

Supplementary Material

A Cost-Consequence Analysis of Different Screening Procedures in Alzheimer's Disease: Results from the MOPEAD Project

Abbreviations

AD	Alzheimer's disease
CAIDE	Cardiovascular Risk Factors, Aging, and Incidence of Dementia
CANTAB	the Cambridge Neuropsychological Test Automated Battery
CDR	Clinical Dementia Rating
CSF	Cerebrospinal fluid
DSDRS	Diabetes-Specific Dementia Risk Score
FCSRT	Free and Cued Selective Reminding Test
GLM	Generalized Linear Model
HADS	Hospital Anxiety and Depression Scale
MMSE	Mini-Mental State Examination
MOPEAD	Models of Patient-Engagement for Alzheimer's Disease
MRI	Magnetic resonance imaging
NA	Not applicable
NNS	Number needed to screen
OR	Odds Ratio
RBANS	Repeatable Battery for the Assessment of Neuropsychological Status
RUD_	Resource Utilization in Dementia
TP	True positive
WP	Work package

Countries

DE	Germany
ES	Spain
NL	the Netherlands
SE	Sweden
SL	Slovenia

Supplementary Table 1. Used instruments in MOPEAD

Instrument	Run 1	Run 2	Run 3	Run 4	WP3
CANTAB	X				
MMSE		X	X	X	
CAIDE			X		
p-FCSRT A		X			
RBANS					X
CDR					X
HADS		X			X
RUD					X
DSDRS				X	

Supplementary Table 2. Unit cost base case: Hourly rates

	Hourly rates	SE	SL	DE	ES	NL
Run 2	Physician	143.50	21.50	46.00		33.62
	Nurse	143.50	8.50	22.62		23.66
	Physiotherapist, Occupational therapist	143.50	8.50			
	Other staff	143.50	8.50	14.35	25.00	23.66
	Neuropsychologist	143.50	17.00	32.85	50.00	26.48
Run 3	Physician	80.69	21.50	76.00	60.00	33.62
	Nurse	26.36	8.50	21.44	35.00	23.66
	Physiotherapist, Occupational therapist	26.27	8.50			
	Neuropsychologist	34.75	17.00	24.55		26.48
	Other staff	21.06	8.50	14.35		23.66
Run 4	Physician	82.85	32.00	76.00	60.00	33.62
	Nurse	26.36	10.00	21.44		23.66
	Physiotherapist, Occupational therapist	26.27				
	Neuropsychologist	34.75	17.00	24.55		26.48
	Other staff	21.06	10.00	14.35		23.66
WP3	Physician	116.08	32.00	35.33	60.00	33.62
	Nurse	26.36	10.00	21.44	35.00	23.66
	Physiotherapist, Occupational therapist	26.27	0.00		35.00	23.66
	Neuropsychologist	34.75	20.00	24.55	50.00	26.48
	Other staff	21.06	10.00	14.35	25.00	23.66
	Medical specialist (Netherlands)					110.79

Supplementary Table 3. Costs base case: overhead costs. For Run 2-4: Costs per screened case. For WP3: costs per evaluated case.

	SE	SL	DE	ES	NL
Run 2					
Advertisements, info, etc.	36	5	29	0	2
Rent for Open House	0	3	0	0	0
Material, machines, etc., at Open House (if not in rent)	0	1	0	0	0
Administration of Open House	0	20	0	0	0
Cost for instrument	10	2	10	10	10
Parking cards participants	0	0	0	0	14
Public transport compensation participants	0	0	0	0	10
Run 3					
Advertisements, info, etc.	0	0	0	0	1
Administration	0	28	0	0	0
Cost for instrument	2	2	2	2	2
Public transport compensation participants	0	0	0	0	19
Run 4					
Advertisements, info, etc.	0	0	0	0	4
Administration	0	21	0	0	107
Cost for instrument	2	2	2	2	2
Public transport compensation participants	0	0	0	0	0
WP 3					
Cost for instrument	183	9	20	55	27
Costs for lab	48	61	13	129	46
Costs for CSF	44	67	19	34	8
Costs for MRI	388	166	326	489	270
Parking cards participants	0	0	0	0	24
Public transport compensation participants	0	0	0	0	9

Supplementary Table 4. Hourly rates uniform source: <http://www.salaryexplorer.com>

		SE	SL	DE	ES	NL
Run 2	Specialist (geriatrics)	55.19	29.96	49.34	37.43	51.76
	Registered Nurse	23.14	13.31	20.34	15.19	20.55
	Occupational therapist	33.91	20.48	32.95	24.59	31.64
	Other staff	23.14	13.31	20.34	15.19	20.55
	Psychologist	68.22	41.10	66.86	50.30	67.13
Run 3	Physician	57.35	32.15	55.69	39.57	52.19
	Registered Nurse	23.14	13.31	20.34	15.19	24.00
	Occupational therapist	33.91	20.48	32.95	24.59	31.64
	Psychologist	68.22	41.10	66.86	50.30	67.13
	Other staff	23.14	13.31	20.34	15.19	20.55
Run 4	Physician	81.71	46.32	73.79	56.72	78.75
	Registered Nurse	23.14	13.31	20.34	15.19	20.55
	Occupational therapist	33.91	20.48	32.95	24.59	31.64
	Psychologist	68.22	41.10	66.86	50.30	67.13
	Other staff	23.14	13.31	20.34	15.19	20.55
WP3	Physician	55.19	29.96	49.34	37.43	51.76
	Registered Nurse	23.14	13.31	20.34	15.19	20.55
	Occupational therapist	33.91	20.48	32.95	24.59	31.64
	Psychologist	68.22	41.10	66.86	50.30	67.13
	Other staff	23.14	13.31	20.34	15.19	20.55
All	Average health sector	38.33	24.32	39.24	26.54	41.96

Supplementary Table 5. Run 1: Country specific data: study population outcomes.

RUN 1	SE	SL	DE	ES	NL	All
Numbers						
Completed Screenings	125	653	41	528	140	1,487
Positive screen	43	225	14	191	74	547
Invited to WP3	43	155	14	191	74	477
Contacted for referral to WP3	21	67	10	49	27	174
Evaluated at WP3	17	31	6	31	6	91
TP at WP3	12	13	0	22	2	49
Proportions (%)						
Positive screens of screened	34%	34%	34%	36%	53%	37%
Invited of screened positive	100%	69%	100%	100%	100%	87%
Contacted of screened positive	49%	30%	71%	26%	36%	32%
WP3 of screened	14%	5%	15%	6%	4%	6%
WP3 of positive screens	40%	14%	43%	16%	8%	17%
TP of contacted	57%	19%	NA	45%	7%	28%
TP of positive screens	28%	6%	NA	12%	3%	9%
TP of evaluated	71%	42%	NA	71%	33%	54%
TP of screened	10%	2%	NA	4%	1%	3%
NNS/TP	10	50	NA	24	70	30

Supplementary Table 6. Run 2: Country specific data: study population outcomes.

RUN 2	SE	SL	DE	ES	NL	All
Numbers						
Completed Screenings	118	83	178	101	181	661
Positive screen	30	47	48	49	56	230
Invited to WP3	30	47	48	39	54	218
Contacted for referral to WP3	28	45	48	39	54	214
Evaluated at WP3	28	33	34	33	33	161
TP at WP3	17	13	19	32	1	82
Proportions (%)						
Positive screens of screened	25%	57%	27%	49%	31%	35%
Invited of screened positive	100%	100%	100%	80%	96%	95%
Contacted of screened positive	93%	96%	100%	80%	96%	93%
WP3 of screened	24%	40%	19%	33%	18%	24%
WP3 of positive screens	93%	70%	71%	67%	59%	70%
TP of contacted	61%	29%	40%	82%	2%	38%
TP of positive screens	57%	28%	40%	65%	2%	36%
TP of evaluated	61%	39%	56%	97%	3%	51%
TP of screened	14%	16%	11%	32%	1%	12%
NNS/TP	7	6	9	3	181	8

Supplementary Table 7. Run 3: Country specific data: study population outcomes.

RUN 3	SE	SL	DE	ES	NL	All
Numbers						
Completed Screenings	99	65	89	105	77	435
Positive screen	34	38	22	57	40	191
Invited to WP3	34	36	22	56	40	188
Contacted for referral to WP3	32	32	20	55	40	179
Evaluated at WP3	19	15	5	32	23	94
TP at WP3	17	11	1	25	4	58
Proportions (%)						
Positive screens of screened	34%	58%	25%	54%	52%	44%
Invited of screened positive	100%	95%	100%	98%	100%	98%
Contacted of screened positive	94%	84%	91%	96%	100%	94%
WP3 of screened	19%	23%	6%	30%	30%	22%
WP3 of positive screens	56%	39%	23%	56%	58%	49%
TP of contacted	53%	34%	5%	45%	10%	32%
TP of positive screens	50%	29%	5%	44%	10%	30%
TP of evaluated	89%	73%	20%	78%	17%	62%
TP of screened	17%	17%	1%	24%	5%	13%
NNS/TP	6	6	89	4	19	8

Supplementary Table 8. Run 4: Country specific data: study population outcomes.

RUN 4	SE	SL	DE	ES	NL	All
Numbers						
Completed Screenings	39	91	13	109	12	264
Positive screen	17	49	6	75	6	153
Invited to WP3	17	48	6	75	4	150
Contacted for referral to WP3	16	45	6	72	4	143
Evaluated at WP3	4	16	2	33	1	56
TP at WP3	0	15	1	31	0	47
Proportions (%)						
Positive screens of screened	44%	54%	46%	69%	50%	58%
Invited of screened positive	100%	98%	100%	100%	67%	98%
Contacted of screened positive	94%	92%	100%	96%	67%	93%
WP3 of screened	10%	18%	15%	30%	8%	21%
WP3 of positive screens	24%	33%	33%	44%	17%	37%
TP of contacted	NA	33%	17%	43%	NA	33%
TP of positive screens	NA	31%	17%	41%	NA	31%
TP of evaluated	NA	94%	50%	94%	NA	84%
TP of screened	NA	16%	8%	28%	NA	18%
NNS/TP	NA	6	13	4	NA	6

Supplementary Table 9. Time spent by different staff types in Runs 2-4 (minutes per screened case).

	Minutes per case	SE	SL	DE	ES	NL	All raw mean	All sample size weighted
Run 2	Physician	116.9	30.0	0.0	0.0	0.0	29.4	24.1
	Nurse	23.7	6.0	11.8	0.0	0.0	8.3	8.0
	Physiotherapist, Occupational therapist	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other staff	36.6	0.0	0.0	9.6	75.0	24.2	29.6
	Neuropsychologist	7.6	25.4	84.6	56.5	60.0	53.4	52.6
	Total	184.9	61.4	96.4	66.1	135.0	108.8	114.2
Run 3	Physician	34.4	36.0	4.4	6.3	1.0	16.4	15.7
	Nurse	20.6	36.0	5.0	20.2	7.2	17.8	17.2
	Physiotherapist, Occupational therapist	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Neuropsychologist	0.0	0.0	33.8	0.0	54.0	17.6	16.7
	Other staff	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	55.0	72.0	43.2	26.5	62.2	75.8	49.6
Run 4	Physician	39.6	15.0	4.4	54.0	16.4	25.9	34.0
	Nurse	19.2	15.0	5.0	0.0	13.6	10.6	8.9
	Physiotherapist, Occupational therapist	3.0	0.0	0.0	0.0	0.0	0.0	0.4
	Neuropsychologist	0.0	90.0	33.8	0.0	26.4	41.4	33.8
	Other staff	0.0	105.5	0.0	0.0	76.8	25.1	40.4
	Total	61.8	225.5	43.2	54.0	133.2	102.9	117.6

Supplementary Table 10. Time spent by different staff types in specialist level WP3 (minutes screened case).

Minutes per case	SE	SL	DE	ES	NL	All raw mean	All sample size weighted
Physician	120.0	120.0	102.0	128.8	73.0	108.8	113.4
Nurse	60.0	120.0	27.6	19.8	3.0	46.1	48.8
Physiotherapist, Occupational therapist	0.0	0.0	0.0	0	0.0	0.0	0.0
Neuropsychologist	0.0	120.0	79.0	105.6	247.8	110.5	109.4
Other staff	0.0	1.8	0.0	19.0	322.6	68.7	56.4
Total	180.0	361.8	208.6	273.2	646.4	334.0	328.0

Supplementary Table 11. Use of diagnostic tools at WP 3

	SE	SL	DE	ES	NL	All
MRI	64	95	46	129	61	395
Evaluated at WP3	64	95	47	129	63	398
Proportion MRI	100%	100%	98%	100%	97%	99%
CSF	31	55	5	21	24	131
Evaluated at WP3	64	95	47	129	63	398
Proportion CSF	48%	58%	11%	16%	38%	33%

Supplementary Table 12. Cost effectiveness outcomes of the different Runs – country specific results. Costs as Euros (€) 2019.

	Cost per RUN case	Cumulative Run cost	Cost per WP3 case	Cumulative WP3 cost	Cumulative total cost	Cost per Screened	Cost per positive screen	Cost per evaluated at WP3	Cost per TP of AD
RUN 1									
SE	121	15,118	921	15,665	30,782	246	716	1,811	2,565
SL	24	15,702	428	13,263	28,965	44	207	934	2,228
DE	460	18,852	866	5,194	24,046	586	2004	4,008	NA
ES	39	20,343	757	23,447	43,820	83	272	1,414	1,992
NL	142	19,858	857	5,142	25,000	179	397	4,167	12,500
RUN 2									
SE	489	57,649	921	25,801	83,450	707	2,782	2,980	4,909
SL	50	4,166	428	14,119	18,284	220	389	554	1,406
DE	90	16,034	866	29,435	5,469	255	947	1,337	2,393
ES	61	6,205	757	24,992	31,197	309	800	945	975
NL	91	16,534	857	28,283	44,817	248	830	1358	44,817
RUN 3									
SE	57	5,627	921	17,508	23,134	234	680	1,218	1,361
SL	47	3,080	428	6,418	9,497	146	264	633	863
DE	23	2,017	866	4,329	6,345	71	288	1,269	6,345
ES	20	2,059	757	24,234	26,293	250	470	822	1,052
NL	49	3,764	857	19,712	23,476	305	587	1,021	5,869
RUN 4									
SE	66	2,572	921	3,686	6,258	160	368	1,564	NA
SL	76	6,889	428	6,845	13,734	151	286	858	916
DE	23	295	866	1,731	2,026	156	338	1,013	2,026
ES	55	6,047	757	24,992	31,039	285	414	941	1,001
NL	169	2,033	857	857	2,890	241	723	2,890	NA

Supplementary Table 13. GLM-model of cost per TP and cost per screened case*.

Parameter	B	Exp(B)(OR)	95% Confidence Interval for Exp(B)		Least square means	95% Confidence interval	
			Lower	Upper		Lower	Upper
Intercept	6.766	868.257	823.407	915.551			
Run							
Run 1	0.868	2.381	2.260	2.510	4,200	4,086	4,317
Run 2	0.970	2.638	2.472	2.816	4,653	4,497	4,814
Run 3	0.366	1.442	1.351	1.540	2,543	2,445	2,645
Run 4	Ref	1			1,764	1,675	1,857
Country							
Germany	0.856	2.355	2.218	2.500	3,547	3,382	3,721
Spain	-0.099	0.906	0.872	0.941	1,365	1,323	1,408
The Netherlands	2.442	11.494	10.856	12.169	17,314	16,541	18,123
Sweden	0.343	1.410	1.336	1.487	2,123	2,035	2,216
Slovenia	Ref	1			1,506	1,459	1,556

* Since TPs for Germany in Run 1 and for Sweden and the Netherlands in Run 4 were 0, mean TPs for the other countries in each Run were imputed

Supplementary Table 14. Cost effectiveness. Sensitivity analysis. Country specific results.

Sensitivity 1	Cost per RUN case	Cumulative Run cost	Cost per WP3 case	Cumulative WP3 cost	Cumulative total cost	Cost per screened	Cost per positive screen	Cost per evaluated at WP3	Cost per TP of AD
RUN 1									
SE	121	15,118	684	11,621	26,739	214	622	1,573	2,228
SL	24	15,702	504	15,612	31,314	48	139	1,010	2,409
DE	460	18,852	945	5,668	24,520	598	1,751	4,087	NA
ES	39	20,343	700	21,692	42,035	80	220	1,356	1,911
NL	142	19,858	870	5,221	25,079	179	339	4,180	12,539
RUN 2									
SE	172	20,262	684	19,140	39,402	334	1,313	1,407	2,318
SL	65	5,404	504	16,619	22,023	265	469	667	1,694
DE	113	20,093	945	32,121	52,214	293	1,088	1,536	2,748
ES	58	5,832	700	23,092	28,923	286	590	876	904
NL	64	11,524	870	28,715	40,239	222	719	1,219	40,239
RUN 3									
SE	42	4,192	684	12,988	17,180	174	505	904	1,011
SL	29	1,872	504	7,554	9,426	145	248	628	857
DE	45	3,9 98	945	4,724	8,722	98	396	1,744	8,722
ES	11	1,133	700	22,392	23,525	224	413	735	941
NL	66	5,058	870	20,013	25,072	326	627	1,090	6,268
RUN 4									
SE	65	2,517	684	2,734	5,252	135	309	1,313	NA
SL	78	7,105	504	8,058	15,162	167	309	948	1,011
DE	46	601	945	1,889	2,491	192	415	1,245	2,491
ES	53	5,725	700	23,092	28,817	264	384	873	930
NL	57	686	870	870	1,556	130	259	1,556	NA

Sensitivity 2	Cost per RUN case	Cumulative Run cost	Cost per WP3 case	Cumulative WP3 cost	Cumulative total cost	Cost per screened	Cost per positive screen	Cost per evaluated at WP3	Cost per TP of AD
RUN 1									
SE	121	15,118	662	11,306	26,423	211	614	1,554	2,202
SL	24	15,702	481	14,905	30,607	47	136	987	2,354
DE	460	18,852	862	5,399	24,251	591	1732	4,042	NA
ES	39	20,343	633	19,638	39,981	76	209	1,290	1,817
NL	142	19,858	755	4,532	24,390	174	330	4,065	12,195
RUN 2									
SE	141	16,643	665	18,621	35,264	299	1175	1,259	2,074
SL	56	4,671	481	15,867	20,538	247	437	622	1,580
DE	102	18,220	900	30,597	48,817	274	1017	1,436	2,569
ES	35	3,571	633	20,905	24,476	242	500	742	0,765
NL	54	9,750	755	24,926	34,676	192	619	1,051	34,676
RUN 3									
SE	37	3,629	665	12,636	16,264	164	478	853	957
SL	31	1,996	481	7,212	9,208	142	242	614	837
DE	30	2,648	900	4,500	7,147	80	325	1,429	7,147
ES	13	1,391	633	20,272	21,663	206	380	677	867
NL	45	3,466	755	17,372	20,839	271	521	906	5,210
RUN 4									
SE	41	1,599	665	2,660	4,259	109	251	1,065	NA
SL	50	4,565	481	7,693	12,258	135	250	766	817
DE	30	387	900	1,800	2,187	168	364	1,093	2,187
ES	25	2,767	633	20,905	23,672	217	316	717	764
NL	41	491	755	0,755	1,247	104	208	1,247	NA

Sensitivity 3	Cost per RUN case	Cumulative Run cost	Cost per WP3 case	Cumulative WP3 cost	Cumulative total cost	Cost per screened	Cost per positive screen	Cost per evaluated at WP3	Cost per TP of AD
RUN 1									
SE	121	15,118	695	11,815	26,933	215	626	1,584	2,244
SL	24	15,702	527	16,349	32,051	49	142	1,034	2,465
DE	460	18,852	1008	6,050	24,901	607	1,779	4,150	NA
ES	39	20,343	719	22,283	42,626	81	223	1,375	1,938
NL	142	19,858	926	5,554	25,411	182	343	4,235	12,706
RUN 2									
SE	242	28,500	695	19,461	47,961	406	1599	1,713	2,821
SL	99	8,185	527	17,404	25,589	308	544	775	1,968
DE	150	26,727	1008	34,281	61,007	343	1271	1,794	3,211
ES	111	11,167	719	23,721	34,888	345	712	1,057	1,090
NL	129	23,305	926	30,546	53,851	298	962	1,632	53,851
RUN 3									
SE	82	8,166	695	13,206	21,372	216	629	1,125	1,257
SL	72	4,703	527	7,911	12,613	194	332	841	1,147
DE	90	8,021	1008	5,041	13,062	147	594	2,612	13,062
ES	40	4,186	719	23,002	27,188	259	477	850	1,088
NL	164	12,633	926	21,290	33,923	441	848	1,475	8,481
RUN 4									
SE	134	5,215	695	2,780	7,996	205	470	1,999	NA
SL	124	11,268	527	8,438	19,707	217	402	1,232	1,314
DE	255	3,309	1008	2,017	5,325	410	888	2,663	5,325
ES	72	7,838	719	23,721	31,559	290	421	956	1,018
NL	196	2,354	926	926	3,280	273	547	3,280	NA

Supplementary Table 15. Cost effectiveness. Sensitivity analysis S5. Country specific results.

Sensitivity 5 input TP means	Cost per TP of AD	Cost per TP of screened pos	Cost per TP at WP3
RUN 1			
SE	2,565	1,739	1,477
SL	2,228	1,436	1,078
DE	4,537	2,173	1,472
ES	1,987	1,397	1,117
NL	12,500	7,819	2,997
RUN 2			
SE	4,909	2,380	2,322
SL	1,406	1,268	1,213
DE	2,326	1,710	1,643
ES	972	872	841
NL	44,817	33,398	31,297
RUN 3			
SE	1,361	1,144	1,093
SL	863	747	648
DE	6,158	4,640	4,254
ES	1,048	1,010	0,991
NL	5,869	5,417	5,209
RUN 4			
SE	544	418	343
SL	916	704	537
DE	1,951	1,792	1,702
ES	998	937	862
NL	1,652	1,071	587

Sensitivity 5 input TP=1	Cost per TP of AD	Cost per TP of screened positive	Cost per TP at WP3
RUN 1			
SE	2,565	1,739	1,477
SL	2,228	1,436	1,078
DE	23,821	11,407	7,728
ES	1,987	1,397	1,117
NL	12,500	7,819	2,997
RUN 2			
SE	4,909	2,380	2,322
SL	1,406	1,268	1,213
DE	2,326	1,710	1,643
ES	972	872	841
NL	44,817	33,398	31,297
RUN 3			
SE	1,361	1,144	1,093
SL	863	747	648
DE	6,158	4,640	4,254
ES	1,048	1,010	991
NL	5,869	5,417	5,209
RUN 4			
SE	6,258	4,807	3,950
SL	916	704	537
DE	1,951	1,792	1,702
ES	998	937	862
NL	2,890	1,874	1,026

Supplementary Table 16. Drop-out reasons in Run 1.

Run	Status wp3	DE	ES	NL	SE	SL	ALL
RUN_1	Not specified	78	805	366	202	878	2,329
RUN_1	Appointment rejected - complex protocol		3	4	1	2	10
RUN_1	Appointment rejected - fear of study procedures		2	1		1	4
RUN_1	Appointment rejected – the informant not available		1			1	2
RUN_1	Appointment rejected – logistic reasons	2	1	4		4	11
RUN_1	Appointment rejected – not aware of cognitive problems		2			4	6
RUN_1	Appointment rejected - other reasons		4	4		4	12
RUN_1	Individual not eligible - age		3	1		6	10
RUN_1	Individual not found	2	111	36		73	222
RUN_1	Leaves study			1		5	6
RUN_1	Pre screening error	2	2	6	2	9	21
Grand Total	Total	84	934	423	205	987	2,633