frequency
paracetamol	341	benzylamine	2
ibuprofen	219	Drinking honey and lemon 1 a day	2
Lozenges	61	flucloxacillin	2
Soothers	56	Mouth wash to relieve sore throat	2
Throat Lozenges	56	Numbing throat spray 4/5 daily	2
Spray	49	Vicks Chloraseptic	2
Lemsip	47	Amoxyclav 10mlx3pd	1
codeine	43	Chewing gum	1
Antibiotics	31	Corpodylmouthwash	1
penicillin	31	Corsadel mouthwash 5 times in one day	1
co-codamol	30	Cough sweets 2/3 times a day	1
difflam	28	Cyclizine 1 x 3times	1
co-amoxiclav	12	dexamethasone	1
Tyrozets	11	diazepam	1
amoxicillin	9	drink 7/day	1
Cold & Flu	9	Flurbiprofen lozenges	1
clarithromycin	8	Herbal Tea	1
Asprin	7	Honey, Lemon & ginger root	1
naproxen	7	Listerine mouthwash - all week	1
Corvonia throat spray	5	morphine	1
Medicated mouth wash	5	Neopan	1
Sea Salt gargle	5	Nurofen	1
All in 1 Beechams	4	omeprazole	1
Bio Yogurt	4	Oral Spray 3 days	1
Chloraseptic Anaesthetic	4	Other painkillers in hospital	1
Diclofenac	4	Roxithromycin tab 2xdaily, 5 days	1
erythromycin	4	saline nasal spray	1
Halls Losanges	4	Senna	1

Tramadol	4	TCP 3 days	1
Anaesthetic Spray	3	throat/mouthwash	1
Dizo?	3	tyrabetts	1
Fisherman friends	3	Tyresels	1
Oscillocoquinum	3	Vitamin C	1
Vocal Zone	3		

Table S 5: GP linkage medication names

Medication name	Frequency	Medication name	Frequency
penicillin	422	nystatin	2
clarithromycin	81	prochlorperazine	2
difflam	51	tranexamic acid	2
amoxicillin	45	xylometazoline nasal spray	2
paracetamol	28	24hr antibiotics no other details	1
ibuprofen	27	analgesia	1
erythromycin	25	azithromycin	1
codeine	22	beclometasone 50mcg spray	1
co-codamol	21	bisoprolol	1
Doxycycline	20	buscopan	1
pen v	14	ceftriaxone	1
benzydamine	13	clenil	1
co-amoxiclav	13	clindamycin	1
Naproxen	10	clotrimazole	1
Salbutamol	9	coal tar	1
metronidazole	7	co-dydramol	1
amitriptyline	6	dalteparin prophylaxis	1
dexamethasone	6	dequadin	1
Omeprazole	6	diazepam	1
Otomize	6	dymista nasal spray	1
prednisolone	6	enstilar	1
Augmentin	5	eye lubricant - xailin	1
Sertraline	5	fluconazole	1
Tramadol	5	fusidic acid cream	1
Cephalexin	4	gentamicin	1
Citalopram	4	gentian hc	1
Corsodyl	4	iv benpen	1
fluticasone	4	iv fluids	1
mometasone	4	iv meropenem	1
beconase	3	iv not specified	1
ciprofloxacin	3	iv steroid	1
diclofenac	3	lactulose	1
flucloxicillin	3	laxido	1

gedarel	3	loratadine	1
hydrogen peroxide gargles	3	montelukast	1
morphine	3	nefopam	1
rigevidon	3	neomycin/chlorhexidine	1
sodium chloride	3	oral abx	1
trimethoprim	3	pcm	1
aciclovir	2	propranolol	1
betnovate	2	sofradex ear drops	1
ferrous sulphate	2	solifenacin	1
gaviscon	2	symbicort	1
iv antibiotics	2	transorazole	1
lansoprazole	2	varenicline	1
norethistrone	2		

Table S 6: Summary of responses to the STARLET questionnaire

	Conservative mgmt. (N=75)		Tonsillectomy (N=63)	
	Mean (sd)	n	Mean (sd)	n
Number of sore throat episodes	5.15 (7.73)	75	4.57 (5.85)	63
Proportion of sore throat episodes - mild	0.29 (0.34)	75	0.33 (0.35)	63
Proportion of sore throat episodes - moderate	0.37 (0.36)	75	0.34 (0.43)	63
Proportion of sore throat episodes - severe	0.34 (0.38)	75	0.31 (0.35)	63
Proportion of sore throat episodes requiring over-the-counter medications	1.67 (0.40)	75	1.44 (0.49)	63
Proportion of sore throat episodes requiring prescribed medications	1.24 (0.35)	75	1.21 (0.42)	63
Proportion of sore throat episodes requiring time away from paid work	0.68 (1.41)	75	0.52 (0.86)	63
Proportion of sore throat episodes requiring time away from usual activities	1.24 (1.54)	75	1.09 (1.42)	63
Utility score (SF-6D) – mild sore throat	0.75 (0.13)	110 ^a	0.74 (0.13)	78 ^a
Utility score (SF-6D) – moderate sore throat	0.74 (0.15)	125 ^a	0.70 (0.12)	92 ^a
Utility score (SF-6D) – severe sore throat	0.62 (0.14)	67 ^a	0.62 (0.13)	61 ^a

Table S 7: CEA sensitivity analysis – estimating costs for participants with data at at least one timepoint and has complete effects data

Investigation strategy	Cost (£) [95% CI] ^a	Incremental Cost (£) [95% CI] ^b	Effect [95% CI] ^a	Incremental Effect [95% CI] ^b	ICER (£)	Probability that tonsillectomy is cost-effective for different threshold values for society's willingness to pay to avoid a sore throat day					
						£0	£20	£30	£40	£50	
Outcome: sore throat days – results (sensitivity analysis)											
Conservative											
mgmt. (costs n=147, outcomes n=205)	814 (669 to 959)		55.42 (44 to 67)			1.00	0.72	0.30	0.12	0.05	
Tonsillectomy (costs n=161, outcomes n=224)	1474 (1377 to 1571)	673 (503 to 844)	34.15 (29 to 39)	-28.00 (-44 to -12)	24	0.00	0.28	0.70	0.88	0.95	

^a point estimates are based on the unadjusted analysis (costs n=308, QALYs n=429); ^b incremental estimates are based on the adjusted analysis (n=304)

Table S 8: CUA sensitivity analysis - estimating costs for participants with data at at least one timepoint and has complete effects data

Investigation strategy	Cost (£)	Incremental	Effect	Incremental	ICER (£)	Probability that Tonsillectomy is cost-effective for different threshold values for society's willingness to pay for an additional QALY				
	[95% CI] ^a	Cost (£)	[95% CI] ^a	Effect						
Outcome: QALYs – results (sensitivity analysis)						£0	£10000	£20000	£30000	£50000
Conservative										
mgmt.	814		1.517			1.00	0.09	0.02	0.01	0.01
(costs n=147, outcomes n=44)	(669 to 959)		(1.45 to 1.59)							
Tonsillectomy	1474	683	1.577	0.118	5788	0.00	0.91	0.98	0.99	0.99
(costs n=161, outcomes n=46)	(1377 to 1571)	(350 to 1016)	(1.52 to 1.63)	(0.04 to 0.19)						

^a point estimates are based on the unadjusted analysis (costs n=308, QALYs n=90); ^b incremental estimates are based on the adjusted analysis (n=90)

Table S 9: CBA sensitivity analysis

Investigation strategy	Cost (£) [95% CI]^a	Incremental Cost (£) [95% CI]^b	Effect [95% CI]^a	Incremental Effect [95% CI]^b	Probability that Tonsillectomy has a higher net benefit
Outcome: number of sore throat days and WTP to avoid a sore throat day – results (sensitivity analysis)					
Conservative mgmt. (costs n=147, outcomes n=196)	814 (669 to 959)		-1874 (-2464 to -1284)		
Tonsillectomy (costs n=161, outcomes n=217)	1474 (1377 to 1571)	689 (512 to 866)	-1218 (-1628 to -808)	779 (-189 to 1742)	0.56

^a point estimates are based on the unadjusted analysis (costs n=308, outcomes [number of sore throat days and WTP value to avoid a sore throat day] n=413); ^b incremental estimates are based on the adjusted analysis (n=286);

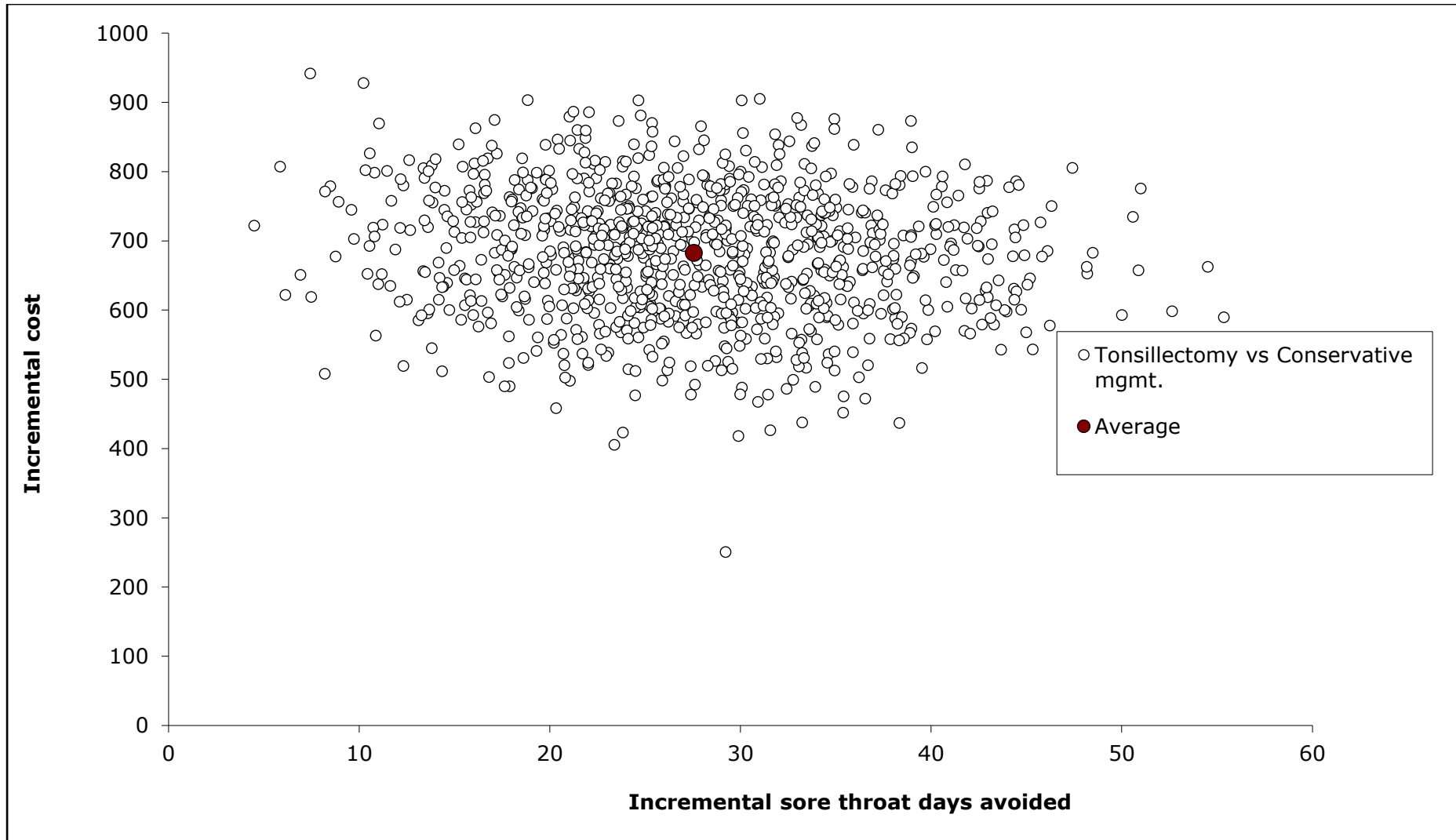


Figure S 1: Cost-effectiveness acceptability curves for tonsillectomy vs. conservative management using the adjusted bootstrapped CEA sensitivity analysis results

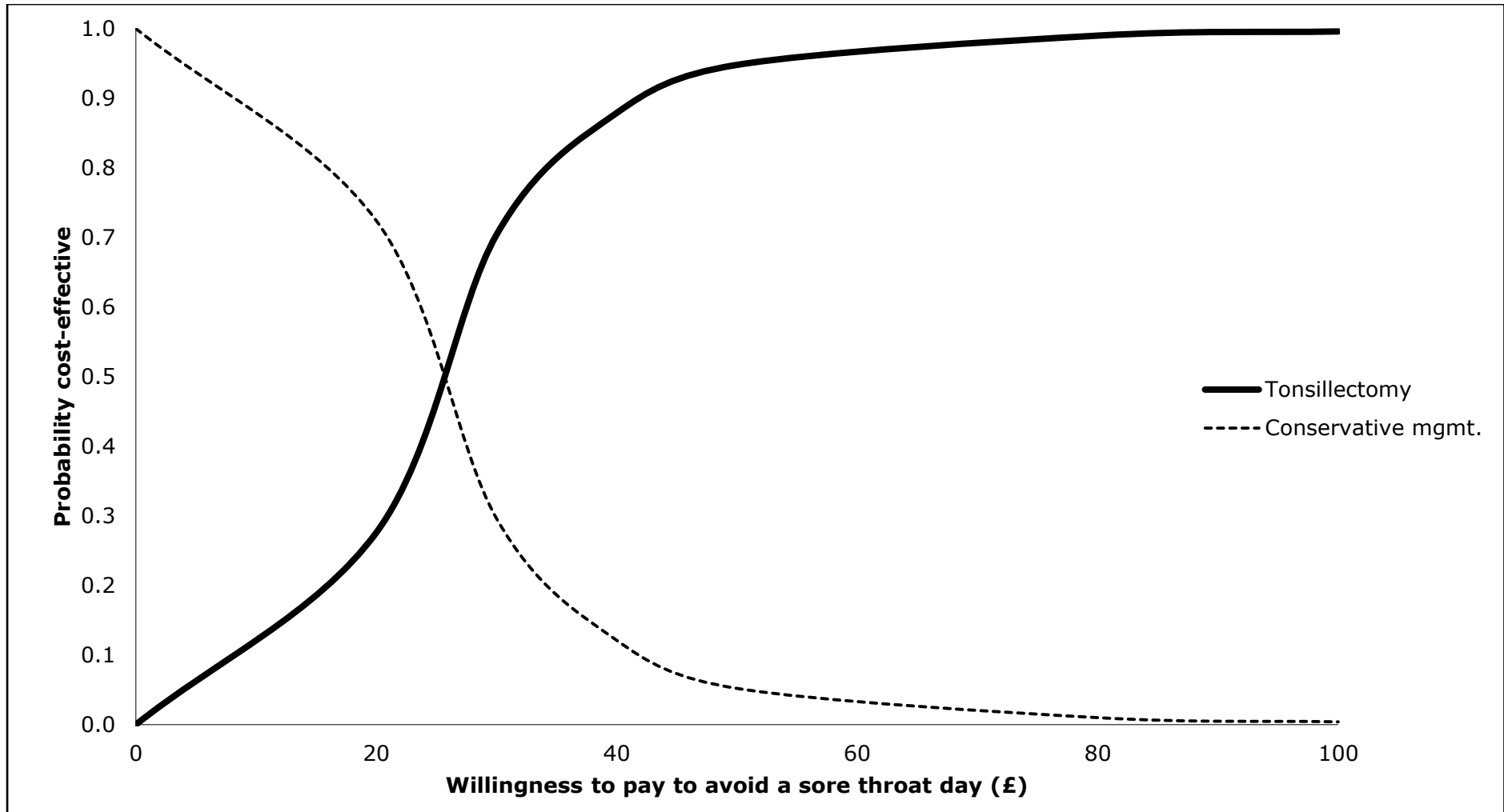


Figure S 2: Cost-effectiveness acceptability curves for tonsillectomy vs. conservative management using the adjusted bootstrapped CEA sensitivity analysis results

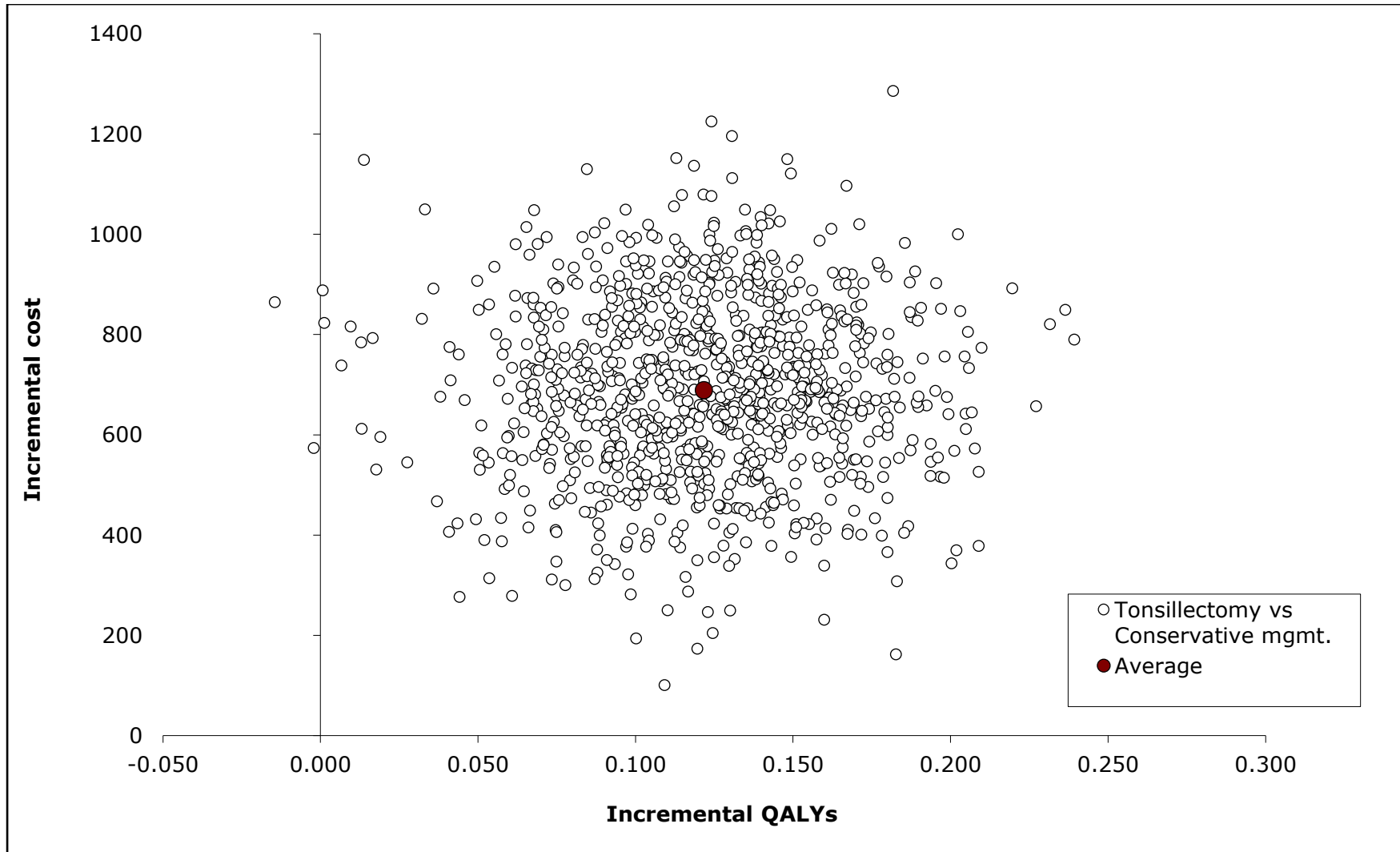


Figure S 3: Cost-effectiveness acceptability curves for tonsillectomy vs. conservative management using the adjusted bootstrapped CUA sensitivity analysis results

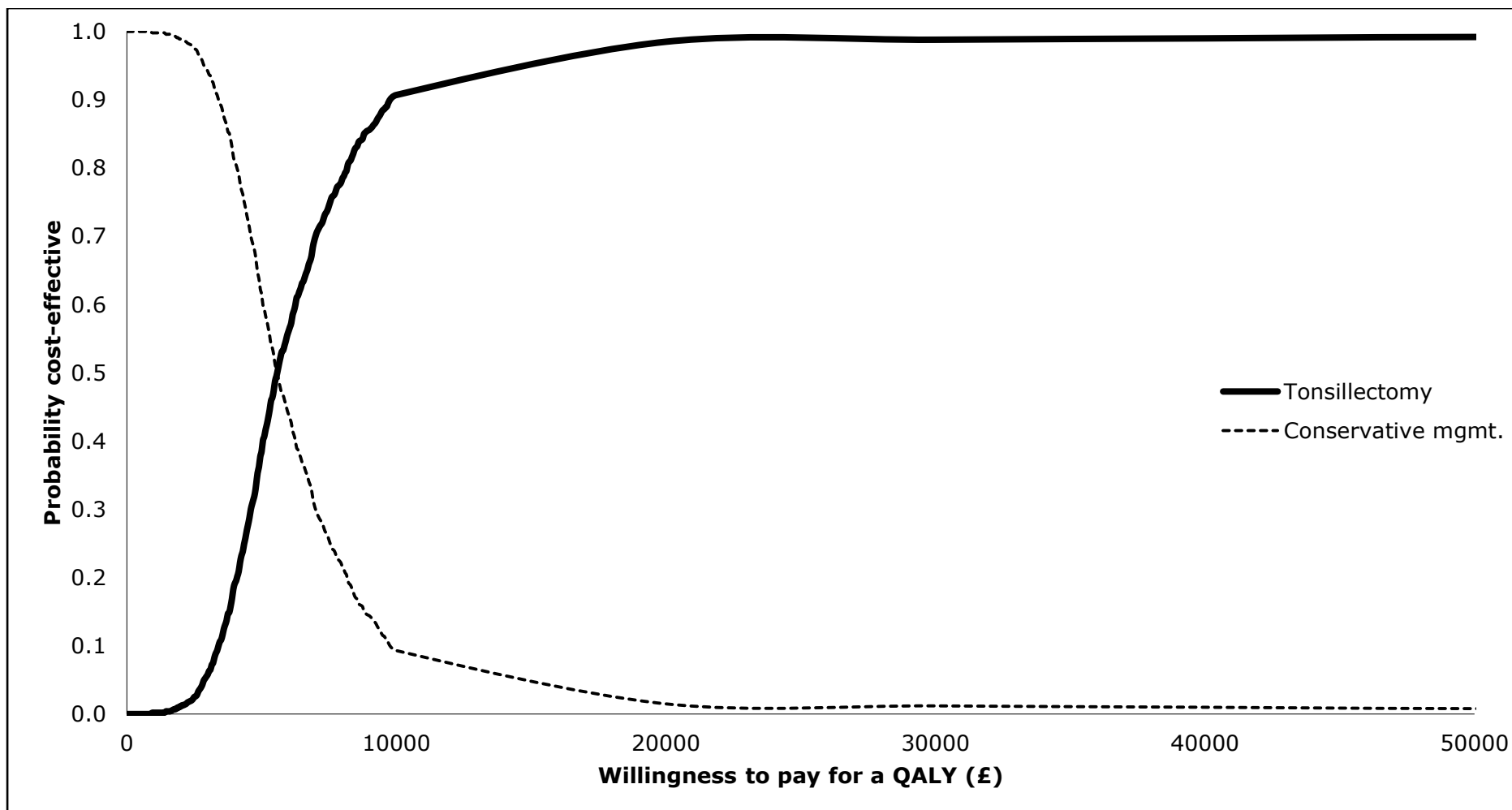


Figure S 4: Cost-effectiveness acceptability curves for tonsillectomy vs. conservative management using the adjusted bootstrapped CUA sensitivity analysis results

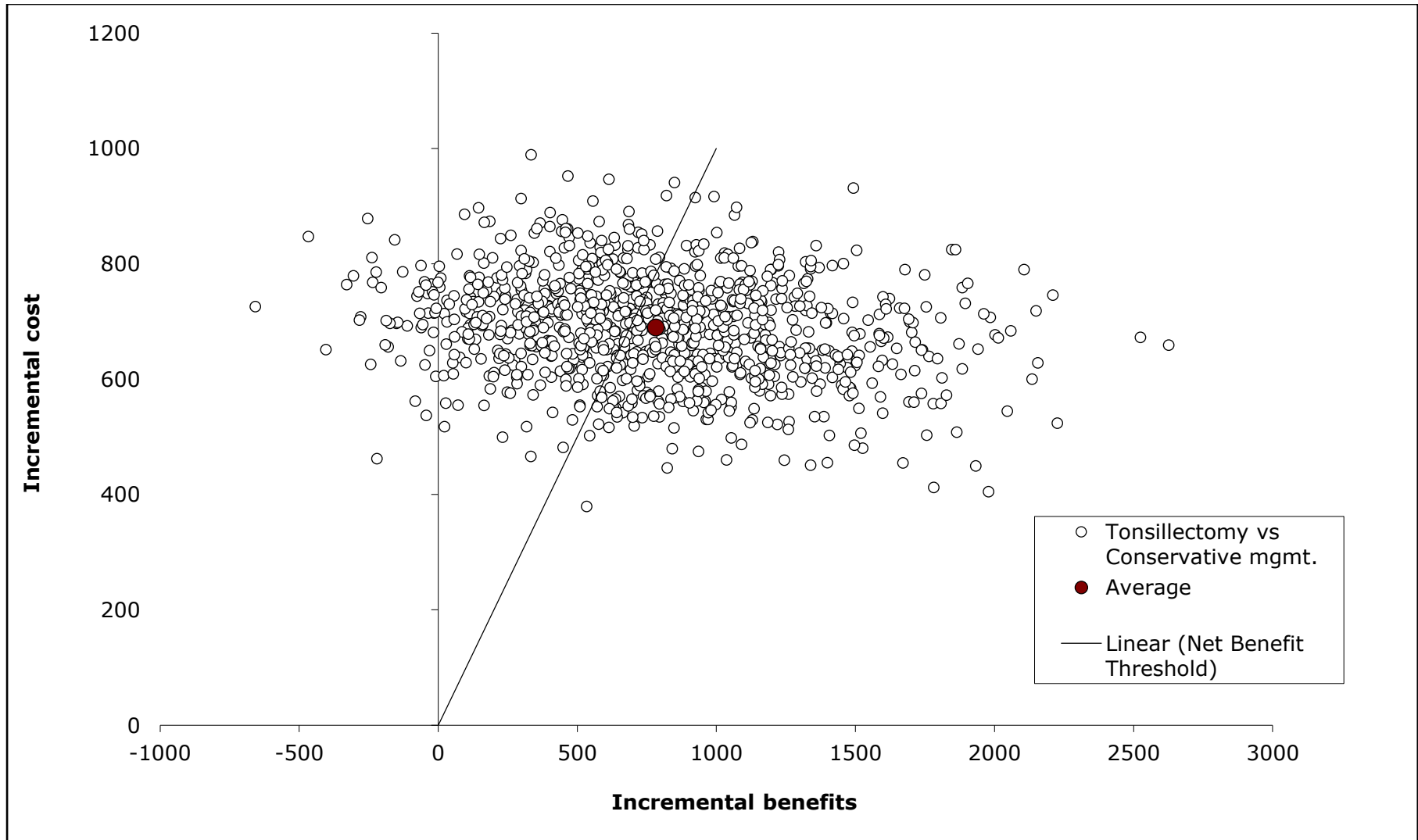


Figure S 5: Cost-effectiveness acceptability curves for tonsillectomy vs. conservative management using the adjusted bootstrapped CBA sensitivity analysis result

