Supplementary material

Supplementary table 1a. *B. Pertussis* vaccine schedules and vaccines in Finland

Year	Scheme	Vaccine composition	Change	pertussis Vaccine name (Company)	Study cohort	Vaccination coverage[1]
BEFORE				No vaccine available	Older adults	
1952		DTwP	First only DwP, T added in 1957 1962 change to DTwP (Fim2,3 strain), Additional Fim2 strain added in 1976	Diphteria-Pertussis Forte (Orion) PDT (Orion) DTwP (KTL)	Older and young adults	92-99%
2003	3,4,5, 20-24 m 6y	DTwP + IPV + Hib Tdap3	 First ap booster vaccine in NIP	DTwP (KTL) Boostrix (GSK)	Adolescents Adults	98%
2005	3,5,12 m 4y 14-15y	DTaP2-IPV-Hib DTaP2-IPV Tdap3	Introduction aP priming, 2 Bp components Also catch-up for 11-13y	Pentavac (Sanofi) Tetravac (Sanofi) Boostrix (GSK)	Adolescents and children Young adults	97-99%
2009	3,5,12 m 4y 14-15y	DTaP3-IPV-Hib DTaP2-IPV Tdap3	3 Bp components	Infanrix (GSK) Tetravac (Sanofi) Boostrix	Children Adolescents Young adults	99%
2012	Military	Tdap3	Addition of pertussis vaccination in the military, 18-25y (estimation)	Boostrix (GSK)	Young adults	89-99%
2018	25y	Tdap3	Introduction of adult booster	Boostrix (GSK)	Young adults	91%
2019 (Sep)	3,5,12 m	DTaP2-IPV-Hib	2 Bp components	Pentavac (Sanofi)		

Supplementary table 1b. *B. Pertussis* vaccine schedules and vaccines in the Netherlands

Year	Scheme	Vaccine composition	Change	pertussis Vaccine name (Company)	Study cohort	Vaccination coverage[1]
BEFORE				No vaccine available	Older adults	
1954		DT**wP**	Combination vaccine became available	DTwP (RIVM)	Older adults	
1957	3,4,5,11 m	DT**wP**	Start of NIP	DTwP (RIVM)	Older and young adults	96-97%
1999	2,3,4,11 m	DT**wP**-IPV + Hib	Accelerated vaccination	DTwP(RIVM)		97·0-97·2%
2001	2,3,4,11 m 4y	DT**wP**-IPV + Hib DT-IPV + **aP3**	 Introduction aP booster, 3 Bp components	DTwP(RIVM) monovalent aP (GSK)	Adolescents	97·2-97·8%
2005	2,3,4,11 m 4y	DT**aP3**-IPV-Hib DT-IPV + **aP3**	Introduction aP priming, 3 Bp components	Infanrix(GSK) monovalent aP (GSK)	Adolescents	96.0%
2006 (Jan)	2,3,4,11 m 4y	DT**aP5**-IPV-Hib DT-IPV + **aP3**	5 Bp components	Pediacel (SP MSD) monovalent aP (GSK)	Adolescents	96·3-96.9%
2011 (Oct)	2,3,4,11 m 4y	DT**aP3**-IPV-Hib-HepB + Pneu DT**aP3**-IPV	3 Bp components	Infanrix(GSK) Infanrix(GSK)		94·8-96·7%
2017 (Jan)	2,3,4,11 m 4y	DT**aP3**-IPV-Hib-HepB + Pneu Td**ap3**-IPV	 Reduced dose of 3 Bp components	Infanrix(GSK) Boostrix(GSK)		93·9%
2018 (Dec)	2,3,4,11 m 4y	DT**aP5**-IPV-Hib-HepB + Pneu Td**ap3**-IPV	5 Bp components	Vaxelis (SP MSD) Boostrix(GSK)		93·5%
2019 (Dec)	Pregnant women (from 22 w of gestational age)	Td**ap3**	Introduction ap booster for pregnant women, reduced dose of 3 Bp components	Boostrix (GSK)		

Supplementary table 1c. *B. Pertussis* vaccine schedules and vaccines in the UK

Year	Scheme	Vaccine composition	Change	pertussis Vaccine name (Company)	Study cohort	Vaccination coverage[1]
BEFORE				No vaccine available	Older adults	
1957	3, 4.5-5, 8.5-11 m	DT**wP**	Start of NIP	DTwP	Older adults	40.0-78.0%
1990 (Jun)	2,3,4 m	DT**wP**-IPV + Hib	Accelerated schedule	DTwP-IPV-Hib	Young adults	85.0-96.0%
2000-2001	2,3,4 m	DT**wP**-IPV + Hib / DT-IPV + **aP3**	Shortness of wP -use of a mix aP/wP	DTwP-IPV-Hib		91.0%
2001 (Nov)	2,3,4 m 3y 4m	DT**wP**-IPV-Hib DT-IPV + **aP3**	Introduction aP booster	DTwP-IPV/Hib		91.0%
2004 (Aug)	2,3,4 m 3y 4m	DT**aP5**-IPV-Hib DT-IPV + **aP5**	Introduction aP priming, 5 Bp components	Pediacel (SP MSD) Repevax (MSD)	Adolescents	92%
2005 (Jan)	2,3,4 m 3y 4m	DT**aP5**-IPV-Hib / DT**aP3**-IPV-Hib DT-IPV + **aP5** / DT-IPV + **aP3**	Availability of 3 or 5 components	Pediacel (SP MSD) / Infanrix (GSK) Repevax (MSD) / Infanrix (GSK)	Adolescents and children	91.0-95.0%
2012 (Sep)	Pregnant woman (28-32w of gestational age)	DT-IPV + **aP5**	Introduction ap booster for pregnant women , reduced dose of 5 Bp components	Repevax (MSD)		94.0-95.0%
2016	Pregnant woman (from 16 weeks of gestational age)	DT-IPV + **aP5** / DT-IPV + **aP3**	changed timing of vaccination, availability of 3 or 5 reduced Bp components	Repevax (MSD) / Boostrix (GSK)		
2019 (Dec)	Pregnant women (from 22 weeks gestational age)	Td**ap3**	changed timing of vaccination, discontinuation of use of Repevax	Boostrix (GSK)		

m=months; y= years; D=diphtheria; T=tetanus; wP: whole cell pertussis; aP: acellular pertussis; IPV: inactivated poliovirus; Pneu: pneumococcal; Hib: *Haemophilus influenzae* type B; HepB: Hepatitis B; Bp: *Bordetella pertussis*; NVI: Netherlands Vaccine Institute; GSK: GlaxoSmithKline; SP: Sanofi Pasteur; MSD: Merck Sharp & Dohme

Supplementary table 2. IgG GMCs per age and country

Antigen	timepoint	Country	Children	Adolescents	Young adults	Older adults
Ptx GMC (CI) in IU/ml	Day 0	FI	16 (11-23)[a,b,c,d]	13 (9-18)[a,e,f]	5 (3-8)[g,h,i]	10 (7-16)[j,k,l]
		NL	12 (8-17)[m,n,o]	14 (10-19)[m,p,q]	3 (2-5)[r,s,t,u,v]	15 (10-24)[j,m,w,x]
		UK	8 (5-11)[g,y,z,aa,bb]	16 (11-23)[b,j,z,cc,dd]	3 (2-5)[b,y,ee,ff]	5 (3-7)[t,y,gg,hh,ii]
	Day 28	FI	197 (138-282)[d,g,h]	202 (141-288)[f,h,jj]	99 (64-153)[a,c,e,i]	132 (85-204)[l,gg]
		NL	147 (103-211)[o,r]	150 (109-205)[q,s]	99 (64-152)[m,v]	156 (101-240)[t,x]
		UK	110 (77-157)[b,bb]	137 (96-196)[y,dd]	112 (72-174)[z,ff]	86 (56-133)[j,ii]
	1 year	FI	39 (27-55)[c,g]	54 (38-77)[e,i,jj]	27 (17-42)[a,f,h]	51 (33-78)[k,gg]
		NL	30 (21-43)[n,r]	44 (32-60)[p,s,v]	22 (14-34)[m,q,u]	43 (28-66)[t,w]
		UK	36 (25-51)[b,aa]	48 (34-70)[y,cc]	30 (19-47)[z,ee]	38 (25-59)[j,hh]
FHA GMC (CI) in IU/ml	Day 0	FI	41 (31-54)[b,c,d,r]	47 (36-62)[e,f,s,y,gg]	30 (21-41)[h,i,z]	27 (20-38)[k,l,*t*,jj]
		NL	25 (19-33)[n,o,g,t]	30 (24-38)[m,p,q,*t*,jj]	18 (13-25)[s,t,u,v]	59 (42-81)[j,m,r,*s*,w,x,*gg*]
		UK	20 (15-26)[g,aa,bb]	29 (22-38)[z,cc,dd,jj]	15 (11-21)[a,y,ee,ff]	18 (13-25)[t,hh,ii]
	Day 28	FI	363 (277-476)[d,g]	369 (282-484)[f,k,jj]	281 (202-390)[a,i]	225 (162-312)[e,l,w,gg]
		NL	234 (178-308)[o,r,w]	291 (230-369)[q,s]	330 (237-458)[m,v]	425 (306-590)[k,n,t,x,hh]
		UK	288 (218-380)[b,bb,hh]	285 (216-375)[y,dd,hh]	287 (205-401)[z,ff]	174 (125-241)[j,w,aa,cc,ii]
	1 year	FI	102 (78-135)[c,g]	139 (106-182)[e,jj]	117 (84-162)[a,h]	104 (75-144)[k,gg]
		NL	60 (45-79)[n,r]	107 (85-136)[p,s]	103 (74-143)[m,u]	140 (101-194)[t,w]
		UK	113 (87-148)[b,aa]	119 (89-157)[y,cc]	119 (84-169)[z,ee]	88 (63-123)[j,hh]
Prn GMC (CI) in IU/ml	Day 0	FI	9 (6-15)[c,d,r]	7 (4-10)[a,e,f,s,y]	22 (12-39)[h,i,m,*jj*]	11 (6-19)[k,l]
		NL	24 (15-39)[g,m, n,o,t]	20 (13-30)[m,t,p,q,*jj*]	8 (5-15)[a,r,s,u,v]	8 (5-15)[r,s,w,x]
		UK	20 (13-32)[*j*,aa,bb]	15 (9-24)[cc,dd,jj]	12 (7-23)[ee,ff]	6 (3-11)[*b*,hh,ii]
	Day 28	FI	391 (244-629)[d,g]	256 (159-411)[f,jj]	413 (232-735)[a,*i*]	195 (109-347)[*l*,gg]
		NL	259 (160-419)[o,r]	467 (308-708)[q,s]	237 (133-421)[m,*v*]	232 (130-412)[t,x]
		UK	248 (154-397)[b,bb]	270 (169-431)[y,dd]	371 (206-668)[z,*ff*,hh]	111 (63-198)[j,ee,ii]
	1 year	FI	95 (59-152)[c,g]	85 (53-137)[e,k,jj]	193 (108-343)[a,*h*]	90 (50-159)[*k*,gg]
		NL	71 (44-116)[n,q,r]	170 (112-258)[o,p,s]	107 (60-190)[m,*u*]	81 (46-145)[t,w]
		UK	89 (57-141)[b,aa]	103 (64-166)[y,cc]	168 (92-308)[z,*ee*]	65 (37-117)[j,hh]
Fim2/3 GMC (CI) in AU/ml	Day 0	FI	0·2 (0·1-0·3)[a,b,c,d,r,*jj*,gg]	0·7 (0·4-1·3)[a,e,f,*g*,s,y,gg]	7·4 (3·7-14·7)[g,jj]	10·1 (5·1-20·2)[g,j,jj]
		NL	5·4 (3·0-9·5)[g,n]	4·3 (2·6-7·1)[y,jj]	6·6 (3·3-13·2)	4·0 (2·0-7·9)
		UK	10·3 (6·1-17·5)[g,j,*aa*]	11·1 (6·5-18·8)[j,s,jj]	10·6 (5·2-21·4)[j]	1·5 (0·8-3·1)[b,y,z,gg]
	Day 28	FI	0·3 (0·2-0·6)[c,e,g,h,k,n,aa]	1·1 (0·6-1·9)[c,h,k,p,cc,jj]	8·8 (4·4-17·5)[c,e,f,i]	10·1 (5·1-20·1)[c,e,f,*hh*]
		NL	7·6 (4·3-13·5)[*o*,r]	5·2 (3·2-8·6)[e,q,cc]	7·7 (3·9-15·4)[v]	4·3 (2·2-8·6)[x]
		UK	17 (10·0-28·9)[*b*,c,bb,hh]	14·9 (8·8-25·3)[e,p,dd,hh]	10·7 (5·3-21·7)[hh]	1·7 (0·8-3·3)[*k*,aa,cc,ee]
	1 year	FI	0·3 (0·2-0·6)[d,f,g,i,l,o,bb,ii]	1·1 (0·6-1·9)[d,*q*,i,l,dd,ii,jj]	5·7 (2·9-11·4)[d,h,*ii*]	11·6 (5·8-23·0)[d,x,bb,dd,*ff*,ii]
		NL	4·7 (2·6-8·3)[*n*,bb]	3·5 (2·1-5·7)[*f*,*p*,dd]	5·0 (2·5-10·0)[u]	2·9 (1·5-5·8)[l,w]
		UK	11·8 (7·0-19·7)[d,o,aa]	10·5 (6·1-18·0)[f,q,cc]	8·8 (4·3-17·9)	1·9 (0·9-3·7)[l]

Ptx: pertussis toxin; FHA: filamentous haemagglutinin; Prn: pertactin; Fim2/3: fimbriae 2 and 3; GMC: geometric mean concentration; CI: confidence interval; IU/ml: international units per millilitre; AU/ml: arbitrary units per millilitre; FI: Finland; NL: Netherlands; UK: United Kingdom. Significance per antigen has been tested between timepoints of an age group, age groups within a country and between countries within an age group, $p \leq 0{\cdot}05$, *$p \leq 0{\cdot}01$*, **$p \leq 0{\cdot}001$**. Significantly different from **a** young adults FI at day 0; **b** children UK at day 0; **c** children FI at day 28; **d** children FI at 1 year; **e** adolescents FI at day 28; **f** adolescents FI at1 year; **g** children FI at day 0; **h** young adults FI at day 28; **i** young adults FI at 1 year; **j** older adults UK at day 0; **k** older adults FI at day 28; **l** older adults FI at 1 year; **m** young adults NL at day 0; **n** children NL at day 28; **o** children NL at 1 year; **p** adolescents NL at day 28; **q** adolescents NL at 1 year; **r** children NL at day 0; **s** adolescents NL at day 0; **t** older adults NL at day 0; **u** young adults NL at day 28; **v** young adults NL at 1 year; **w** older adults NL at day 28; **x** older adults NL at 1 year; **y** adolescents UK at day 0; **z** young adults UK at day 0; **aa** children UK at day 28; **bb** children UK at 1 year; **cc** adolescents UK at day 28; **dd** adolescents UK at 1 year; **ee** young adults UK at day 28; **ff** young adults UK at 1 year; **gg** older adults FI at day 0; **hh** older adults UK at day 28; **ii** older adults UK at 1 year; **jj** adolescents FI at day 0.

Supplementary table 3. IgA GMCs per age and country

Antigen	timepoint	Country	Children	Adolescents	Young adults	Older adults
Ptx GMC (CI) in IU/ml	Day 0	FI	0·26 (0·18-0·38)[a,b,c]	0·39 (0·26-0·57)[a,d,e]	0·49 (0·30-0·77)[f,g]	0·86 (0·54-1·37)[h,i,j,k,l]
		NL	0·38 (0·26-0·56)[j,m,n,o,p]	0·68 (0·49-0·95)[j,q,r,s,t]	0·77 (0·48-1·23)[j,q,u,v]	1·88 (1·18-2·99)[a,m,n,q,w,x,y]
		UK	0·23 (0·16-0·34)[w,z,aa,bb]	0·36 (0·25-0·53)[m,cc,dd]	0·57 (0·35-0·91)[ee,ff,gg]	0·63 (0·39-1·00)[j,ee,hh,ii]
	Day 28	FI	0·82 (0·56-1·20)[d,f,h,k]	1·66 (1·14-2·44)[b,i,k]	2·07 (1·30-3·29)[b,k,jj]	8·2 (5·2-13·1)[a,b,d,f,l]
		NL	1·32 (0·89-1·94)[p,q,u,x]	2·15 (1·53-3·00)[m,t,x]	3·63 (2·28-5·78)[n,o,v,x]	19·5 (12·3-31·1)[j,o,s,u,y]
		UK	1·06 (0·72-1·56)[cc,ee,ff,hh]	2·01 (1·37-2·94)[r,aa,dd,hh]	2·33 (1·46-3·73)[z,aa,hh]	11·2 (7·0-17·9)[w,aa,cc,ff,ii]
	1 year	FI	0·79 (0·54-1·16)[g,h,l]	1·45 (0·99-2·12)[i,l]	1·73 (1·09-2·75)[c,l,jj]	4·78 (3·00-7·61)[a,c,e,g,k]
		NL	0·71 (0·48-1·05)[o,q,v,y]	1·11 (0·79-1·55)[m,s,y]	1·84 (1·15-2·92)[n,p,u,y]	7·1 (4·5-11·3)[j,p,t,v,x]
		UK	0·85 (0·59-1·23)[ee,ii]	1·36 (0·92-2·01)[r,cc,ii]	1·58 (0·97-2·56)[z,ii]	4·71 (2·95-7·53)[w,bb,dd,gg,hh]
FHA GMC (CI) in IU/ml	Day 0	FI	0·14 (0·07-0·30)[a,b]	0·22 (0·10-0·45)[a,d,m]	0·32 (0·13-0·80)[a,f,g]	1·76 (0·71-4·35)[h,i,j,k,l,jj]
		NL	0·11 (0·05-0·23)[j,m,n,o]	0·74 (0·38-1·41)[j,j,q,s,t]	0·46 (0·19-1·14)[j,q,u,v]	10·5 (4·2-25·9)[a,m,n,q,w,x,y]
		UK	0·12 (0·06-0·26)[r,w,z,aa,bb]	0·58 (0·28-1·23)[cc,dd,ee]	0·47 (0·19-1·19)[ee,ff,gg]	1·96 (0·79-4·84)[j,ee,hh,ii]
	Day 28	FI	1·65 (0·78-3·48)[f,h,k,c]	2·56 (1·22-5·39)[e,i,k,s]	8·9 (3·6-22·03)[b,g,k,jj]	84 (34-209)[a,b,d,f,l]
		NL	1·79 (0·84-3·80)[p,q,s,u,x]	10·1 (5·2-19·3)[d,m,o,t,x]	14·9 (6·0-37·0)[n,o,v,x]	148 (59-366)[j,o,s,u,y,hh]
		UK	3·47 (1·64-7·38)[bb,ee,hh]	6·4 (3·0-13·6)[r,dd,hh]	9·7 (3·9-24·3)[z,gg,hh]	76 (31-188)[w,x,aa,cc,ff,ii]
	1 year	FI	0·25 (0·12-0·52)[b,g,l]	0·40 (0·19-0·83)[d,g,l,t,dd]	1·69 (0·68-4·20)[c,e,f,l,jj]	29·8 (12·0-73·7)[a,c,e,g,k]
		NL	0·18 (0·09-0·39)[o,dd,gg,ii]	2·75 (1·43-5·30)[e,m,s,y,bb]	3·23 (1·30-7·99)[n,u,y,bb]	42 (17-105)[j,t,v,bb]
		UK	0·35 (0·17-0·74)[aa,dd,ee,gg,ii]	1·98 (0·92-4·26)[e,r,bb,cc,ii]	2·68 (1·04-6·92)[z,bb,ff,ii]	18·5 (7·4-46·3)[w,bb,dd,gg,hh]
Prn GMC (CI) in IU/ml	Day 0	FI	1·25 (0·71-2·18)[a,b,c,jj]	1·67 (0·95-2·92)[a,d,e,jj]	4·50 (2·27-8·90)[f,g,h,i]	6·2 (3·1-12·3)[h,i,k,l]
		NL	1·45 (0·82-2·56)[j,m,n,o,p]	3·55 (2·17-5·80)[q,r,s,t]	4·24 (2·14-8·39)[q,u,v]	8·4 (4·2-16·6)[q,x,y]
		UK	0·85 (0·49-1·48)[w,z,aa,bb]	0·95 (0·54-1·64)[m,w,z,cc,dd]	3·71 (1·87-7·39)[r,ee,ff,gg]	4·55 (2·3-8·99)[r,ee,hh,ii]
	Day 28	FI	7·0 (4·0-12·3)[f,h,k]	9·2 (5·3-16·2)[f,i,k]	55 (28-108)[b,d,g,jj]	97 (49-192)[a,b,d,l]
		NL	3·49 (1·98-6·15)[q,s,u,x]	15·3 (9·3-25·0)[m,o,t,u,x,cc]	46·7 (23·6-92·3)[n,o,s,v,x]	230 (116-455)[j,o,s,u,y]
		UK	4·03 (2·31-7·03)[ee,ff,hh]	4·78 (2·75-8·31)[r,s,ff,hh]	37·1 (18·7-73·9)[z,aa,cc,gg]	103 (52-203)[w,aa,cc,ii]
	1 year	FI	6·6 (3·8-11·6)[g,h,l]	7·4 (4·2-13·0)[g,i,l]	28·9 (14·6-57·2)[c,e,f,jj]	45·8 (23·2-90·6)[a,c,e,k]
		NL	3·38 (1·92-5·97)[q,t,v,y]	9·1 (5·6-15·0)[m,p,s,y]	17·0 (8·6-33·7)[u,n,p,y]	89 (45-177)[j,p,t,v,x]
		UK	3·58 (2·09-6·14)[ee,gg,ii]	4·67 (2·65-8·22)[r,gg,ii]	18·5 (9·2-37·6)[z,bb,dd,ff]	45·8 (23·0-91·0)[w,bb,dd,hh]
Fim2/3 GMC (CI) in AU/ml	Day 0	FI	0·14 (0·08-0·27)[a,b,c,q,i,ee,jj]	0·45 (0·24-0·86)[a,e,m,h,r,jj]	4·8 (2·2-10·3)[h,i]	11·8 (5·4-25·6)[h,i,l]
		NL	2·61 (1·37-4·96)[h,j]	4·41 (2·52-7·70)[i,j]	8·2 (3·8-17·8)	25·7 (11·8-55·6)[q,m,w]
		UK	3·09 (1·69-5·66)[h,aa]	5·7 (3·1-10·4)[i]	9·9 (4·6-21·6)	3·44 (1·59-7·46)[j]
	Day 28	FI	0·28 (0·15-0·53)[c,f,h,k,o,aa]	0·66 (0·35-1·25)[e,f,k,s,cc]	6·1 (2·8-13·2)[b,d]	18·6 (8·6-40·3)[b,d]
		NL	3·50 (1·84-6·67)[b,x]	4·11 (2·35-7·18)[d,x]	9·2 (4·2-19·8)	24·5 (11·3-53·1)[o,s,hh]
		UK	5·8 (3·2-10·8)[b,ee]	7·9 (4·3-14·5)[d]	11·5 (5·3-25·1)	5·0 (2·3-10·8)[x]
	1 year	FI	0·56 (0·30-1·06)[b,e,g,h,l,p,bb]	1·96 (1·04-3·71)[c,d,i,l,dd]	6·3 (2·9-13·6)[c,l]	24·8 (11·4-53·7)[a,c,e,g,ii]
		NL	3·14 (1·65-5·98)[c,y]	3·87 (2·22-6·77)[y]	8·0 (3·7-17·4)	23·1 (10·4-50·0)[p,f,ii]
		UK	4·51 (2·49-8·14)[c]	6·5 (3·5-12·1)[e]	10·9 (5·0-24·1)	5·0 (2·3-10·9)[l,y]

Ptx: pertussis toxin; FHA: filamentous haemagglutinin; Prn: pertactin; Fim2/3: fimbriae 2 and 3; GMC: geometric mean concentration; CI: confidence interval; IU/ml: international units per millilitre; AU/ml: arbitrary units per millilitre; FI: Finland; NL: Netherlands; UK: United Kingdom. Significance per antigen has been tested between timepoints of an age group, age groups within a country and between countries within an age group, $p \leq 0{\cdot}05$, *$p \leq 0{\cdot}01$*, **$p \leq 0{\cdot}001$**. Significantly different from **a** older adults, FI at day 0; **b** children, FI at day 28; **c** children, FI at 1 year; **d** adolescents, FI at day 28; **e** adolescents, FI at 1 year; **f** young adults, FI at day 28; **g** young adults, FI at 1 year; **h** children, FI at day 0; **i** adolescents, FI at day 0; **j** older adults, NL at day 0; **k** older adults, FI at day 28; **l** older adults, FI at 1 year; **m** adolescents, NL at day 0; **n** young adults, NL at day 0; **o** children, NL at day 28; **p** children, NL at 1 year; **q** children, NL at day 0; **r** adolescents, UK at day 0; **s** adolescents, NL at day 28; **t** adolescents, NL at 1 year; **u** young adults, NL at day 28; **v** young adults, NL at 1 year; **w** older adults, UK at day 0; **x** older adults, NL at day 28; **y** older adults, NL at 1 year; **z** young adults, UK at day 0; **aa** children, UK at day 28; **bb** children, UK at 1 year; **cc** adolescents, UK at day 28; **dd** adolescents, UK at 1 year; **ee** children, UK at day 0; **ff** young adults, UK at day 28; **gg** young adults, UK at 1 year; **hh** older adults, UK at day 28; **ii** older adults, UK at 1 year; **jj** young adults, FI at day 0.

Supplementary table 4. GMCs of pertactin per vaccination background

Ig class	Timepoint	aP2 (n=10)	aP3 (n=7)	wP (n=41)
IgG GMC (CI) in IU/ml	Day 0	0·9 (0·4-2·2)[a,b,c,d]	24·7 (9·0-67·7)[e,f,g]	14·9 (9·8-22·6)[e,h,i]
	Day 28	62 (26-143)[d,e,f,h]	652 (238-1788)[a,c]	451 (297-683)[b,c,i]
	1 Year	11 (5-26)[c,e,g,i]	263 (96-720)[a,d]	175 (115-265)[b,d,h]
IgA GMC (CI) in IU/ml	Day 0	0·6 (0·2-1·9)[b,c,d]	4·0 (1·0-16·3)[f,g]	3·2 (1·8-5·8)[e,h,i]
	Day 28	5 (2-16)[e]	29 (7-119)[a]	17 (9-30)[b,i]
	1 Year	10 (3-33)[e]	18 (4-74)[a]	9 (5-16)[b,h]

aP2: participants prior to study exclusively vaccinated with 2 acellular pertussis components containing vaccines; aP3: participants prior to study exclusively vaccinated with 3 acellular pertussis components containing vaccines; wP: participants prior to study at least 3 times vaccinated with a whole cell pertussis containing vaccine; GMC: geometric mean concentration; CI: confidence interval; IU/ml: international units per millilitre. Significance per Ig class has been tested between timepoints within a vaccine group and between vaccine groups within a timepoint, $p \leq 0{\cdot}05$, *$p \leq 0{\cdot}01$*, **$p \leq 0{\cdot}001$**. Significantly different from **a** aP3 at day 0; **b** wP at day 0; **c** aP2 at day 28; **d** aP2 at 1 year; **e** aP2 at day 0, **f** aP3 at day 28; **g** aP3 at 1 year; **h** wP at day 28, **i** wP at 1 year.

Supplementary table 5. GMCs of Fim2/3 per vaccination background

Ig class	Timepoint	aP3 (n=7)	aP5 (n=65)	wP (n=41)
IgG GMC (CI) in AU/ml	Day 0	0·2 (0·1-0·8)[a,b]	7·4 (5·1-10·8)[b,c,d,e]	3·5 (2·2-5·7)[a,c,f]
	Day 28	0·4 (0·1-1·2)[d,f]	10·1 (6·9-14·7)[a,e,f,g]	4·6 (2·8-7·4)[b,g,d]
	1 Year	0·3 (0·1-1·1)[e,h]	6·0 (4·1-8·7)[a,d,i]	3·9 (2·4-6·3)[i]
IgA GMC (CI) in AU/ml	Day 0	0·6 (0·1-2·5)	3·6 (2·2-5·9)	2·7 (1·4-4·9)
	Day 28	1·0 (0·2-4·4)	4·7 (2·9-7·6)	2·7 (1·5-5·1)
	1 Year	0·9 (0·2-3·8)	4·2 (2·6-6·8)	3·9 (2·1-7·1)

aP3: participants prior to study exclusively vaccinated with 3 acellular pertussis components containing vaccines; aP5: participants prior to study at least 3 timed vaccinated with 5 acellular pertussis components containing vaccines; wP: participants prior to study at least 3 timed vaccinated with a whole cell pertussis containing vaccine; GMC: geometric mean concentration; CI: confidence interval; IU/ml: international units per millilitre. IgG and IgA GMCs and confidence intervals (CI). Significance per Ig class has been tested between timepoints within a vaccine group and between vaccine groups within a timepoint, $p \leq 0{\cdot}05$, *$p \leq 0{\cdot}01$*, **$p \leq 0{\cdot}001$**. Significantly different from **a** aP5 at day 0; **b** wP at day 0; **c** aP3 at day 0; **d** aP5 at day 28; **e** aP5 at 1 year; **f** wP at day 28, **g** aP3 at day 28; **h** wP at 1 year, **i** aP3 at 1 year.

Supplementary panel. List of in- and exclusion criteria

Inclusion criteria

In order to be eligible to participate in this study, participants must meet all of the following criteria:

- normal general health;
- within the right age group for the cohort;
- received all regular vaccines for their age group according to the Dutch NIP in the Netherlands, UK NIP in the United Kingdom, or Finnish NIP in Finland; a copy of the vaccination booklet will be included in the participant's documents. If booklet is not available for cohorts A, B and C, vaccination status will be checked with regulatory agencies / GP. For cohort C and D this booklet might not be available due to their age;
- provision of written informed consent from the adult participants and parents or legal guardians of minors;
- willing to adhere to the protocol and be available during the study period.

Exclusion criteria

- present evidence of serious disease(s) within the last 3 months before inclusion requiring immunosuppressive or immune modulating medical treatment, such as systemic corticosteroids, that might interfere with the results of the study ;
- chronic infection
- known or suspected immune deficiency;
- history of any neurologic disorder, including epilepsy;
- previous administration of serum products (including immunoglobulins) within 6 months before vaccination and blood sampling;
- known or suspected allergy to any of the vaccine components (by medical history);
- occurrence of serious adverse events (SAEs) after primary DTwP-IPV vaccination, DTaP-IPV vaccination or any other vaccination (by medical history);
- vaccination with any pertussis containing vaccine other than those described in the inclusion criteria (i.e. only according to NIP);
- adult pertussis vaccination according to the NIP in the last 5 years (i.e. maternal vaccination);
- children in cohort B in Finland who already received the Tdap booster at 14-15 years of age;
- vaccination with any other diphtheria, tetanus or polio containing vaccine in the last 5 years, other than described in the NIP;
- children between 8 and 10 years of age eligible for cohort A in the Netherlands who have already received the dT-IPV booster vaccination according to the Dutch NIP around 9 years of age;
- children in cohort B in the United Kingdom who already received the dT-IPV booster vaccination according to the UK NIP around 14 years of age;
- mixed wP and aP priming within a participant;
- pregnancy.

References

1. OECD (2020). Child vaccination rates (indicator). doi: 10.1787/b23c7d13-en (accessed on 21 August 2020).