

Supplementary material has been published as submitted. It has not been copyedited, or typeset by Acta Dermato-Venereologica

**Table SI. Results of key outputs after using multiple imputation for handling missing values.**

Key outputs	Original data - base-case analysis		Pooled data
	N	Mean	Mean
Itch severity	111	4.95	4.95
Pain severity	106	3.26	3.26
DLQI score	112	10.14	10.13
EQ-5D- 5L health index	112	0.86	0.87
EQ-VAS	114	63.74	63.90
PBI score	112	2.77	2.75
hours were you away from work because of your health problems?	60	2.40	1.69
how many hours did you work- last week	81	37.99	37.42
Percent % Work time missed (Absenteeism)	85	0.04	0.06
Percent % Impairment while working (Presenteeism)	86	0.25	0.26
Percent % Overall work impairment	85	0.27	0.29
Percent % Activity Impairment	114	0.32	0.32
number of healthcare contacts in the last month	107	1.58	1.58
cost out-of-pocket per year	73	1143.73	1148.77
cost out-of-pocket per month	74	208.68	211.52
Total cost productivity losses per year	54	1972.32	2132.64
cost absenteeism per week	60	68.95	76.04
cost presenteeism per week	87	310.95	312.99
total cost productivity losses per week	55	388.12	389.03

Abbreviations: DLQI = Dermatology Life Quality Index; EQ-5D-5L = EuroQol 5-Dimension 5-Level; EQ-VAS = EuroQol Visual Analogue Scale; PBI = Patient Benefit Index; WPAI = Work Productivity and Activity Impairment.

**Note:** Based on the table above, no significant differences were observed between the base-case analysis and analysis (pooled data) using multiple imputation for handling missing values



<i>Other allergies</i>	106 (65%)							
<i>Depression</i>	21 (13%)	0.53	0.69	0.18	0.19	<b>&lt;0.01</b>	<0.001	<b>0.002</b>
<i>Anxiety</i>	35 (22%)							
<i>ADHD</i>	13 (8%)	0.21	0.84	0.96	0.29	<b>&lt;0.01</b>	<b>0.02</b>	<0.001
<b>Itch (NRS, 0-10)</b>	5,06 (2,58)	<b>&lt;0.001</b>	0.90	0.76	0.17	<b>0.03</b>	0.21	0.26
<b>Pain (NRS, 0-10)</b>	3,27 (2,61)	<b>&lt;0.001</b>	0.97	0.67	0.23	0.13	0.40	0.33
<b>DLQI (0-30)</b>	10,14 (6,26)	<b>&lt;0.001</b>	0.86	0.18	<b>0.035</b>	0.27	0.96	<b>0.026</b>
<b>EQ-5D-5L index (-0,314-1)</b>	0,86 (0,16)	<b>&lt;0.001</b>	0.27	0.12	<b>0.008</b>	<b>0.006</b>	0.067	<b>0.028</b>
<b>EQ VAS (0-100)</b>	62,10 (20,41)	<b>0.002</b>	0.17	0.16	0.27	<b>0.01</b>	<b>0.045</b>	0.109
<b>PBI (0-4)</b>	2,82 (0,84)	<b>0.006</b>	0.64	0.50	<b>0.046</b>	<b>0.04</b>	0.08	0.258
<b>WPAI</b>	<b>% impairment (SD) or % present-absenteeism (SD)</b>							
<i>% Overall work impairment</i>	29,14% (0,29)	<b>0.006</b>	0.69	0.89	0.31	<b>0.01</b>	<b>0.04</b>	<b>0.05</b>
<i>% Activity impairment</i>	32,00% (27,77)	<b>&lt;0.001</b>	0.20	<b>0.006</b>	<b>&lt;0.001</b>	<b>0.02</b>	0.089	0.078
<i>% Presenteeism</i>	18,29% (24,75)	<b>0.001</b>	0.92	0.92	0.36	<b>0.04</b>	0.129	<b>0.03</b>
<i>% Absenteeism</i>	5,67% (18,55)	0.38	0.30	0.91	0.32	0.38	0.461	0.202

**Abbreviations:** DLQI=Dermatology Life Quality Index, EQ-5D-5L=EuroQol 5-Dimension 5-Level, EQ-VAS= EuroQol Visual Analogue Scale, PBI=Patient Benefit Index, WPAI=Work Productivity and Activity Impairment.

**Note:** "Allergic conditions" include allergic rhinitis, food allergy, or other allergic diagnoses (excluding asthma). "Asthma and allergies" refers to respondents reporting asthma together with at least one of the other allergic conditions. \*all results were not statistically significant between males and females  $p>0,05$ , +statistically significant results with bold.

**Note on the table:** Asthma (51%) and allergic rhinitis (44%) were common and strongly associated with each other ( $p < 0.001$ ) but not with AD severity. Higher AD severity was linked to greater itch and pain (NRS, both  $p < 0.001$ ) and poorer quality of life (DLQI, EQ-5D-5L, both  $p < 0.001$ ). Non-atopic and psychological comorbidities were related to worse health outcomes and work impairment. The presence of ADHD (8%) was associated with non-atopic conditions ( $p < 0.01$ ), anxiety/depression ( $p = 0.02$ ), and overall comorbidity burden ( $p < 0.001$ ), but not with AD severity ( $p = 0.21$ ). The presence of asthma does not affect the population characteristics significantly. Most significant differences are seen with the presence of allergic condition and some non-atopic diseases.

Table SIII. Mean costs per AD severity level.

	Statistic	Bias	Bootstrap <sup>a</sup>			
			Std. Error	95% Confidence Interval		
				Lower	Upper	
no problem, little	cost out-of-pocket per year	515.9	4.8	169.5	248.1	884.5
	cost out-of-pocket per month	257.9	2.4	84.8	124.0	442.3
	total cost productivity losses per week	359.8	-6.5	112.8	138.4	579.4
	cost absenteeism per week	97.2	-1.9	84.9	.0	287.2
	cost presenteeism per week	262.6	-4.7	88.8	92.0	436.7
	Total cost productivity losses per year	719.6	-13.1	225.6	276.7	1158.9
mild	cost out-of-pocket per year	310.9	-4.8	82.6	148.8	477.6
	cost out-of-pocket per month	115.2	-1.8	30.6	55.1	176.9
	total cost productivity losses per week	191.3	-1.6	51.0	98.7	295.5
	cost absenteeism per week	14.4	-.2	7.4	.0	28.7
	cost presenteeism per week	177.0	-1.4	49.7	84.3	278.1
	Total cost productivity losses per year	516.6	-4.3	137.7	266.4	797.9
moderate	cost out-of-pocket per year	3373.6	-55.6	2422.8	520.2	8863.8
	cost out-of-pocket per month	421.7	-7.0	302.9	65.0	1108.0
	total cost productivity losses per week	454.6	-3.4	120.3	210.7	682.3
	cost absenteeism per week	19.2	-.7	12.7	.0	45.5
	cost presenteeism per week	435.4	-2.7	112.0	205.6	642.3
	Total cost productivity losses per year	3636.6	-26.9	962.4	1685.9	5458.5
extreme	cost out-of-pocket per year	1495.8	20.7 <sup>b</sup>	841.0 <sup>b</sup>	393.6 <sup>b</sup>	2597.9 <sup>b</sup>
	cost out-of-pocket per month	166.2	2.3 <sup>b</sup>	93.4 <sup>b</sup>	43.7 <sup>b</sup>	288.7 <sup>b</sup>
	total cost productivity losses per week	925.1	5.5 <sup>b</sup>	223.6 <sup>b</sup>	632.1 <sup>b</sup>	1218.2 <sup>b</sup>
	cost absenteeism per week	229.8	4.3 <sup>b</sup>	175.4 <sup>b</sup>	.0 <sup>b</sup>	459.7 <sup>b</sup>
	cost presenteeism per week	695.3	1.2 <sup>b</sup>	48.2 <sup>b</sup>	632.1 <sup>b</sup>	758.5 <sup>b</sup>
	Total cost productivity losses per year	8326.0	49.5 <sup>b</sup>	2012.6 <sup>b</sup>	5688.6 <sup>b</sup>	10963.5 <sup>b</sup>
Total	cost out-of-pocket per year	1269.7	-6.7	664.9	434.6	2697.4
	cost out-of-pocket per month	253.9	-.4	86.9	123.5	457.7
	total cost productivity losses per week	368.6	-3.2	62.8	246.4	489.1
	cost absenteeism per week	60.0	-.7	34.8	9.3	140.2
	cost presenteeism per week	308.6	-2.5	52.0	208.2	409.0
	Total cost productivity losses per year	1879.5	-10.4	468.4	1040.1	2819.3

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

b. Based on 868 samples

Table S4. Mean difference in costs between AD severity groups.

## Multiple Comparisons Bonferroni

Dependent Variable	(I) severity categorical 1-4 mild to extreme	(J) severity categorical 1-4 mild to extreme	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
cost out-of-pocket per year	no problem, little	mild	204.9	1592,1	1,00	-4292,3	4702,1
		moderate	-2857.8	1641,3	,55	-7494,0	1778,5
		extreme	-979.9	2875,0	1,00	-9100,9	7141,1
	mild	no problem, little	-204.9	1592,1	1,00	-4702,1	4292,3
		moderate	-3062.7	1739,1	,53	-7975,2	1849,8
		extreme	-1184.9	2931,9	1,00	-9466,7	7097,0
	moderate	no problem, little	2857.8	1641,3	,55	-1778,5	7494,0
		mild	3062.7	1739,1	,53	-1849,8	7975,2
		extreme	1877.9	2959,0	1,00	-6480,3	10236,0
	extreme	no problem, little	979.9	2875,0	1,00	-7141,1	9100,9
		mild	1184.9	2931,9	1,00	-7097,0	9466,7
		moderate	-1877.9	2959,0	1,00	-10236,0	6480,3
cost out-of-pocket per month	no problem, little	mild	142.8	215,0	1,00	-464,5	750,0
		moderate	-163.8	221,6	1,00	-789,8	462,3
		extreme	91.7	388,2	1,00	-1004,9	1188,3
	mild	no problem, little	-142.8	215,0	1,00	-750,0	464,5
		moderate	-306.5	234,8	1,00	-969,9	356,8
		extreme	-51.0	395,9	1,00	-1169,4	1067,3
	moderate	no problem, little	163.8	221,6	1,00	-462,3	789,8
		mild	306.5	234,8	1,00	-356,8	969,9
		extreme	255.5	399,6	1,00	-873,1	1384,1
	extreme	no problem, little	-91.7	388,2	1,00	-1188,3	1004,9
		mild	51.0	395,9	1,00	-1067,3	1169,4
		moderate	-255.5	399,6	1,00	-1384,1	873,1
total cost productivity losses per week	no problem, little	mild	168.4	140,8	1,00	-229,2	566,1
		moderate	-94.8	145,1	1,00	-504,7	315,1
		extreme	-565.3	254,2	,20	-1283,3	152,7
	mild	no problem, little	-168.4	140,8	1,00	-566,1	229,2
		moderate	-263.2	153,8	,58	-697,6	171,1
		<b>extreme</b>	<b>-733.8*</b>	<b>259,2</b>	<b>,05</b>	<b>-1466,0</b>	<b>-1,5</b>
	moderate	no problem, little	94.8	145,1	1,00	-315,1	504,7
		mild	263.2	153,8	,58	-171,1	697,6
		extreme	-470.5	261,6	,49	-1209,5	268,4
	extreme	no problem, little	565.3	254,2	,20	-152,7	1283,3
		<b>mild</b>	<b>733.8*</b>	<b>259,2</b>	<b>,05</b>	<b>1,5</b>	<b>1466,0</b>
		moderate	470.5	261,6	,49	-268,4	1209,5
cost absenteeism per week	no problem, little	mild	82.9	88,5	1,00	-167,2	332,9
		moderate	78.1	91,3	1,00	-179,7	335,9
		extreme	-132.6	159,8	1,00	-584,1	318,9
	mild	no problem, little	-82.9	88,5	1,00	-332,9	167,2
		moderate	-4.8	96,7	1,00	-277,9	268,3
		extreme	-215.5	163,0	1,00	-675,9	245,0
	moderate	no problem, little	-78.1	91,3	1,00	-335,9	179,7
		mild	4.8	96,7	1,00	-268,3	277,9
		extreme	-210.7	164,5	1,00	-675,4	254,0
	extreme	no problem, little	132.6	159,8	1,00	-318,9	584,1
		mild	215.5	163,0	1,00	-245,0	675,9
		moderate	210.7	164,5	1,00	-254,0	675,4
cost presenteeism per week	no problem, little	mild	85.6	118,1	1,00	-248,1	419,2
		moderate	-172.9	121,8	1,00	-516,8	171,1
		extreme	-432.7	213,3	,31	-1035,2	169,8
	mild	no problem, little	-85.6	118,1	1,00	-419,2	248,1
		moderate	-258.4	129,0	,33	-622,9	106,0
		extreme	-518.3	217,5	,14	-1132,7	96,1
	moderate	no problem, little	172.9	121,8	1,00	-171,1	516,8
		mild	258.4	129,0	,33	-106,0	622,9
		extreme	-259.8	219,5	1,00	-879,9	360,2
	extreme	no problem, little	432.7	213,3	,31	-169,8	1035,2
		mild	518.3	217,5	,14	-96,1	1132,7
		moderate	259.8	219,5	1,00	-360,2	879,9
no problem, little	mild	203.0	719,2	1,00	-1828,5	2234,4	

Total cost productivity losses per year	mild	moderate	-2917.0*	741,4	,00	-5011,3	-822,8
		<b>extreme</b>	<b>-7606.4*</b>	<b>1298,7</b>	<b>&lt;,001</b>	<b>-11274,8</b>	<b>-3938,1</b>
		no problem, little	-203.0	719,2	1,00	-2234,4	1828,5
		<b>moderate</b>	<b>-3120.0*</b>	<b>785,6</b>	<b>,00</b>	<b>-5339,0</b>	<b>-900,9</b>
	moderate	<b>extreme</b>	<b>-7809.4*</b>	<b>1324,4</b>	<b>&lt;,001</b>	<b>-11550,4</b>	<b>-4068,4</b>
		<b>no problem, little</b>	<b>2917.0*</b>	<b>741,4</b>	<b>,0027</b>	<b>822,8</b>	<b>5011,3</b>
		<b>mild</b>	<b>3120.0*</b>	<b>785,6</b>	<b>,0025</b>	<b>900,9</b>	<b>5339,0</b>
		<b>extreme</b>	<b>-4689.4*</b>	<b>1336,6</b>	<b>,0087</b>	<b>-8464,9</b>	<b>-913,9</b>
	extreme	<b>no problem, little</b>	<b>7606.4*</b>	<b>1298,7</b>	<b>&lt;,001</b>	<b>3938,1</b>	<b>11274,8</b>
		<b>mild</b>	<b>7809.4*</b>	<b>1324,4</b>	<b>&lt;,001</b>	<b>4068,4</b>	<b>11550,4</b>
		<b>moderate</b>	<b>4689.4*</b>	<b>1336,6</b>	<b>,0087</b>	<b>913,9</b>	<b>8464,9</b>

\*. The mean difference is significant at the 0.05 level.

Table S5. Mean costs per comorbid condition.

having asthma		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
yes	cost out-of-pocket per year	782.8	.352	217.8	398.6	1301.8
	cost out-of-pocket per month	226.7	.428	71.8	110.7	386.7
	total cost productivity losses per week	433.6	-.936	84.8	274.2	611.7
	cost absenteeism per week	88.1	-3.136	74.9	2.4	263.3
	cost presenteeism per week	345.5	2.201	71.4	216.7	490.8
	Total cost productivity losses per year	1674.4	6.818	442.8	908.3	2691.5
no	cost out-of-pocket per year	1728.0	-1.186	1277.7	292.2	4637.3
	cost out-of-pocket per month	281.6	-.199	156.5	77.9	652.3
	total cost productivity losses per week	334.9	-2.635	91.9	158.7	517.5
	cost absenteeism per week	39.9	-.696	25.9	4.1	102.0
	cost presenteeism per week	295.0	-1.939	76.8	143.3	448.1
	Total cost productivity losses per year	2154.8	-28.426	778.2	742.8	3797.8

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

having asthma and allergies		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
yes	cost out-of-pocket per year	1389.8	-20.9	765.1	424.4	3083.3
	cost out-of-pocket per month	272.5	-2.9	99.7	121.8	487.6
	total cost productivity losses per week	376.0	-1.4	63.0	255.4	501.4
	cost absenteeism per week	55.4	-.3	40.2	6.6	145.8
	cost presenteeism per week	320.5	-1.1	54.9	214.0	433.4
	Total cost productivity losses per year	1665.8	.3	409.6	915.6	2517.7
no	cost out-of-pocket per year	786.6	-16.3 <sup>b</sup>	457.1 <sup>b</sup>	51.6 <sup>b</sup>	1768.7 <sup>b</sup>
	cost out-of-pocket per month	168.1	3.2 <sup>b</sup>	90.7 <sup>b</sup>	20.6 <sup>b</sup>	379.2 <sup>b</sup>
	total cost productivity losses per week	401.1	-16.1 <sup>b</sup>	242.2 <sup>b</sup>	.0 <sup>b</sup>	860.9 <sup>b</sup>
	cost absenteeism per week	97.7	-5.1 <sup>b</sup>	85.6 <sup>b</sup>	.0 <sup>b</sup>	306.5 <sup>b</sup>
	cost presenteeism per week	303.4	-11.0 <sup>b</sup>	176.9 <sup>b</sup>	.0 <sup>b</sup>	644.5 <sup>b</sup>
	Total cost productivity losses per year	3452.2	-142.0 <sup>b</sup>	2125.8 <sup>b</sup>	.0 <sup>b</sup>	7475.6 <sup>b</sup>

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

b. Based on 995 samples

having various allergic diagnosis (asthma not incl.)		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
yes	cost out-of-pocket per year	1462.6	-10.5	798.2	457.5	3437.9
	cost out-of-pocket per month	280.3	-3.4	102.8	125.1	524.1
	total cost productivity losses per week	414.9	-3.3	69.4	278.3	551.4
	cost absenteeism per week	71.8	.9	42.9	10.0	171.3
	cost presenteeism per week	343.1	-4.2	55.8	229.4	449.0
	Total cost productivity losses per year	2021.2	-2.3	517.8	1100.9	3112.9
no	cost out-of-pocket per year	378.9	-3.9 <sup>b</sup>	168.9 <sup>b</sup>	58.3 <sup>b</sup>	728.9 <sup>b</sup>
	cost out-of-pocket per month	124.4	-1.2 <sup>b</sup>	84.7 <sup>b</sup>	16.4 <sup>b</sup>	319.6 <sup>b</sup>
	total cost productivity losses per week	182.7	3.7 <sup>b</sup>	156.2 <sup>b</sup>	.0 <sup>b</sup>	524.8 <sup>b</sup>
	cost absenteeism per week	5.7	.2 <sup>b</sup>	5.9 <sup>b</sup>	.0 <sup>b</sup>	19.2 <sup>b</sup>
	cost presenteeism per week	177.0	3.5 <sup>b</sup>	150.5 <sup>b</sup>	.0 <sup>b</sup>	505.7 <sup>b</sup>
	Total cost productivity losses per year	1461.8	29.2 <sup>b</sup>	1250.0 <sup>b</sup>	.0 <sup>b</sup>	4198.4 <sup>b</sup>

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples b. Based on 996 samples

having various non atopic conditions (e.g. depression anxiety. ADHD. bulimia anorexia		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
yes	cost out-of-pocket per year	654.3	6.1	287.3	262.8	1301.8
	cost out-of-pocket per month	262.3	3.5	153.4	59.5	627.8
	total cost productivity losses per week	533.6	4.1	156.7	230.5	838.9
	cost absenteeism per week	172.4	4.6	161.2	.0	579.4
	cost presenteeism per week	361.2	-.5	140.3	101.2	649.7
	Total cost productivity losses per year	1929.0	-10.3	758.2	761.6	3680.2
no	cost out-of-pocket per year	1471.8	-5.8	819.5	440.6	3307.6
	cost out-of-pocket per month	255.2	-2.1	101.4	116.8	487.3
	total cost productivity losses per week	338.4	2.5	65.2	217.3	479.6
	cost absenteeism per week	32.0	.8	18.3	6.5	76.6
	cost presenteeism per week	306.3	1.7	55.4	203.2	419.7
	Total cost productivity losses per year	1938.5	34.5	552.1	972.3	3155.5

		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
<b>having anxiety/depression</b>						
<b>yes</b>	cost out-of-pocket per year	513.5	4.0	268.7	135.2	1159.0
	cost out-of-pocket per month	226.2	2.0	135.7	39.2	556.2
	total cost productivity losses per week	451.1	2.5	162.5	149.2	769.9
	cost absenteeism per week	150.8	.8	142.3	.0	465.4
	cost presenteeism per week	300.2	1.7	133.7	50.6	589.8
	Total cost productivity losses per year	1561.4	20.0	750.1	408.7	3279.0
<b>no</b>	cost out-of-pocket per year	1549.5	-1.8	878.4	442.1	3609.8
	cost out-of-pocket per month	266.4	-1.5	108.0	118.7	518.5
	total cost productivity losses per week	356.9	1.3	62.7	238.6	487.2
	cost absenteeism per week	33.3	.5	18.0	7.2	74.7
	cost presenteeism per week	323.6	.8	52.8	221.3	429.8
	Total cost productivity losses per year	2056.4	24.2	538.7	1060.6	3210.8

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

		Statistic	Bias	Std. Error	Bootstrap <sup>a</sup> 95% Confidence Interval	
					Lower	Upper
<b>having ADHD</b>						
<b>yes</b>	cost out-of-pocket per year	1417.1	-7.4 <sup>b</sup>	635.5 <sup>b</sup>	559.8 <sup>b</sup>	2274.3 <sup>b</sup>
	cost out-of-pocket per month	603.6	-4.6 <sup>b</sup>	395.6 <sup>b</sup>	70.0 <sup>b</sup>	1137.1 <sup>b</sup>
	total cost productivity losses per week	505.7	-3.3 <sup>b</sup>	281.2 <sup>b</sup>	126.4 <sup>b</sup>	884.9 <sup>b</sup>
	cost absenteeism per week	.0	.0 <sup>b</sup>	.0 <sup>b</sup>	.0 <sup>b</sup>	.0 <sup>b</sup>
	cost presenteeism per week	505.7	-3.3 <sup>b</sup>	281.2 <sup>b</sup>	126.4 <sup>b</sup>	884.9 <sup>b</sup>
	Total cost productivity losses per year	1390.5	-3.3 <sup>b</sup>	281.2 <sup>b</sup>	1011.3 <sup>b</sup>	1769.8 <sup>b</sup>
<b>no</b>	cost out-of-pocket per year	1290.7	4.6	724.8	393.0	2962.1
	cost out-of-pocket per month	234.3	.4	90.0	111.9	441.5
	total cost productivity losses per week	371.6	-.7	60.9	253.2	506.0
	cost absenteeism per week	65.8	.6	38.2	11.3	150.8
	cost presenteeism per week	305.8	-1.3	50.7	209.2	414.1
	Total cost productivity losses per year	1971.7	.9	475.0	1114.1	2947.8

a. Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

b. Based on 903 samples