T1

TABLE 3.1

Studies providing information on risk of lung cancer in relation to type of cigarette smoked

Continent	Country (State)	Study name	Study title	Study type[a]	Period of deaths/cases
Asia	China	HU	Heilongjiang case-control study	CC	1985-87
	China	FU	Harbin case-control study	CC	1977-79
	Hong Kong	CHAN	Hong Kong case-control study	CC	1976-77
	India	NOTANI	Bombay Tata Memorial study	CC	1963-71
	India	JUSSAW	Greater Bombay case-control study	CC	1964-73
	Japan	HIRAYA	Japanese 29 Health Centre study	P	1965-81
	Japan	WAKAI	Okinawa case-control study	CC	1988-91
	Korea	CHOI	Korea case-control study	CC	1985-88
	Singapore	MACLEN	Singapore case-control study	CC	1972-73
South and	Argentina	MATOS	Buenos Aires case-control study	CC	1994-96
Central	Argentina	PEZZOT	Rosario case-control study	CC	1987-91
America	Brazil	SUZUKI	Rio de Janeiro case-control study	CC	1991-92
	Cuba	JOLY	Havana case-control study	CC	1978-80
	Uruguay	DESTEF1	First Montevideo case-control study	CC	1988-94
	Uruguay	DESTEF2	Second Montevideo case-control study	CC	1993-96
USA	California	SIDNEY	Kaiser Permanente prospective study	P	1979-91
	California	CARPEN	Los Angeles case-control study	CC	1990-94
	Louisiana	CORREA	Louisiana case-control study	CC	1979-81
	New Jersey	WILCOX	New Jersey case-control study	CC	1980-81
	New Mexico	PATHAK	New Mexico case-control study	CC	1980-82
	New York	BROSS	Roswell Park case-control study	CC	1960-66
	New York	WYNDER	Sloan Kettering case-control study	CC	1966-69
	Pennsylvania	KHUDER	Philadelphia case-control study	CC	1985-87
	Pennsylvania	WEINBE	Allegheny County study	HL	1970[b]
	Texas	BUFFLE	Texas case-control study	CC	1979-82
	Multicentre	AHF1	American Health Foundation multicentre case-control study 1	CC	1969-76
	Multicentre	AHF2	American Health Foundation multicentre case-control study 2	CC	1977-95
	Multicentre	KAUFMA[c]	US/Canada multicentre case-control study	CC	1981-86

T2

TABLE 3.1 (Continued)

Continent	Country (State)	Study name	Study title	Study type[a]	Period of deaths/cases
	Multicentre	MRFIT	Multiple risk factor intervention trial	P	1973-85
	25 states	CPSI	American Cancer Society Cancer Prevention Study I	P	1959-72
	Nationwide	CPSII	American Cancer Society Cancer Prevention Study II	P	1982-88
	Nationwide	SPEIZE	Nurses Health Study	P	1976-92
Europe	Multicentre	LUBIN	West European multicentre case-control study	CC	1976-80
(not UK)	Denmark	LANGE	Copenhagen city heart study	P	1976-89
	Finland	PERNU	Helsinki case-control study	CC	1944-58
	France	BENHAM[d]	French case-control study	CC	1976-80
	Italy	BERRIN[d]	Italian case-control study	CC	1977-80
	Austria	VUTUC[d]	Austrian case-control study	CC	1976-80
	Germany	JOCKEL	North West German case-control study	CC	1985-86
	Germany	KNOTH	Mannheim/Ludwigshafen/Heidelberg study	C	1967-76
	Norway	ENGELA	Norwegian part of US/UK/Norway migrant study	P	1964-93
	Poland	ZEMLA	Gliwice case-control study	CC	Not stated
	Spain	AGUDO	Barcelona case-control study	CC	1989-92
	Spain	ARMADA	Second Barcelona case-control study	CC	1986-90
UK	England	ALDERS	Multicentre case-control study 1977-82	CC	1977-82
	England	BENSHL	Whitehall study	P	1967-78
	N Ireland	DEAN	Northern Ireland case-control study	CC	1960-62
	England	DEAN2	North-East England case-control study	CC	1963-72
	England	DOLL1	Multicentre case-control study 1948-52	CC	1948-52
	Scotland	HAWTHO[e]	West Central Scotland prospective study	P	1965-77
	Scotland	GILLIS	West Central Scotland case-control study	CC	1976-81
	Nationwide	MIGRAN[e]	British part of US/UK/Norway migrant study	P	1964-77
	England	RIMING	Mass radiography follow-up study	P	1970-76
	G Britain	TANG	Study of 4 British cohorts	P	1967-90

Table 3.1 (Continued 2)

Notes

[a] Study type: CC = case-control study, P = prospective study, C = case study (no controls), HL = comparison of risk factors in high and low risk areas.

[b] Period for which high and low areas were identified, risk factors determined in 1978-79.

[c] Includes one Canadian centre.

[d] Part of LUBIN study.

[e] Some overlap with TANG study.

T4

TABLE 3.2

Number of studies[a] including lung cancer cases or deaths in specified periods

	Period									
Studies	1941-1950	1951-1960	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990	1991-1995	1996-1999
Asia	0	0	3	3	4	3	3	3	1	0
South/Central America	0	0	0	0	0	1	0	2	5	2
USA	0	2	2	4	3	9	11	7	4	0
Europe - not UK	1	1	1	1	1	6	3	5	2	0
UK	1	2	4	6	6	7	3	1	0	0
Prospective	0	1	5	8	9	11	8	6	3	0
Case-control	2	4	5	6	5	15	12	12	9	2
Total	2	5	10	14	14	26	20	18	12	2

Notes
[a] Omitting studies WEINBE, KNOTH, ZEMLA.

T5

TABLE 3.3

Lung cancer cases in the 54 studies

Study	Number of lung cancers[a] Men	Women	Histological confirmation	Results by histological type	Proxy interviews
Asia					
HU	161	66	100%	No	No
FU	523		Not required	No	100%
CHAN	208	189	54%	No	No
NOTANI	683	-	42%[b]	No	No
JUSSAW	792	-	41%[b]	No	No
HIRAYA	1454	463	No: DC[c]	No	NA[d]
WAKAI	245	88	100%	Yes	No
CHOI	280	95	100%[b]	No	No
MACLEN	147	86	Not required	No	No
South and Central America					
MATOS	200	-	94.5%	Yes	No
PEZZOT	215	-	100%	Yes	No
SUZUKI	99	24	100%	No	No
JOLY	607	219	100%[b]	No	No
DESTEF1	497	-	100%	Yes	No
DESTEF2	427	-	85%	Yes	No
USA					
SIDNEY	318		Not required	No	NA[d]
CARPEN	353		Not required	No	No
CORREA	1338		97%	No	24%
WILCOX	763	-	100%	No	44%
PATHAK	192	277	96.4%[e]	No	47%
BROSS	974	-	Not stated	No	No
WYNDER	284	66	100%	Yes	No
KHUDER	482	-	100%	No	No
WEINBE	NA[d]	NA[d]	NA[d]	NA[d]	NA[d]

TABLE 3.3 (Continued)

Study	Number of lung cancers[a] Men	Women	Histological confirmation	Results by histological type	Proxy interviews
USA (continued)					
BUFFLE	475	460	100%	No	84%
AHF1	1051	314	100%	Yes	No
AHF2	Large[f]	Large[f]	100%	Yes	No
KAUFMA	881		Not stated	No	No
MRFIT	119	-	No: DC[c]	No	NA[d]
CPSI	969[g]		No: DC[c]	No	NA[d]
CPSII	Large[h]	1006[h]	No: DC[c]	No	NA[d]
SPEIZE	-	593	96%[b]	No	No
Europe (not UK)					
LUBIN	6920	884	100%	Yes	No
LANGE	200	68	No: DC[c]	No	NA[d]
PERNU	1477	129	50%	No	No
BENHAM	1625	96	100%	Yes	No
BERRIN	1101	-	100%	No	No
VUTUC	252	297	100%	No	No
JOCKEL	146	48	Not required	No	No
KNOTH	733	59	100%[b]	No	100%
ENGELA	333	102	80%	Yes	NA[d]
ZEMLA	210	-	Not required	No	No
AGUDO	-	103	98%	No	No
ARMADA	325	-	100%	No	No
UK					
ALDERS	1025	676	Not required	Yes	No
BENSHL	193	-	No: DC[c]	No	NA[d]
DEAN	803	151	Not required	No	100%
DEAN2	616	150	Not required	No	100%
DOLL1	1357	108	70%	No	No

T7

TABLE 3.3 (Continued 2)

Study	Number of lung cancers[a] Men	Women	Histological confirmation	Results by histological type	Proxy interviews
UK (continued)					
HAWTHO	104	< 28	No: DC[c]	No	NA[d]
GILLIS	656	-	77%	No	No
MIGRAN	136	23	No: DC[c]	No	NA[d]
RIMING	104	-	Not required	No	NA[d]
TANG	836	-	No: DC[c]	No	NA[d]

Notes
[a] Numbers of lung cancers usually relate to totals in study; in some studies they relate to smokers analyzed. Numbers between columns relate to sexes combined.
[b] % confirmed by histology or cytology.
[c] DC = death certificates.
[d] NA = not applicable.
[e] % confirmed by histology, cytology or death certificates
[f] Numbers vary in papers depending on period and hospitals included.
[g] In first 6 years of follow up.
[h]Not given.

T8

TABLE 3.4

Controls (or populations at risk) in the 54 studies

Study	Number of controls[a] Men	Women	Type of control[b]	Matching factors	Proxy interviews
Asia					
HU	161	66	Hospital: not CA or RD	Age, area	No
FU	523		Decedent: not RD	Age, area	100%
CHAN	208	189	Hospital: orthopaedic	Age group, hospital	No
NOTANI	1279	-	Hospital: not CA or RD	Age, community	No
JUSSAW	792	-	Population: Voters List	Age, community	No
HIRAYA	(122261)	(142857)	Prospective study	NA[c]	No
WAKAI	490	176	Population: Voters List	Age, residence	No
CHOI	560	190	Hospital: not CA or SAD	Age, date, area	No
MACLEN	134	166	Hospital: not SAD	Age, dialect, ward	No
South and Central America					
MATOS	397	-	Hospital: not SAD	Age, hospital	No
PEZZOT	433	-	Hospital: not SAD	Age, hospital	No
SUZUKI	99	24	Hospital: not CA or RD	Age, race	No
JOLY	1518		Hospital: not SAD (979) and Neighbourhood (539)	Age, race, hospital, date, area[d]	No
DESTEF1	497	-	Hospital: not SAD[e]	Age, residence, urban/rural status	No
DESTEF2	427	-	Hospital: not SAD	Age residence	No
USA					
SIDNEY	(34975)	(44791)	Prospective study	NA	No
CARPEN	724		Population: Licensed drivers and Medicare beneficiaries	Age, race	No
CORREA	1393		Hospital: not COPD, SAC	Age, race, hospital	11%
WILCOX	900	-	Population: Licensed drivers and Death Certificate files	Age, race, area, date death/diagnosis	37%
PATHAK	338	462	Population: Telephone sampling and Medicare participants	Age, race	No

T9

TABLE 3.4 (Continued)

Study	Number of controls[a] Men	Women	Type of control[b]	Matching factors	Proxy interviews
USA (continued)					
BROSS	974	-	Hospital: Not CA	Age, hospital, date	No
WYNDER	420	132	Hospital: not SAD	Age, hospital	No
KHUDER	1094	-	Population: Health Survey	Age, race	No
WEINBE	NA	NA	NA	NA	NA
BUFFLE	466	482	Population: state and federal record	Age, race, residence, vital status	84%
AHF1	2519	831	Hospital: not SAD	Age, race, city	No
AHF2	Large[f]	Large[f]	Hospital: not SAD	Age, hospital, city, date	No
KAUFMA	2570		Hospital: not CA or SAD	None	No
MRFIT	(12866)		Prospective study	NA[c]	No
CPSI	(Over 1 million)		Prospective study	NA[c]	No
CPSII	(Over 1.2 million)		Prospective study	NA[c]	No
SPEIZE	-	118351	Prospective study	NA[c]	No
Europe (not UK)					
LUBIN	13460	1747	Hospital: Mainly not SAD	Age, centre	No
LANGE	(6511)	(7703)	Prospective study	NA[c]	No
PERNU	713	1060	Hospital: not CA	None[g]	No
BENHAM	1625	96	Hospital: Mainly not SAD	Age, hospital, interviewer	No
BERRIN	1918	-	Hospital: Mainly not SAD	Age, residence, date of diagnosis	No
VUTUC	839	580	Hospital: not SAD and Neighbourhood	Age	No
JOCKEL	292	96	Hospital: not SAD and Population: Residence registry	Age	No
KNOTH	-	-	NA[c]	NA[c]	NA
ENGELA	(11857)	(14269)	Prospective study	NA[c]	No
ZEMLA	420	-	Hospital: not CA	Age	No
AGUDO	-	206	Hospital: not SAD	Age, residence, hospital	No
ARMADA	325	-	Hospital: not SAD, trauma	Age	No

T10

TABLE 3.4 (Continued 2)

Study	Number of controls[a] Men	Women	Type of control[b]	Matching factors	Proxy interviews
UK					
ALDERS	1025	676	Hospital: not SAD	Age, region, hospital ward, date of diagnosis	No
BENSHL	(17475)	-	Prospective study	NA[c]	No
DEAN	803	151	Decedent: not RD	Age, time of death	100%
DEAN2	2563	2958	Population: random sample	None	Yes[h]
DOLL1	1357	108	Hospital: not SAD	Age, hospital, time in hospital	No
HAWTHO	(11295)	(7491)	Prospective study	NA[c]	No
GILLIS	1312	-	Hospital: not SAD	Age, date and place of interview	No
MIGRAN	(3661)	(2727)	Prospective study	NA[c]	No
RIMING	(10414)	-	Prospective study	NA[c]	No
TANG	(56255)		Prospective study	NA[c]	No

Notes

[a] Numbers of controls usually relate to totals in study; in some studies they relate to smokers analyzed. Bracketed numbers indicate size of baseline populations in prospective studies. Numbers between columns relate to sexes combined.

[b] CA = cancer, RD = respiratory disease, SAD = smoking associated disease, SAC = smoking associated cancer, COPD = chronic obstructive pulmonary disease.

[c] NA = not applicable.

[d] Hospital and date for hospital controls, area for neighbourhood controls.

[e] Diseases not associated with maté in one study.

[f] Numbers vary in papers depending on period and hospitals included.

[g] Controls selected as “aged”.

[h] One member of each household answered for all residents.

T11

TABLE 3.5

Aspects of cigarette type considered

Study	Filter/ plain	Tar level	Hand rolled/ manufactured	Black/ blond[a]	Other
Asia					
HU			T		
FU			T		
CHAN			T		
NOTANI					Bidis/cigarettes
JUSSAW					Bidis/cigarettes
HIRAYA	T				
WAKAI	T				Local/other brands
CHOI	T				
MACLEN			T		
South and Central America					
MATOS	T			T	
PEZZOT	T			T	
SUZUKI				T	
JOLY				T	
DESTEF1	T		T	T	
DESTEF2	T		T	T	
USA					
SIDNEY	T	T			Menthol/nonmenthol
CARPEN					Menthol/nonmenthol
CORREA	T				
WILCOX		T			
PATHAK	T				
BROSS	T				
WYNDER	T				
KHUDER	T				
WEINBE	T	T			

TABLE 3.5 (Continued)

Study	Filter/ plain	Tar level	Hand rolled/ manufactured	Black/ blond[a]	Other
USA (continued)					
BUFFLE	T		T		
AHF1	T				
AHF2	T	T			Menthol/nonmenthol
KAUFMA		T			
MRFIT	T	T			Nicotine level
CPSI		T[b]			
CPSII	T	T			
SPEIZE		T			
Europe (not UK)					
LUBIN	T	T			
LANGE	T				
PERNU					Pilli/Pölli
BENHAM	T	T	T	T	
BERRIN	T			T	
VUTUC		T			
JOCKEL	T				
KNOTH	T				
ENGELA	T		T		
ZEMLA	T				
AGUDO	T			T	
ARMADA	T			T	
UK					
ALDERS	T	T	T		
BENSHL		T			
DEAN	T				
DEAN2	T				
DOLL1	T				
HAWTHO	T		T		

TABLE 3.5 (Continued 2)

Study	Filter/ plain	Tar level	Hand rolled/ manufactured	Black/ blond[a]	Other
UK (continued)					
GILLIS		T			
MIGRAN	T		T		
RIMING	T				
TANG	T	T			

Notes
[a] Includes dark/light.
[b] Categories based on tar and nicotine.

T14

TABLE 3.6

Potential confounding variables adjusted for[a]

Study	None	Age	N cigs per day	Duration	Pack-years	Age at start	Years quit	Inhalation	Race	Area of residence	Education/S class	Time iview/admit	Other
Asia													
HU	T												
FU	T												
CHAN	T												
NOTANI	T												
JUSSAW			T	T									Religion
HIRAYA	T[b]												
WAKAI		T	T			T	T						Fraction smoked/cig. Type of cigarette
CHOI	T												
MACLEN	T												
South and Central America													
MATOS		T	T										Hospital
PEZZOT		T	T	T								T	
SUZUKI		T			T				T				
JOLY	T												
DESTEF1		T								T	T		
DESTEF2		T								T	T		Family LC history[c], body mass index
USA													
SIDNEY		T	T	T					T		T		
CARPEN		T			T		T		T				
CORREA		T	T						T				Hospital
WILCOX		T	T	T	T								
PATHAK		T	T	T	T				T				
BROSS			T	T									
WYNDER			T										
KHUDER	T												
WEINBE		T											

TABLE 3.6 (Continued)

Study	None	Age	N cigs per day	Duration	Pack-years	Age at start	Years quit	Inhalation	Race	Area of residence	Education/S class	Time iview/admit	Other
USA (continued)													
BUFFLE	T												
AHF1		T	T	T									
AHF2		T	T	T				T			T		Age at switch to filter
KAUFMA		T	T			T			T	T	T	T	
MRFIT		T	T								T		Blood pressure, cholesterol
CPSI		T	T			T			T	T			Occup. exposure, History LC & HD[c,d]
CPSII		T	T					T					
SPEIZE		T	T			T							
Europe (not UK)													
LUBIN			T	T			T						
LANGE		T			T								
PERNU	T												
BENHAM		T	T	T							T		Current/ex Type of cigarette
BERRIN		T	T				T			T			Type of cigarette
VUTUC		T	T	T									
JOCKEL		T											
KNOTH	T												
ENGELA		T											
ZEMLA	T												
AGUDO		T								T			Hospital
ARMADA		T	T	T	T						T		Filter/plain, blond/black
UK													
ALDERS		T	T										
BENSHL		T									T		
DEAN	T												
DEAN2		T	T					T					
DOLL1	T												
HAWTHO		T	T										

TABLE 3.6 (Continued 2)

Study	None	Age	N cigs per day	Duration	Pack-years	Age at start	Years quit	Inhalation	Race	Area of residence	Education/S class	Time iview/admit	Other
UK (continued)													
GILLIS			T										
MIGRAN		T	T			T		T					
RIMING		T	T										
TANG		T	T										Study

Notes
[a] Not all analyses took into account all variables stated.
[b] Not stated which, if any, variables were adjusted for.
[c] LC = lung cancer.
[d] CHD = coronary heart disease.

T17

TABLE 5.1

Details of studies providing evidence on risk of lung cancer in filter and plain cigarette smokers

Study/ Location	Population considered	Period to which filter/plain smoking is relevant	Groups compared
Prospective studies			
HIRAYA Japan 29 Health Centres	Not stated	Baseline (1965) - followed until 1981	Plain Filter
SIDNEY USA San Francisco/ Oakland	Current cigarette smokers (smoked for 20+ years in duration analysis)	Brand usually smoked at baseline (1979-85) or lifetime history (duration analysis) - followed until 1987	(i) Plain Filter (ii) 0 1-9 10-19 20+ yrs filter
MRFIT USA 22 centres	Current cigarette smokers	Baseline (1973-76) - followed until 1985	Plain Filter
CPSII USA Nationwide	Current cigarette smokers (smoked for 20+ years in % filter analysis)	Lifetime history baseline (1982) - followed until 1988	(i) Only Plain Mixed Only Filter (ii) Filter 40% or less Filter only
LANGE Denmark Copenhagen	Current cigarette smokers	Baseline (1976) - followed until 1989	Plain Filter
ENGELA Norway Nationwide	Current cigarette smokers	Baseline (1964-65) - followed until 1993	Only plain Mixed Only filter
HAWTHO Scotland West Central	Current cigarette smokers	Baseline (1965-1975) - followed until 1977	Plain Filter
MIGRAN UK Nationwide	Current cigarette smokers	Baseline (1974-1975) - followed until 1977	Plain Filter
RIMING England Manchester	Current cigarette smokers	Baseline (1970-1971) - followed until 1976	Plain Filter
TANG UK 4 cohorts	Current man. cig. only smokers	Baseline (1967-1982) - followed for 13 years on average	Plain Filter

TABLE 5.1 (Continued)

Study/ Location	Population considered	Period to which filter/plain smoking is relevant	Groups compared
Case-control studies			
WAKAI Japan Okinawa	Current cigarette smokers	Brand smoked 5 years before interview - interviewed in 1988-1991	Plain Filter
CHOI Korea Nationwide	Current and ex cig. smokers	Period of smoking unstated - interviewed in 1985-1988	Only plain Mixed Only filter
MATOS Argentina Buenos Aires	Current and ex cig. smokers separately	Brands smoked in lifetime - interviewed in 1994-1996	Mainly plain Mainly filter
PEZZOT Argentina Rosario	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1987-1991	Always plain Ever filter
DESTEF1 Uruguay Montevideo	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1988-1994	Ever plain Always filter
DESTEF2 Uruguay Montevideo	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1993-1996	Plain Filter (not further defined)
CORREA USA Louisiana	Current and ex cig. smokers	Period of smoking unstated - interviewed in 1979-1981	(i) Plain Filter (not further defined) (ii) Plain only Mixed Filter only
PATHAK USA New Mexico	Current cigarette smokers	Brands smoked in lifetime - interviewed in 1980-1982	% years smoked filter used 0 1-33 34-66 67-99 100
BROSS USA New York	Current cigarette smokers	Most recent brand smoked - interviewed in 1960-1966	Plain Filter
WYNDER USA New York	Current smokers of 1+ cig/day for 20+ years	Brands smoked in lifetime - interviewed in 1966-1969	Plain Filter (10+ years)

TABLE 5.1 (Continued 2)

Study/ Location	Population considered	Period to which filter/plain smoking is relevant	Groups compared
Case-control studies (continued)			
KHUDER USA Philadelphia	Current and ex cig. smokers	Ever smoked filter - interviewed in 1985-1987	Always plain — Ever filter
BUFFLE USA Texas	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1976-1980	(i) Plain — Filter (not further defined) (ii) Always plain — Mixed — Always filter
AHF1 USA 6 cities	Current cigarette smokers (≥10 years)	Brands smoked in lifetime - interviewed in 1969-1976	Always plain — Switched to F <10 years ago — Switched to F 10+ years ago
AHF2 USA 45 hospitals	Current cigarette smokers (≥10 years)	Brands smoked in lifetime - interviewed in 1977-1995	Always plain — Switched to F (various breakdowns) — Always filter
LUBIN W. Europe 7 centres	Current and ex cig. smokers	Four previous brands smoked - interviewed in 1976-1980	Always plain — Mixed — Always filter
BENHAM France Paris[a,b]	Current and ex cig. smokers	Four previous brands smoked - interviewed in 1976-1980	(i) Always plain — Mixed — Always filter (ii) Always plain — 51-99% plain — ≤50% plain
BERRIN Italy Milan[b]	Current and ex cig. smokers	Four previous brands smoked - interviewed in 1977-1980	Always plain — <50% filter — ≥50% filter — Always filter
JOCKEL Germany 5 cities	Current and ex cig. smokers	Last 20 years - interviewed in 1985-1986	Plain — Filter
ZEMLA Poland Gliwice	Not stated	Not stated	Plain — Filter
AGUDO Spain Barcelona	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1989-1992	Ever plain — Always filter
ARMADA Spain Barcelona	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1986-1990	(i) Always plain — Mixed — Always filter (ii) Ever plain — Always (last 20 years) filter

TABLE 5.1 (Continued 3)

Study/ Location	Population considered	Period to which filter/plain smoking is relevant	Groups compared
Case-control studies (continued 2)			
ALDERS England 10 regions	Current and ex smokers of man. cigs. only	Brands smoked in lifetime - interviewed in 1977-1982	(i) Always plain — Ever filter (ii) Ever plain — Always filter (iii) Always plain — Switched to F <10 years ago — Switched to F 10+ years ago — Always filter
DEAN N. Ireland Nationwide	Current and ex cig. smokers	Brand last smoked - died in 1960-1962	Plain — Filter
DEAN2 England Cleveland Co.	Current and ex smokers of man. cigs. only	Brands smoked 1969 (P/F) or 1954-1969 (Switching analyses) - died in 1963-1972	(i) Plain — Filter (ii) Always plain — Switched to F — Always filter
DOLL England 5 regions	Current and ex cig. smokers	Brands smoked in lifetime - interviewed in 1948-1952	Always plain — Ever filter
Other study (comparison of risk factors in high and low lung cancer risk areas)			
WEINBE USA Pennsylvania	Current cigarette smokers 1973-1980	Brands smoked 1973-1980 - interviewed in 1980-1981	% filter smokers in two areas
Other study (comparison of average age at death in filter and plain cigarette smokers)			
KNOTH Germany 3 cities	Current cigarette smokers	Brand last smoked - died in 1967-1976	Plain — Filter

[a] 13 of 16 hospitals in Paris
[b] Part of Lubin study
[c] Switching analyses exclude those changing number of cigarettes smoked

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TABLE 5.2

Relative risk (95% CI) of lung cancer in filter and plain cigarette smokers

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)			
Prospective studies						
HIRAYAMA (Hirayama, 1984)						
Not stated	Not stated	Not stated	Plain	Filter		
			1.00	0.51		
			(Presumably significant as large study)			
SIDNEY (Sidney et al, 1993)						
			Plain	Filter		
Age, race, education, cigs/day, duration	98M	Male	1.00	1.03 (0.61-1.75)		
	83F	Female	1.00	0.65 (0.32-1.31)		
			0	1-9	10-19	20+ years filter
	93M	Male	1.00	0.72(0.30-1.76)	0.93(0.50-1.75)	1.04(0.58-1.87)
	73F	Female	1.00	1.08(0.45-2.59)	0.70(0.33-1.49)	0.36(0.18-0.75)
MRFIT (Ockene et al, 1990)						
			Plain	Filter		
Age, cigs/day, age start, tar, nicotine, alcohol, blood pressure, cholesterol, serum thiocyanate	106M	Male	1.00	0.53 (0.24-1.17)		
CPSII (Garfinkel and Stellman, 1988)						
			Filter 40% or less	Filter only		
Age, cigs/day, inhalation	1006F[b]	Female	1.00	0.66 (0.57-0.78)		
CPSII (Thun and Heath, 1997)						
			Only plain	Mixed	Filter only	
Age	1783M	Male	1.00	0.8(0.7-0.9)	0.45(0.4-0.5)[c]	
LANGE (Lange et al, 1992)						
			Plain	Filter		
Age, pack-years	90M	Male	1.0	0.9 (0.6-1.4)		
	39F	Female	1.0	0.7 (0.4-1.4)		

TABLE 5.2 (Continued)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)		
Prospective studies (continued)					
ENGELA (Engeland et al, 1996)					
			Only plain	Mixed	Only filter
Age	45M		1.00	0.00	0.67 (0.30-1.43)
	24F		1.00	2.09(0.47-9.31)	0.91 (0.41-2.03)
HAWTHO (Hawthorne et al, 1978)					
			Plain	Filter	
Age, cigs/day	88M	Male	1.00	0.83 (0.53-1.31)	
	<20F	Female	1.00	1.29 (NS)	
MIGRAN (Lee, 1979)					
			Plain	Filter	
Age, cigs/day	104M	Male	1.00	1.16 (0.78-1.73)	
	23F	Female	1.00	1.00 (0.42-2.38)	
Age, cigs/day, inhalation, age at start	99M	Male	1.00	1.13 (0.75-1.70)	
	21F	Female	1.00	0.92 (0.38-2.23)	
RIMING (Rimington, 1981)					
			Plain	Filter	
Age	104M	Male	1.00	0.65 (0.44-0.96)	
Age, cigs/day	104M	Male	1.00	0.62 (0.42-0.91)	
TANG (Tang et al, 1995)					
			Plain	Filter	
Age, study, cigs/day	366M	Male	1.00	0.94 (0.75-1.18)	
Case-control studies					
WAKAI (Wakai et al, 1997)					
			Plain	Filter	
Age, cigs/day, age start, inhalation, fraction smoked per cig.	179M	Male	1.00	1.02 (0.31-3.33)	

TABLE 5.2 (Continued 2)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)		
Case-control studies (continued)					
CHOI (Choi et al, 1989)					
			Only plain	Mixed	Only filter
None	267M	Male	1.00	0.09(0.02-0.40)	0.06 (0.01-0.30)
	19F	Female	1.00	0.00 (NS)	0.00 (NS)
MATOS (Matos et al, 1998)					
				Mainly plain	Mainly filter
Age, hospital, cigs/day, years since quit	185M	Male			
		Current		1.00	0.34 (0.11-1.11)
		Ex		1.00	3.33 (1.25-10.0)
		All		1.00	1.25 (0.67-2.50)
		Black only		1.00	1.67 (0.36-10.0)
		Blond only		1.00	1.67 (0.71-5.0)
PEZZOT (Pezzotto et al, 1993)					
				Mainly plain	Mainly filter
Age, hospital	211M	Male		1.00	0.23 (0.16-0.34)
Age, hospital, cigs/day	211M	Male		1.00	0.29 (0.20-0.42)
DESTEF1 (DeStefani et al, 1996a)					
				Ever plain	Always filter
Age, residence, urban/rural status, education	470M	Male		1.00	0.72 (0.54-0.96)
DESTEF2 (DeStefani et al, 1996b)					
				Plain	Filter
Age, sex, residence, urban/rural status, education, BMI and family history of lung cancer	300M	Male		1.00	0.73 (0.51-1.05)

TABLE 5.2 (Continued 3)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)				
Case-control studies (continued 2)							
CORREA (Correa et al, 1984)							
			Plain	Filter			
Age and sex	1338M+F[b]	Male + Female	1.00	0.55 (0.35-0.85)			
PATHAK (Pathak et al, 1986)							
		Male + female	% years smoked filter used				
			0	1-33	34-66	67-99	100
Age, sex, race, cigs/day, duration, cigs/day x duration	205M, 106F	Non-hispanics	1.00	0.83	0.58	0.71	0.80
		Hispanics	1.00	0.56	0.39 (CI not available)	0.26 (p<0.05)	0.04 (p<0.05)
BROSS (Bross and Gibson, 1968; Bross 1968)							
			Plain	Filter			
Cigs/day, duration	265M	Males	1.00	0.56 (0.37-0.81)			
Cigs/day	265M	Males	1.00	0.57 (0.39-0.85)			
Duration	265M	Males	1.00	0.59 (0.39-0.89)			
WYNDER (Wynder, 1972)							
			Plain	Filter (10+ years)			
Cigs/day	226M	Males (Kreyberg I)	1.00	0.51 (0.34-0.76)			
KHUDER (Khuder et al, 1998)							
			Always plain	Ever filter			
None	457M	Males	1.00	0.46 (0.37-0.59)			
BUFFLE (Buffler et al, 1984)							
			Plain	Filter			
None	457M, 460F[b]	Males	1.00	0.92			
		Females	1.00 (CI not available)	1.17			
BUFFLE (Ives, 1984)							
			Always plain		Mixed		Always filter
None	208F	Females	1.00		1.15 (0.65-2.04)		1.34 (0.80-2.23)

TABLE 5.2 (Continued 4)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)		
Case-control studies (continued 3)					
AHF1 (Wynder and Stellman, 1977)					
			Always plain	Switched to F <10 years ago	Switched to F 10+ years ago
None	690M	Males	1.00	1.12 (0.87-1.44)	0.89 (0.71-1.11)
	186F	Females	1.00	0.90 (0.47-1.72)	0.61 (0.35-1.05)
AHF2 (Stellman et al 1997)					
			Always plain	Switched to F	Always filter
Age, cigs/day, duration	1442M	Males	1.00	0.96 (0.77-1.19)	0.92 (0.65-1.29)
	850F	Females	1.00	0.97 (0.60-1.56)	0.68 (0.39-1.19)
AHF2 (Kabat, 1996)						
			Always plain	Switched to F 1-9 years	Switched to F 10+ years	Always filter
Age, cigs/day, duration, inhalation	2085M[b]	Males	1.00	0.85(0.62-1.18)	0.72(0.54-0.95)	0.77(0.46-1.30)
	1012F[b]	Females	1.00	1.0 (in base)	0.94(0.74-1.19)	0.87(0.56-1.33)
AHF2 (Wynder and Muscat, 1995)							
			Always plain	Switched to F 1-9 years	Switched to F 10-20 years	Switched to F 21+ years	Always filter
Age	1414M	Males	1.00	1.00(0.71-1.41)	1.03(0.78-1.37)	0.90(0.63-1.29)	0.67(0.46-0.97)
	885 F	Females	1.00	1.01(0.55-1.85)	0.77(0.46-1.31)	1.09(0.63-1.90)	0.55(0.33-0.93)
LUBIN (Lubin et al, 1984a)						
			Always plain	Mixed	Always filter
Duration, years of cessation	6626M	Males	1.00	0.89 (0.92-0.96)	0.56 (0.47-0.66)
Cigs/day, years of cessation	6626M	Males	1.00	1.00 (0.91-1.10)	0.48 (0.40-0.56)
Duration, years of cessation	551F	Females	1.00	0.72 (0.36-1.44)	0.40 (0.19-0.83)
Cigs/day, years of cessation	551F	Females	1.00	1.00 (0.54-1.87)	0.43 (0.22-0.85)

TABLE 5.2 (Continued 5)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)			
Case-control studies (continued 4)						
BENHAM (Benhamou et al, 1994)						
			Always plain	Mixed		Always filter
Cigs/day, duration, inhalation, current use, tobacco type, tar	1114M	Males	1.00	1.00 (0.79-1.27)		0.63 (0.35-1.10)
Age	1114M	Males	1.00	1.00 (0.84-1.19)		0.38 (0.24-0.62)
BENHAM (Benhamou et al, 1989)						
			Always plain	Mixed		Always filter
Age, cigs/day, duration	1030M	Males	1.00	0.95 (0.76-1.18)		0.70 (0.52-0.94)
BENHAM (Benhamou et al, 1987)						
			Always plain	Mixed		Always filter
Age, hospital, interviewer	46F	Females	1.00	0.45 (0.09-2.23)		0.16 (0.04-0.61)
BERRIN (Benhamou and Benhamou, 1993)						
			Always plain	<50% filter	≥50% filter	Always filter
Age, cigs/day, current smoking, light/dark tobacco, residence	1101M	Males	1.00	1.18	1.27	0.91
JOCKEL (Jockel et al, 1992)						
			Plain	Filter		
Age	137M	Males	1.00	0.41 (0.21-0.81)		
ZEMLA (Zemla et al, 1988)						
		Males	Plain	Filter		
None	210M[b]	Unexposed to dust	1.00	0.97		
		Exposed to dust	1.00 (CI not available)	3.57		

TABLE 5.2 (Continued 6)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)			
Case-control studies (continued 5)						
AGUDO (Agudo et al, 1994)						
			Ever plain	Always filter		
Age, hospital, town of residence	22F	Females	1.00	0.22 (0.04-1.27)		
ARMADA (Armadans-Gil et al, 1999)						
			Always plain	Mixed	Always filter	
Age, pack-years	317M	Males	1.00	1.00(0.60-1.60)	0.70(0.40-1.20)	
			Ever plain	Always filter	(last 20 years)	
Age, pack-years	267M	Males	1.00	0.40(0.30-0.70)		
Age, pack-years, SES, black/blond			1.00	0.40(0.20-0.70)		
Age, cigs/day, SES, duration, black/blond			1.00	0.41(0.30-0.70)		
ALDERS (Alderson et al, 1985)						
			Always plain	Ever filter		
Age, cigs/day three years before admission	312M	Males	1.00	1.20 (0.83-1.73)		
	410F	Females	1.00	1.09 (0.70-1.70)		
			Ever plain	Always filter		
	312M	Males	1.00	1.48 (0.85-2.57)		
	410F	Females	1.00	0.66 (0.47-0.92)		
			Always plain	Switched to F 1-9 years	Switched to F 10+ years	Always filter
	312M	Males	1.00	1.13(0.65-1.97)	1.09(0.73-1.63)	1.48(0.81-2.69)
	410F	Females	1.00	1.04 (0.54-1.99)	1.41(0.86-2.31)	0.85(0.52-1.38)
DEAN (Wicken, 1966)						
			Plain	Filter		
None	678M	Males	1.00	0.97 (0.50-1.86)		
	62F	Females	1.00	3.12 (0.65-15.0)		

TABLE 5.2 (Continued 7)

Adjustment factors	Number of cases[a]	Sex	Relative risk (95% CI)		
Case-control studies (continued 6)					
DEAN2 (Dean et al, 1997, with supplement)					
			Plain	Filter	
Age	318M	Males	1.00	0.52 (0.38-0.71)	
Age, cigs/day			1.00	0.54 (0.40-0.73)	
Age, inhalation			1.00	0.55 (0.41-0.74)	
Age, cigs/day, inhalation			1.00	0.54 (0.40-0.73)	
Age	96F	Females	1.00	0.69 (0.43-1.12)	
Age, cigs/day			1.00	0.68 (0.42-1.11)	
Age, inhalation			1.00	0.86 (0.53-1.40)	
Age, cigs/day, inhalation			1.00	0.82 (0.50-1.33)	
			Always plain	Switched to F	Always filter
Age	262M	Males	1.00	0.57 (0.41-0.79)	0.32 (0.19-0.54)
Age, cigs/day			1.00	0.59 (0.43-0.82)	0.35 (0.21-0.59)
Age	81F	Females	1.00	0.95 (0.56-1.60)	0.31 (0.16-0.62)
Age, cigs/day			1.00	0.98 (0.58-1.65)	0.32 (0.16-0.64)
DOLL (Doll and Hill, 1952)					
			Always plain	Ever filter	
None	504M	Males	1.00	0.18 (0.05-0.63)	
Other studies					
WEINBE (Weinberg et al, 1982)					
			% filter smokers		
None	378 HR[d] 607LR	Males	8.9% higher ($p<0.05$) in low risk area (South Hills)		
KNOTH (Knoth et al, 1983)					
			Plain	Filter	
			Average age at death (CI)		
None	497M	Males	62.6 (61.1-63.3)	60.6 (59.6-61.7)	
			($p = 0.01$)		

[a] Number of cases in analysis described except where specified
[b] Numbers of cases shown are all cases in study
[c] CI estimates very approximate
[d] HR = high risk area (Lawrenceville), LR = low risk area (South Hills)

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TABLE 5.3

Relative risk (95% CI) of lung cancer in relation to filter and plain cigarette smoking (using the most extreme groups for comparison where more than two groups were compared)[a]

Study	Base group	Comparison group	Relative risk (95% CI)
Males			
ALDERS	Always plain	Always filter	1.48(0.81-2.69)
MATOS	Mainly plain	Mainly filter	1.25(0.67-2.50)
MIGRAN	Plain	Filter	1.13(0.75-1.70)
SIDNEY	Always plain	20+ years filter	1.04(0.58-1.87)
WAKAI	Plain	Filter	1.02(0.31-3.33)
DEAN	Plain	Filter	0.97(0.50-1.86)
TANG	Plain	Filter	0.94(0.75-1.18)
AHF2	Always plain	Always filter	0.92(0.65-1.29)
LANGE	Plain	Filter	0.90(0.60-1.40)
AHF1	Always plain	Switched to F 10+ yrs ago	0.89(0.71-1.11)
HAWTHO	Plain	Filter	0.83(0.53-1.31)
DESTEF2	Plain	Filter	0.73(0.51-1.05)
DESTEF1	Ever plain	Always filter	0.72(0.54-0.96)
ENGELA	Only plain	Only filter	0.67(0.30-1.43)
BENHAM	Always plain	Always filter	0.63(0.35-1.10)
RIMING	Plain	Filter	0.62(0.42-0.91)
BROSS	Plain	Filter	0.56(0.37-0.81)
MRFIT	Plain	Filter	0.53(0.24-1.17)
WYNDER	Plain	Filter 10+ years	0.51(0.34-0.76)
LUBIN	Always plain	Always filter	0.48(0.40-0.56)
KHUDER	Always plain	Ever filter	0.46(0.37-0.59)
CPSII	Only plain	Only filter	0.45(0.40-0.50)[b]
JOCKEL	Plain	Filter	0.41(0.21-0.81)
ARMADA	Ever plain	Always filter (in 20 yr period)	0.41(0.30-0.70)
DEAN2	Always plain	Always filter (in 15 yr period)	0.35(0.21-0.59)
PEZZOT	Mainly plain	Mainly filter	0.29(0.20-0.42)
DOLL	Always plain	Ever filter	0.18(0.05-0.63)
CHOI	Only plain	Only filter	0.06(0.01-0.30)

TABLE 5.3 (Continued)

Study	Base group	Comparison group	Relative risk (95% CI)
Males (continued)			
Combined estimate (n = 28)		Fixed-effects Random-effects	0.58(0.55-0.62)[c] 0.64(0.55-0.75)
Excluding HAWTHO, BENHAM, CPSII (n = 25)		Fixed-effects Random-effects	0.64(0.59-0.69)[d] 0.65(0.54-0.77)
Females			
DEAN	Plain	Filter	3.12(0.65-15.0)
BUFFLE	Always plain	Always filter	1.34(0.80-2.23)
MIGRAN	Plain	Filter	0.92(0.38-2.23)
ENGELA	Only plain	Only filter	0.91(0.41-2.03)
ALDERS	Always plain	Always filter	0.85(0.52-1.38)
LANGE	Plain	Filter	0.70(0.40-1.40)
AHF2	Always plain	Always filter	0.68(0.39-1.19)
CPSII	60% or more plain	Only filter	0.66(0.57-0.78)
AHF1	Always plain	Switched to F 10+ yrs ago	0.61(0.35-1.05)
LUBIN	Always plain	Always filter	0.43(0.22-0.85)
SIDNEY	Always plain	20+ years filter	0.36(0.18-0.75)
DEAN2	Always plain	Always filter (in 15yr period)	0.32(0.16-0.64)
AGUDO	Ever plain	Always filter	0.22(0.04-1.27)
BENHAM	Always plain	Always filter	0.16(0.04-0.61)
Combined estimate (n = 14)		Fixed-effects Random-effects	0.67(0.59-0.75)[e] 0.65(0.51-0.83)
Excluding BENHAM, CPSII (n = 12)		Fixed-effects Random-effects	0.69(0.57-0.84)[f] 0.67(0.50-0.91)
Sexes combined			
CORREA	Plain	Filter	0.55(0.35-0.85)
Combined estimate (n = 43)		Fixed-effects Random-effects	0.59(0.56-0.63)[a,g] 0.64(0.56-0.73)
Exclusions as for males and females (n = 38)		Fixed-effects Random-effects	0.64(0.60-0.69)[h] 0.65(0.56-0.75)

TABLE 5.3 (Continued 2)

[a] See Tables 5.1 and 5.2 for further details of studies and analyses
[b] Very approximate estimate
[c] Heterogeneity chisquared 140.74 on 27 d.f. ($p<0.001$)
[d] Heterogeneity chisquared 111.83 on 24 d.f. ($p<0.001$)
[e] Heterogeneity chisquared 27.61 on 13 d.f. ($p<0.05$)
[f] Heterogeneity chisquared 23.23 on 11 d.f. ($p<0.05$)
[g] Heterogeneity chisquared 172.53 on 42 d.f. ($p<0.001$)
[h] Heterogeneity chisquared 136.15 on 37 d.f. ($P<0.001$)

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TABLE 5.4

Relative risk (95% CI) of lung cancer in filter and plain cigarette smokers - by histological type

Adjustment factors	Sex	Histological type	Relative risk (95% CI)		
WAKAI (Wakai et al, 1997)					
			Plain	Filter	
Age, cigs/day., age start inhalation, fraction smoked per cig	Male	Sq. carcinoma	1.00	0.45 (0.14-1.52)	
		Adenocarcinoma	1.00	4 (NS)	
MATOS (Matos et al, 1998)					
			Mainly plain	Mainly filter	
Age, hospital, cigs/day, years since quit	Male	Sq. carcinoma	1.00	0.71 (0.27-1.67)	
		Adenocarcinoma	1.00	1.43 (0.63-3.33)	
PEZZOT (Pezzotto et al, 1993)					
			Always plain	Ever filter	
Age, hospital, cigs/day	Male	Sq. carcinoma	1.00	0.20 (0.11-0.37)	
		Adenocarcinoma	1.00	0.38 (0.19-0.75)	
		Small cell	1.00	0.25 (0.10-0.61)	
CORREA (Falk et al, 1992)					
			Only plain	Mixed	Only filter
Cigs/day	Male + Female	Bronchioalveolar carcinoma	1.00	0.77 (0.22-2.69)	0.25 (0.02-2.87)
WYNDER (Wynder, 1972)					
			Plain	Filter (10+ years)	
Cigs/day	Male	Kreyberg I	1.00	0.51 (0.34-0.76)	

TABLE 5.4 (Continued)

Adjustment factors	Sex	Histological type	Relative risk (95% CI)		
AHF1 (Wynder and Stellman, 1977)					
			Always plain	Switched to F <10 years ago	Switched to F 10+ years ago
None	Male	Kreyberg I	1.00	1.06 (0.80-1.40)	0.79 (0.62-1.01)
		Kreyberg II	1.00	1.29 (0.87-1.92)	1.16 (0.83-1.63)
	Female	Kreyberg I	1.00	0.73 (0.34-1.56)	0.56 (0.30-1.06)
		Kreyberg II	1.00	1.18 (0.52-2.71)	0.68 (0.33-1.40)
AHF1 (Wynder and Stellman, 1979)					
			Always plain	Switched to F 10+ years ago	
Cigs/day and duration	Male	Kreyberg I	1.00	0.84 (0.65-1.09)	
	Female	Kreyberg 1	1.00	0.78 (0.40-1.49)	
Age and cigs/day	Male	Kreyberg I	1.00	0.79 (0.61-1.03)	
	Female	Kreyberg I	1.00	0.73 (0.38-1.39)	
AHF2 (Stellman et al, 1997)					
			Always plain	Switched to F	Always filter
Age, cigs/day, education	Male	Sq. carcinoma	1.0	0.9(0.7-1.2)	0.8(0.5-1.2)
		Adenocarcinoma	1.0	1.0(0.8-1.3)	1.0(0.7-1.5)
	Female	Sq. carcinoma	1.0	0.6(0.3-1.0)	0.4(0.2-0.8)
		Adenocarcinoma	1.0	1.2(0.7-2.0)	0.9(0.5-1.7)
AHF2 (Kabat, 1996)						
			Always plain	Switched to F 1-9 yrs ago	Switched to F 10+ yrs ago	Always filter
Age, cigs/day, education, inhalation	Male	Kreyberg I	1.0	0.8(0.6-1.2)	0.7(0.5-0.9)	0.7(0.4-1.3)
		Kreyberg II	1.0	1.0(0.6-1.5)	0.8(0.5-1.2)	0.9(0.4-1.5)
	Female	Kreyberg I	1.0	1.0(0.5-2.0)	0.7(0.4-1.4)	0.6(0.3-1.4)
		Kreyberg II	. . . . . 1.0		1.0(0.8-0.3)	1.0(0.6-1.5)
AHF2 (Wynder and Muscat, (1995)							
			Always plain	Switched to F 1-9 yrs ago	Switched to F 10-20 yrs ago	Switched to F 21+ yrs ago	Always filter
Age	Male	Sq. carcinoma	1.00	1.10 (0.73-1.65)	0.97 (0.70-1.35)	0.93 (0.61-1.41)	0.52 (0.33-0.84)
		Adenocarcinoma	1.00	0.92 (0.62-1.37)	1.10 (0.79-1.52)	0.88 (0.58-1.33)	0.81 (0.53-1.24)
	Female	Sq. carcinoma	1.00	0.71 (0.34-1.48)	0.48 (0.26-0.90)	0.77 0.40-1.48)	0.33 (0.18-0.63)
		Adenocarcinoma	1.00	1.26 (0.64-2.48)	1.07 (0.59-1.94)	1.41 (0.75-2.64)	0.79 (0.43-1.43)

TABLE 5.4 (Continued 2)

Adjustment factors	Sex	Histological type	Relative risk (95% CI)		
LUBIN (Lubin and Blot, 1984)					
			Always plain	Mixed	Always filter
Duration, years of cessation	Male	Sq. carcinoma	1.00	0.84(0.78-0.91)	0.53(0.45-0.62)
		Oat cell	1.00	1.15(0.99-1.34)	0.77(0.59-1.01)
		KI, unknown	1.00	1.06(0.86-1.31)	0.63(0.41-0.94)
		adenocarcinoma	1.00	1.07(0.90-1.27)	0.71(0.52-0.99)
	Female	Sq. carcinoma	1.00	0.27(0.17-0.43)	0.15(0.09-0.26)
		Oat cell	1.00	1.43(0.70-2.91)	0.71(0.33-1.54)
		KI, unknown	1.00	1.06(0.56-2.01)	0.59(0.39-0.88)
		adenocarcinoma	1.00	1.36(0.66-2.83)	0.45(0.20-1.05)
BENHAMOU (Benhamou et al, 1985)					
			Always plain	Mixed	Always filter
None	Male	Kreyberg I	1.00	1.02(0.84-1.25)	0.60(0.44-1.82)
Cigs/day, duration, inhalation, social class, tobacco type, current/ex, HR/manuf.	Male	Kreyberg I	1.00	0.89(0.69-1.14)	0.81(0.58-1.15)

TABLE 5.5

Relative risk (95% CI) of squamous cell carcinoma (or Kreyberg I) and of adenocarcinoma (or Kreyberg II) in relation to filter and plain cigarette smoking (using the most extreme groups for comparison where more than two groups were compared)[a]

Study	Base group/comparison group	Sex	Relative risk (95% CI) Squamous cell carcinoma (or Kreyberg I)	Adenocarcinoma (or Kreyberg II)
WAKAI	Plain/filter	Male	0.45 (0.14-1.52)	-
MATOS	Mainly plain/mainly filter	Male	0.71 (0.27-1.67)	1.43 (0.63-3.33)
PEZZOT	Always plain/ever filter	Male	0.20 (0.11-0.37)	0.38 (0.19-0.75)
WYNDER	Plain/filter (10+ years)	Male	0.51 (0.34-0.76)	-
AHF1	Always plain/switched to F 10+ yrs ago	Male	0.79 (0.62-1.01)[b]	1.16 (0.83-1.63)
		Female	0.56 (0.30-1.06)[b]	0.68 (0.33-1.40)
AHF2	Always plain/always filter	Male	0.70 (0.40-1.30)	0.90 (0.40-1.50)
		Female	0.60 (0.30-1.40)	1.00 (0.60-1.50)
LUBIN	Always plain/always filter	Male	0.53 (0.45-0.62)	0.71 (0.52-0.99)
		Female	0.15 (0.09-0.26)	0.45 (0.20-1.05)
BENHAM	Always plain/always filter	Male	0.81 (0.58-1.15)	-
Combined estimate for all studies (n = 11)		Fixed-effects Random-effects	0.56 (0.50-0.62)[c] 0.50 (0.37-0.67)	-
Combined estimate for studies with data available for both lung cancer types (n = 8)		Fixed-effects Random-effects	0.54 (0.48-0.61)[d] 0.46 (0.32-0.67)	0.84 (0.70-1.00)[e] 0.80 (0.61-1.06)

[a] See Tables 5.1 and 5.4 for further details of studies and analyses

[b] Results, unadjusted for risk factors, taken from Wynder and Stellman (1977) as results, adjusted for various factors, in Wynder and Stellman (1979) only available for Kreyberg I

[c] Heterogeneity chisquared 48.78 on 10 d.f. ($p<0.001$)

[d] Heterogeneity chisquared 43.27 on 7 d.f. ($p<0.001$)

[e] Heterogeneity chisquared 14.49 on 7 d.f. ($p<0.05$)

TABLE 5.6

Effect of adjustment for various risk factors on relative risk (95% CI) of lung cancer in relation to filter and plain cigarette smoking[a]

Study	Base group/comparison group	Sex	Adjustment factors	Relative risk (95% CI)
MIGRAN	Plain/filter	Male	Age. cigs/day	1.16 (0.78-1.73)
			+ inhalation, age of start	1.13 (0.75-1.70)
		Female	Age, cigs/day	1.00 (0.42-2.38)
			+ inhalation, age of start	0.92 (0.38-2.23)
RIMING	Plain/filter	Male	Age	0.65 (0.44-0.96)
			+ cigs/day	0.62 (0.42-0.91)
PEZZOT	Mainly plain/mainly filter	Male	Age, hospital	0.23 (0.16-0.34)
			+ cigs/day	0.29 (0.20-0.42)
BROSS	Plain-filter	Male	Cigs/day	0.57 (0.39-0.85)
			+ duration	0.56 (0.37-0.81)
AHF2	Always plain/always filter	Male	Age, cigs/day, duration	0.92 (0.65-1.29)
			+ inhalation[b]	0.77 (0.46-1.30)
		Female	Age, cigs/day, duration	0.68 (0.39-1.19)
			+ inhalation[b]	0.87 (0.56-1.33)
LUBIN	Always plain/always filter	Male	Duration, years of cessation	0.56 (0.47-0.66)
			Cigs/age, years of cessation	0.48 (0.40-0.56)
		Female	Duration, years of cessation	0.40 (0.19-0.83)
			Cigs/day, years of cessation	0.43 (0.22-0.85)
BENHAM	Always plain/always filter	Male	Age	0.38 (0.24-0.62)
			+ cigs/day,duration[c]	0.70 (0.52-0.94)
			+ inhalation, current use, tobacco type, tar	0.63 (0.35-1.10)
ARMADA	Ever plain/always filter	Male	Age, pack-years	0.40 (0.30-0.70)
			Age, pack-years, SES, black/blond	0.40 (0.20-0.70)
			Age, SES, cigs/day, duration, black/blond	0.41 (0.30-0.70)
DEAN	Plain/filter	Male	Age	0.52 (0.38-0.71)
			+ cigs/day	0.54 (0.40-0.73)
			+ inhalation	0.55 (0.41-0.74)

TABLE 5.6 (Continued)

Study	Base group/comparison group	Sex	Adjustment factors	Relative risk (95% CI)
DEAN (continued)		Female	Age	0.69 (0.43-1.12)
			+ cigs/day	0.68 (0.42-1.11)
			+ inhalation	0.82 (0.50-1.33)
DEAN2	Always plain/always filter	Male	Age	0.32 (0.19-0.54)
			+ cigs/day	0.35 (0.21-0.59)
		Female	Age	0.31 (0.16-0.62)
			+ cigs/day	0.32 (0.16-0.64)

[a] See Tables 5.1 and 5.2 for further details of studies and analyses
[b] Based on different source (Katat, 1996) than previous analysis (Stellman et al, 1997)
[c] Based on different source (Benhamou et al, 1989) than other two analyses (Benhamou et al, 1994)

TABLE 6.1

Details of studies providing evidence on risk of lung cancer in relation to tar level

Study/ Location	Population considered	Period to which tar level is relevant	Tar groupings used (mg/cig)
Prospective studies			
SIDNEY USA California	Current cigarette smokers	Brand usually smoked at baseline (1979-1985) - followed until 1987	(i) > 18 11-18 < 11 (ii) per mg tar
MRFIT USA Multicentre	Current cigarette smokers	Brand smoked at baseline (1973-1976) - followed for 10.5 years	(i) $ 20 16-19 # 15 (ii) per mg tar
CPSI USA 25 studies	Current cig. only smokers	(i) Brand smoked at first interview (1959-60) - followed until 1966	High T/N Medium T/N Low T/N[a]
		(ii) Brand smoked at fourth interview (1965-66) - followed until 1972	High T/N Medium T/N Low T/N[b]
SPEIZE USA Nationwide	Current cigarette smokers	Brand smoked in 1978 - followed until 1992	Quartiles or tertiles[c]
CPSII USA Nationwide	Current cigarette smokers	Brand smoked at baseline (1982) - followed until 1986	per mg tar
BENSHL England London	Current cigarette smokers	Brand smoked at baseline (1967-1969) - followed for 10 years	$ 33 24-32 18-23
TANG 4 UK Cohorts	Current man. cig. only smokers	Brand smoked longest in 3 cohorts, at baseline in 1 cohort (1967-1982) - followed for 13 years[d]	per mg tar
Case-control studies			
WILCOX USA New Jersey	Current cigarette smokers 1973-1980	Brands smoked 1973-80 - interviewed in 1980-81	21-28 17.6-21 14.1-17.5 # 14.0

TABLE 6.1 (Continued)

Study/ Location	Population considered	Period to which tar level is relevant	Tar groupings used (mg/cig)
AHF2 USA 45 hospitals	Current ever filter cigarette smokers (≥ 10 years)	Brands smoked in lifetime - interviewed in 1977-1984	15+ 10-14 < 10
KAUFMA USA/Canada 7 cities	Current cigarette smokers	Brand smoked for at least 75% of years smoking, all years of smoking and 10 years before admission - in 1981-1986	29+ 22-28 < 22
LUBIN Europe 7 centres	Current and former cig. smokers	Four previous brands smoked - mean tar weighted by amount smoked calculated - interviewed in 1976-1980	VI V IV III II I (Mean tar values for categories 29.8 25.2 23.6 20.6 18.5 15.6)
BENHAM France Paris[e,f]	Current and former cig. smokers	Four previous brands smoked - interviewed in 1976-1980	Use of 30+ mg tar cigarettes > 75% 51-75% # 50%
VUTUC Austria Nationwide[f]	Current and former cig. smokers	Main brand and brand smoked exclusively in lifetime - interviewed in 1976-1980	> 24 15-24 < 15
ALDERS England Multicentre	Current and former man. cig. only smokers	Brand smoked at various times before admission - interviewed in 1977-1982	(i) 29+ 23-28 17-22 (10 years before admission) (ii) 29+ 23-28 0-22 (5 years before admission) (iii) 17-22 0-16 (at admission)
GILLIS Scotland West[e]	Current cigarette smokers	Lifetime smoking history - Mean tar weighted by amount smoked calculated - interviewed in 1976-1981	23+ -22
Other study (comparison of risk factors in high and low lung cancer risk area)			
WEINBE USA Pennsylvania	Current cigarette smokers	Brand smoked at interview in 1978-79	Mean tar

TABLE 6.1 (Continued 2)

Notes

[a] For the 1960-66 follow-up, high T/N = 2.0 to 2.7 mg nicotine and 25.8 to 35.7 mg tar, low T/N = < 1.2 mg nicotine and (usually) < 17.6 mg tar and medium T/N = intermediate, based on interview 1 (1959-1960).

[b] For the 1966-72 follow-up, high T/N = high as note a for interview 1 and high or medium as note a for interview 4, low T/N = low as note a for interview 1 and either low or medium as note a for interview 4 (1965-66) or as low on both interview 2 (1961-62) and interview 4.

[c] The authors stated tar values were divided into tertiles and then presented comparisons of the top and bottom quartiles. Actual tar values were not given.

[d] Average follow-up period 12.8 years, maximum 19.4 years for cohort interviewed in 1967-1970.

[e] 13 of 16 hospitals in Paris.

[f] Part of LUBIN study.

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TABLE 6.2

Relative risk (95% CI) of lung cancer in relation to tar yield of brand smoked

Adjustment factors	Number of cases	Sex	Relative risk (95% CI)		
Prospective studies					
SIDNEY (Sidney et al, 1993)					
			> 18	11-18	< 11 mg/cig
Age, race, education, cigs/day, duration	82M	Male	1.00	1.02(0.62-1.65)	0.79(0.41-1.50)
	76F	Female	1.00	1.39(0.71-2.70)	1.49(0.76-2.94)
				Per mg tar increase	
		Male		1.02(0.98-1.05)	
		Female		0.99(0.96-1.03)	
MRFIT (Kuller et al, 1991)					
			20+	16-19	# 15 mg/cig
Age, cholesterol, blood pressure, cigs/day	95M	Male	1.00	0.71(0.49-1.03)	0.88(0.52-1.49)
				Per mg tar increase	
		Male		1.03(0.98-1.07)	
CPSI (Stellman and Garfinkel, 1989)					
			High	Medium	Low T/N
Age, cigs/day	822M	Male	1.00	0.90(0.70-1.04)	0.68(0.54-0.86)
CPSI (Hammond et al, 1976)					
	Period 1[a]		High	Medium	Low T/N
Age, race, cigs/day, age start, urban/rural, occupational exposures, education, history of lung cancer and CHD	341M	Male	1.00	0.96(0.75-1.24)	0.83(0.64-1.08)
	117F	Female	1.00	0.86(0.57-1.30)	0.57(0.36-0.91)
	Period 2[a]		High	Medium	Low T/N
	245M	Male	1.00	0.94(0.70-1.27)	0.79(0.58-1.08)
	137F	Female	1.00	0.73(0.49-1.09)	0.62(0.41-0.94)
CPSII (Garfinkel and Stellman, 1988)					
				Per mg tar increase	
Age, cigs/day, inhalation	570F	Female		1.031 ($p < 0.01$)	
SPEIZE (Speizer et al, 1999)					
			Top quartile		Bottom quartile
Age, Age at start	593F	Female	1.00		0.50(0.36-0.67)
Age, age at start, cigs/day			1.00		1.00(0.71-1.43)

TABLE 6.2 (Continued)

Adjustment factors	Number of cases	Sex	Relative risk (95% CI)			
BENSHL (Higenbottam et al, 1982)						
			# 33	24-32	18-23 mg/cig	
	143M	Male[b]	1.00	0.78(0.49-1.25)	0.68(0.45-1.01)	
Age,		Male	1.00	0.76(0.47-1.22)	0.67(0.45-1.00)	
employment grade, inhalation, cigs/day[b]		Male	1.00	0.63(0.36-1.11)	0.56(0.36-0.86)	
TANG (Tang et al, 1995)						
			Per mg tar increase			
Age, study, cigs/day	366M	Male	1.02(0.99-1.04)			
Case-control studies						
WILCOX (Wilcox et al, 1988)						
			21-28	17.6-21	14.1-17.5	# 14 mg/cig
Cigs/day,	373M	Male[c]	1.00	1.16(0.72-1.86)	1.01(0.68-1.51)	0.61(0.33-1.12)
duration[c]		Male	1.00	1.05(0.65-1.67)	0.89(0.60-1.32)	0.58(0.32-1.07)
		Male	1.00	1.21(0.75-1.96)	1.04(0.70-1.56)	0.61(0.32-1.13)
AHF2 (Wynder and Kabat, 1988)						
None	682M,	Male -	15+		10-14	< 10
	492F	Kreyberg I	1.00		1.26(0.90-1.78)	1.29(0.78-2.13)
		Kreyberg II	1.00		0.94(0.63-1.41)	1.33(0.71-1.48)
		Combined	1.00		1.13(0.87-1.47)	1.32(0.89-1.95)
		Female -				
		Kreyberg I	1.00		0.60(0.39-0.91)	0.77(0.44-1.34)
		Kreyberg II	1.00		0.87(0.56-1.34)	1.17(0.60-2.26)
		Combined	1.00		0.72(0.53-0.97)	0.93(0.61-1.42)
KAUFMA (Kaufman et al, 1989)						
			29+	22-28	< 22 mg/cig	
Age, sex, race,			(Brand identified for 75%+ years smoking)			
region, education,	170M+F	Combined	1.00	0.61(0.26-1.46)	0.32(0.14-0.75)	
cigs/day, age			(Brand identified for 100% years smoking)			
start, year of interview	99M+F	Combined	1.00	0.63(0.16-2.44)	0.42(0.11-0.58)	
			(Brand smoked at least 10 years before admission)			
	119M	Male	1.00	0.90(0.36-2.23)	0.25(0.08-0.82)	
	51F	Female	1.00	0.38(0.09-1.58)	0.21(0.05-0.93)	

TABLE 6.2 (Continued 2)

Adjustment factors	Number of cases	Sex	Relative risk (95% CI)					
LUBIN (Lubin et al, 1984)								
			VI	V	IV	III	II	I[d]
Cigs, duration, years since cessation	2650M 313F	Male	1.00	0.93 0.73-1.18)	0.93 0.74-1.16)	1.21 (0.96-1.54)	0.86 (0.67-1.10)	0.71 (0.55-0.93)
		Female		1.00	0.73 0.40-1.33)	0.87 0.44-1.69)	1.27 0.67-2.40)	0.67 (0.38-1.18)
			High tar			Low tar		
			100%	> 75%	Other	> 75%	100%	
		Male	1.00	1.06 (0.93-1.21)	0.88 (0.79-0.99)	0.71 (0.43-1.56)	0.59 (0.45-0.77)	
		Female	1.00	0.52 (0.31-0.88)	0.77 (0.49-1.19)		0.13 0.06-0.27)	
BENHAM (Benhamou et al, 1994)								
			Use of $ 30 mg cigarettes					
Age, cigs/day, inhalation, duration, tobacco type, filter use[e]	1101M	Male[e]	> 75% 1.00	51-75% 1.10(0.92-1.32)	# 50% 0.74(0.59-0.94)			
		Male	1.00	0.94(0.54-1.64)	0.79(0.52-1.20)			
VUTUC (Vutuc and Kunze, 1982 and 1983)								
			>24	15-24	<15 mg/cig[f]			
Age, cigs/day, duration	248M	Male	1.00	(Main brand) 0.56(0.37-0.86)	0.30(0.11-0.81)			
	188F	Female	1.00	0.49(0.32-0.76)	0.29(0.09-0.95)			
	67M			(Brand smoked exclusively)				
	43F	Male	1.00	0.41(0.23-0.75)				
		Female	1.00	0.43(0.20-0.93)	0.24(0.02-3.00)			

TABLE 6.2 (Continued 3)

Adjustment factors	Number of cases	Sex	Relative risk (95% CI)		
ALDERS (Alderson et al, 1985)					
			10 years before admission		
Age, cigs/day			29+	23-28	17-23 mg/cig
	299M	Male	1.00	0.92(0.57-1.49)	0.83(0.55-1.24)
	386F	Female	1.00	1.06(0.64-1.75)	1.12(0.74-1.70)
			5 years before admission		
			23-28	0-22 mg/cig	
		Male	1.00	0.81(0.56-1.18)	
		Female	1.00	0.96(0.63-1.45)	
			At admission		
			17-22	0-16 mg/cig	
		Male	1.00	1.10(0.62-1.95)	
		Female	1.00	0.96(0.61-1.52)	
GILLIS (Gillis et al, 1988)					
			23+	# 22 mg/cig	
Cigs/day[g]	490M	Males	1.00	0.73(0.52-1.01)	
		Males	1.00	0.74(0.53-1.03)	
Other study					
WEINBE (Weinberg et al, 1982)					
			Mean tar content		
None	378HR[h]	Males	High risk area : 18.7 mg		
	607LR		Low risk area : 16.8 mg		
			(Not significant)		

Notes

[a] Period 1 = 1960-66, Period 2 - 1966-72, Numbers are "adjusted" deaths (see Hammond et al, 1976).

[b] The three sets of relative risks are (i) adjusted for age and employment grade only, (ii) adjusted for inhalation ever and (iii) adjusted for cigs/day also.

[c] The three sets of relative risks are (i) adjusted for cigs/day, (ii) adjusted for duration and (iii) adjusted for cigs/day and duration. Wilcox et al (1988) noted age adjustment had little additional effect.

[d] Tar categories - see Table 6.1.

[e] The first set of relative risks is adjusted for age only, the second set for all the variables listed.

[f] Results for < 15 mg/cig based on very few cases and unreliable.

[g] The two sets of relative risks are (i) unadjusted and (ii) adjusted for cigs/day.

[h] HR = high risk area (Lawrenceville), LR = low risk area (South Hills).

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TABLE 6.3

Relative risk (95% CI) of lung cancer in relation to lowest vs. highest tar level[a]

Sex	Study		Relative risk (95% CI)
Male	AHF2		1.32(0.89-1.95)
	MRFIT		0.88(0.52-1.49)
	ALDERS[b]		0.83(0.55-1.24)
	CPSI (1960-1966)		0.83(0.64-1.08)
	BENHAM		0.79(0.52-1.20)
	SIDNEY		0.79(0.41-1.50)
	CPSI (1966-1972)		0.79(0.58-1.08)
	GILLIS		0.74(0.53-1.03)
	LUBIN[c]		0.71(0.55-0.93)
	WILCOX		0.61(0.32-1.13)
	BENSHL		0.56(0.36-0.86)
	VUTUC		0.30(0.11-0.81)
	KAUFMA[b]		0.25(0.08-0.82)
	Combined estimate (n = 13)	Fixed-effects Random-effects	0.77(0.69-0.86)[d] 0.77(0.66-0.88)
	Excluding AHF2, GILLIS, BENHAM and VUTUC (n = 9)	Fixed-effects Random-effects	0.75(0.66-0.85)[e] 0.75(0.66-0.85)
Female	SIDNEY		1.49(0.76-2.94)
	ALDERS[b]		1.12(0.74-1.70)
	SPEIZE		1.00(0.71-1.43)
	AHF2		0.93(0.61-1.42)
	LUBIN[c]		0.67(0.38-1.18)
	CPSI (1966-1972)		0.62(0.41-0.94)
	CPSI (1960-1966)		0.57(0.36-0.91)
	VUTUC		0.29(0.09-0.95)
	KAUFMA[b]		0.21(0.05-0.93)
	Combined estimate (n = 9)	Fixed-effects Random-effects	0.82(0.70-0.97)[f] 0.79(0.60-1.02)
	Excluding AHF2, SPEIZE, and VUTUC (n = 6)	Fixed-effects Random-effects	0.77(0.62-0.95)[g] 0.75(0.52-1.09)
Sexes combined	Combined estimate (n = 22)	Fixed-effects Random-effects	0.79(0.72-0.86)[h] 0.77(0.68-0.88)
	Exclusions as for two sexes (n = 15)	Fixed-effects Random-effects	0.75(0.67-0.84)[j] 0.74(0.65-0.86)

TABLE 6.3 (Continued)

Notes

[a] See Tables 6.1 and 6.2 for further details of studies and comparisons made.
[b] Brand smoked 10 years before admission.
[c] Categories based on mean tar level, not use of high and low tar brands.
[d] Heterogeneity chisquared 18.00 on 12 d.f. (Not significant).
[e] Heterogeneity chisquared 7.03 on 8 d.f. (Not significant).
[f] Heterogeneity chisquared 17.65 on 8 d.f. ($p < 0.05$).
[g] Heterogeneity chisquared 12.71 on 5 d.f. ($p < 0.05$).
[h] Heterogeneity chisquared 36.01 on 21 d.f. ($p < 0.05$).
[j] Heterogeneity chisquared 19.78 on 14 d.f. (Not significant).

TABLE 7.1

Relative risk (95% CI) of lung cancer in hand rolled vs. manufactured cigarette smokers (current + former smokers[a], all cell types)

Study details	Adjustment factors Number of cases	Sex	Relative risk (95% CI) Manuf only (base)	Ever hand rolled	Mixed manuf/ HR	Hand rolled only
HU (Hu et al, 1997)						
China Heilongjiang Case-control 1985-1987	Unadjusted 118M + 25F cases	Male Female	1.00 1.00	1.27(0.74-2.19) 2.89(0.79-10.5)	1.34(0.59-3.05) 5.14(0.47-56.9)	1.24(0.68-2.25) 2.57(0.67-9.83)
FU (Fu and Gou, 1984)						
China Harbin Case-control 1977-1979	Adjusted for district 300M+F cases	Combined	1.00	-	-	1.22(0.83-1.78)
CHAN (Chan et al, 1979)						
Hong Kong Case-control 1976-1977	Unadjusted 206M + 105F cases	Male Female	1.00 1.00	1.40(0.80-2.46) 0.47(0.22-1.01)	1.39(0.78-2.47) 0.51(0.23-1.13)	1.65(0.15-18.4) 0.41(0.15-1.08)
MACLEN (Maclennan et al, 1977)						
Singapore Case-control 1972-1973	Unadjusted 142M + 45F cases	Male Female	1.00 1.00	1.64(0.96-2.79) 0.69(0.31-1.52)	1.77(1.01-3.10) 1.31(0.47-3.66)	0.98(0.27-3.50) 0.40(0.14-1.09)
DESTEF1 (De Stefani et al, 1996a)						
Uruguay Montevideo Case-control 1988-1994	Adjusted for age, residence, urban/rural, education 470M cases	Male	1.00	1.67(1.22-2.30)[b]	-	-
DESTEF2 (De Stefani et al, 1996b)						
Uruguay Montevideo Case-control 1993-1996	Adjusted for age, residence, urban/rural, education, BMI, family history LC 300M cases	Male	1.00	2.00(1.28-3.12)[b]	-	-

TABLE 7.1 (Continued)

Study details	Adjustment factors Number of cases	Sex	Relative risk (95% CI) Manuf only (base)	Ever hand rolled	Mixed manuf/ HR	Hand rolled only
BUFFLE (Ives, 1984)						
USA Texas Case-control 1976-1980	Unadjusted 208F cases	Female	1.00	2.39(1.11-5.13)[c]	-	-
BENHAM (Benhamou et al, 1989)						
France Paris[d] Case-control 1976-1980	Adjusted for age, cigs/day, duration 1031M cases	Male	1.00	1.28(0.98-1.67)	1.38(0.84-2.26)	1.25(0.92-1.69)
ENGELA (Engeland et al, 1996)						
Norway Nationwide Prospective 1964+1965 followed to 1993	Adjusted for age 244M + 63F cases	Male[e]	1.00	1.06(0.79-1.43)	0.63(0.38-1.05)	1.20(0.88-1.63)
		Female[e]	1.00	1.56(0.91-2.69)	1.28(0.58-2.81)	1.73(0.96-3.15)
ALDERS (Alderson et al, 1985)						
England Multicentre Case-control 1977-1982	Adjusted for age, cigs/day 576M cases	Male	1.00	1.46(1.11-1.91)	1.39(1.04-1.85)	1.95(1.01-3.77)
HAWTHO (Hawthorn and Fry, 1978)						
Scotland West Central Prospective 1965-1975 followed to 1977	Adjusted for age, cigs/day, substudy 88M cases	Male	1.00	1.94(0.95-3.97)[c]	-	-
MIGRAN (Lee, 1979)						
UK Nationwide Prospective 1964-1965 followed to 1977	Adjusted for age, cigs/day 136M cases	Male[c]	1.00	1.67(1.11-2.51)	1.65(0.87-3.13)	1.73(1.07-2.81)

TABLE 7.1 (Continued 2)

Notes

[a] Except where stated.

[b] The comparison was between hand rolled and manufactured with no indication of whether this was actually hand rolled only vs. ever manufactured or ever rolled vs. manufactured only.

[c] The comparison is based on brand usually smoked.

[d] 16 hospitals, 13 in Paris.

[e] Results for current smokers only.

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TABLE 7.2

Meta-analyses for hand rolled vs. manufactured

			Meta-analysis relative risks (95% CI)		
Sex	Manuf only (base)		Ever hand rolled	Mixed manuf/HR	Hand rolled only
Male	1.00	Fixed effects	1.43(1.27-1.61)	1.30(1.09-1.56)	1.33(1.11-1.59)
		Random effects	1.43(1.27-1.62)	1.30(1.01-1.66)	1.33(1.11-1.59)
			(n = 10)	(n = 7)	(n = 7)
Female	1.00	Fixed effects	1.21(0.87-1.69)[a]	0.97(0.60-1.57)	1.06 (0.69-1.63)[a]
		Random effects	1.22(0.64-2.32)	1.04(0.53-2.06)	0.92(0.37-2.29)
			(n = 5)	(n = 4)	(n = 4)
All estimates	1.00	Fixed effects	1.41(1.26-1.57)	1.26(1.06-1.49)	1.27(1.09-1.48)
		Random effects	1.42(1.21-1.66)	1.23(0.97-1.57)	1.27(1.04-1.55)
			(n = 15)	(n = 11)	(n = 12)

Notes
n indicates number of estimates on which meta-analysis is based.
Based on data in Table 7.1.
[a] Significant heterogeneity between estimates ($p < 0.05$).

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TABLE 7.3

Relative risk (95% CI) of lung cancer for hand rolled compared to manufactured cigarette smokers - by histological type[a]

				Relative risk (95% CI)		
Study	Sex	Lung cancer type	Manuf only (base)	Ever hand rolled	Mixed manuf/HR	Hand rolled only
DESTEF1[b]	Male	All types	1.00	1.6(1.2-2.3)	2.3(1.5-3.4)	1.3(0.9-1.8)
		Squamous cell	1.00	1.2(0.8-1.8)	1.6(0.9-2.6)	0.9(0.6-1.5)
		Small cell	1.00	4.5(1.9-10.9)	5.3(2.1-13.8)	4.1(1.6-10.2)
		Adenocarcinoma	1.00	2.3(1.3-4.3)	3.3(1.7-6.5)	1.8(0.9-3.5)
		Large cell	1.00	0.8(0.3-2.0)	1.4(0.5-4.2)	0.6(0.2-1.8)
BENHAM[c]	Male	Kreyberg I	1.00	1.28(0.99-1.66)	1.32(0.95-1.81)	1.22(0.83-1.79)
ENGELA[d]	Male	All types	1.00	1.06(0.79-1.43)	0.63(0.38-1.05)	1.20(0.88-1.63)
		Squamous cell	1.00	1.91(1.00-3.64)	1.2(0.5-2.8)	2.1(1.1-4.1)
		Small cell	1.00	0.73(0.32-1.67)	0.3(0.1-1.3)	1.0(0.4-2.2)
		Adenocarcinoma	1.00	0.43(0.18-1.00)	0.3(0.1-1.2)	0.5(0.2-1.2)

Notes

[a] See Table 7.1 for further details of studies.

[b] From De Stefani et al (1994), adjusted for age, residence, education, pack years and black/blond.

[c] From Benhamou et al (1985), adjusted for cigs/day, duration, inhalation, social class, black/blond, current/ex and filter/plain, but not age.

[d] From Engeland et al (1996), adjusted for age only.

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TABLE 8.1

Relative risk (95% CI) of lung cancer for smokers of black(dark) cigarettes compared to smokers of blond (light) cigarettes (current + former smokers[a], all cell types)

Study details	Adjustment factors Number of cases	Sex	Relative risk (95% CI) Blond only (base)	Ever black	Mixed black/ blond	Black only
MATOS (Matos et al, 1998)						
Argentina Buenos-Aires Case-control 1994-1996	Adjusted for age. hospital, cigs/day 187M cases	Male	1.00	1.31(0.85-2.02)	1.33(0.84-2.11)	1.25(0.71-2.50)
		[Current smokers]	1.00	1.29(0.76-2.19)	1.32(0.73-2.38)	1.25(0.56-2.50)
		[Ex-smokers]	1.00	1.76(0.96-3.25)	1.82(0.92-3.59)	1.67(0.67-3.33)
PEZZOT (Pezzotto et al, 1993)						
Argentina Rosario Case-control 1987-1991	Adjusted for age, hospital, cigs/day, years of smoking 211M cases	Male	1.00	1.70(1.19-2.43)	-	-
SUZUKI (Suzuki et al, 1994)						
Brazil Rio de Janeiro Case-control 1991-1992	Adjusted for age, sex, race, pack-years 112M+F cases	Combined	1.00	2.8(1.0-7.7)	-	-
		[Adj. for age, sex, race only]	1.00	3.7(1.6-8.6)	-	-
JOLY (Joly et al, 1983)						
Cuba Havana Case-control 1978-1980	Unadjusted 552M+165F cases	Male	1.00	1.25(0.56-2.78)	1.09(0.38-3.16)	1.26(0.57-2.79)
		Female	1.00	1.73(0.85-3.53)	1.12(0.43-2.90)	1.88(0.92-3.86)
DESTEF1 (De Stefani et al, 1996a)						
Uruguay Montevideo Case-control 1988-1994	Adjusted for age, residence, urban/rural status, education 470M cases	Male	1.00	1.89(1.41-2.52)	2.23(1.43-3.47)	1.79(1.31-2.43)

TABLE 8.1 (Continued)

Study details	Adjustment factors Number of cases	Sex	Relative risk (95% CI) Blond only (base)	Ever black	Mixed black/ blond	Black only
DESTEF2 (De Stefani et al, 1996b)						
Uruguay Montevideo Case-control 1993-1996	Adjusted for age, residence, urban/ rural status, education, BMI, family history LC 300M cases	Male	1.00	2.38(1.62-3.52)[b]	-	-
BENHAM (Benhamou et al, 1994)						
France Paris[c] Case-control 1976-1980	Adjusted for age, cigs/day, duration, inhalation, current/ ex, filter/plain, tar 1114M cases	Male [Adj. for age only]	1.00 1.00	1.73(0.92-3.26) 3.41(2.00-5.81)	2.6(1.1-6.5) 4.4(1.9-10.3)	1.7(0.9-3.2) 3.4(2.0-5.8)
BENHAM (Benhamou et al, 1987)						
France Paris[c] Case-control 1976-1980	Adjusted for age, hospital, interviewer 46F cases	Female	1.00[d]	2.04(0.75-5.57)	1.66(0.31-8.84)[d]	2.13(0.75-6.01)
BERRIN (Benhamou and Benhamou, 1993)						
Italy Milan Case-control 1977-1980	Adjusted for age, residence, cigs/ day, filter/plain, years since quit 1101M cases	Male	1.00	1.30(0.98-1.73)	1.15(0.86-1.53)	1.60(1.19-2.15)

TABLE 8.1 (Continued 2)

Study details	Adjustment factors Number of cases	Sex	Relative risk (95% CI) Blond only (base)	Ever black	Mixed black/ blond	Black only
AGUDO (Agudo et al, 1994)						
Spain Barcelona Case-control 1989-1992	Adjusted for age, residence, hospital 23 F cases	Female	1.00	2.63(0.56-12.30)	-	-
ARMADA (Armada et al, 1999)						
Spain Barcelona Case-control 1986-1990	Adjusted for age, pack-years	Male	1.00	-	4.9(1.7-13.7)	5.3(2.1-13.6)
	Adjusted for age, SES, duration, cigs/day, filter/plain	Male	1.00	4.68(1.9-11.8)	-	
	[Adjusted for age, SES, pack-years filter/plain only] 317 M cases	Male	1.00	5.04(2.0-12.7)	-	-

Notes

[a] Except where stated.

[b] The comparison was between "blond" and "black" with no indication of whether this was actually blond only vs. ever black or ever blond vs. black only.

[c] Conducted in 16 hospitals, 13 in Paris.

[d] The reference group (base) is ≤50% dark tobacco, with 51-100% dark taken as ever black and 51-99% dark taken as mixed in the table.

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TABLE 8.2

Meta-analyses for black (dark) vs blond (light)

Sex	Blond only (base)		Meta-analysis relative risk (95% CI) Ever black	Mixed black/blond	Black only
Male	1.00	Fixed-effects	1.69 (1.46-1.94)	1.49 (1.22-1.81)	1.69 (1.41-2.04)
		Random-effects	1.73 (1.39-2.14)	1.72 (1.17-2.54)	1.71 (1.33-2.20)
			(n = 8)	(n = 6)	(n = 6)
Female	1.00	Fixed-effects	1.91 (1.11-3.29)	1.23 (0.54-2.83)	1.96 (1.08-3.53)
		Random-effects	1.91 (1.11-3.29)	1.23 (0.54-2.83)	1.96 (1.08-3.53)
			(n = 3)	(n = 2)	(n = 2)
All estimates	1.00	Fixed-effects	1.71 (1.50-1.96)	1.47 (1.21-1.79)	1.72 (1.44-2.05)
		Random-effects	1.75 (1.47-2.09)	1.63 (1.18-2.27)	1.72 (1.42-2.09)
			(n = 12)	(n = 8)	(n = 8)

Notes
n indicates number of estimates on which meta-analysis is based. Based on data in Table 8.1.

TABLE 8.3

Relative risk (95% CI) of lung cancer for ever smokers of black (dark) cigarettes compared to smokers of blond (light) cigarettes only - by histological type[a]

Study	Sex	All types	Squamous carcinoma	Adenocarcinoma	Small cell
MATOS	Male	1.31 (0.85-2.02)	2.67 (1.35-5.30)	1.63 (0.93-2.86)	-
PEZZOT	Male	1.70 (1.19-2.43)	1.30 (0.73-2.31)	2.00 (1.03-3.90)	1.50 (0.63-3.58)
DESTEF1[b]	Male	2.12 (1.29-3.46)[c]	2.75 (1.46-5.18)	1.75 (0.76-4.07)	2.03 (0.67-6.08)
DESTEF2[d]	Male	1.78 (1.15-2.76)	1.77 (0.96-3.26)	1.20 (0.54-2.63)	-
BENHAM[e]	Male	-	3.63 (2.05-6.42)[f]	-	-
4 studies (excluding BENHAM)	Fixed-effects Random-effects	1.68 (1.36-2.08) 1.68 (1.36-2.08)	1.96 (1.44-2.67) 1.98 (1.38-2.82)	1.64 (1.17-2.32) 1.64 (1.17-2.32)	-

Notes

[a] See Table 8.1 for references, details of studies and adjustment factors used except where stated.

[b] From De Stefani et al (1992). Adjusted for age, residence, urban/rural, education, cigs/day, duration, years since quit, filter/plain.

[c] All cases with histology. 2.73 (0.82-9.12) for other types of lung cancer.

[d] From De Stefani et al (1996c), for men never exposed to asbestos.

[e] From Benhamou et al (1985).

[f] Results only given for Kreyberg I.

TABLE 9.1

Relative risk (95% CI) of lung cancer in mentholated vs non-mentholated cigarette smokers

Study details	Population considered, adjustment factors and number of cases[a]	Sex and lung cancer type[b]	Relative risks (95% CI)			
AHF2 (Kabat and Hebert, 1991)				Duration of menthol use		
			< 1 yr (base)	1-14 yrs	15+ yrs	
USA Multicentre Case-control 1985-1990	Current cigarette smokers[c]	Men	1.00	1.14(0.82-1.59)	0.98(0.70-1.38)	
		Women	1.00	0.82(0.52-1.28)	0.76(0.53-1.16)	
	Adjusted for sex, age, cigs/day, duration, race, education, inhalation, and BMI	Sexes combined				
		- squamous cell	1.00	1.17(0.78-1.78)	0.92(0.60-1.42)	
		- small cell	1.00	0.80(0.43-1.48)	0.86(0.49-1.51)	
		- large cell	1.00	1.99(0.73-5.41)	0.84(0.27-2.61)	
		- adenocarcinoma	1.00	0.98(0.68-1.42)	0.95(0.66-1.36)	
	588M + 456F cases					
SIDNEY (Sidney et al, 1995)				Menthol use		
			No (base)	Yes		
USA California Prospective 1979-1985 followed to 1991	Current cigarette smokers for 20+ years	Men	1.00	1.45(1.03-2.02)		
		Women	1.00	0.75(0.51-1.11)		
	Adjusted for age, race, cigs/day, duration and education			Duration of menthol use		
			0 (base)	1-9 yrs	10-19 yrs	20+ yrs
		Men	1.00	1.10(0.65-1.87)	1.32(0.84-2.08) (Trend p=0.02)[d]	1.59(0.96-2.63)
	160M + 138F cases					
		Women	1.00	0.72(0.38-1.39)	1.01(0.61-1.69)	0.70(0.40-1.23)
CARPEN (Carpenter et al, 1999)				Menthol use		
			None (base)	Mixed	Exclusive	
USA California Case-control 1991-1994	Ever smoked cigarettes	Sexes combined	1.00	1.01(0.71-1.42)	1.04(0.62-1.75)	
	Adjusted for age, race, total pack years, years since quit			Pack-years of menthol		
			0 (base)	> 0-15	16-31	32+
		Men	1.00	0.87(0.57-1.37)	1.21(0.56-2.62)	1.48(0.71-3.05)
		Women	1.00	1.58(0.77-3.22)	0.51(0.19-1.34)	0.41(0.15-1.11)
	202M + 135F cases					

TABLE 9.1 (Continued)

Notes
[a] Numbers of cases are those considered in the analyses.
[b] All lung cancer types unless stated.
[c] Current smokers defined as smokers in year preceding diagnosis.
[d] Only statistically significant trends are indicated.

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TABLE 9.2

Mentholated cigarettes - meta-analysis of results for regular use

		Relative risk (95% CI)	
Study	Comparison[a]	Men	Women
AHF2	15+ vs. < 1 yrs menthol use	0.98(0.70-1.38)	0.76(0.53-1.16)
SIDNEY	20+ vs. 0 yrs menthol use	1.59(0.96-2.63)	0.70(0.40-1.23)
CARPEN	32+ vs. 0 pack-years of menthol	1.48(0.71-3.05)	0.41(0.15-1.11)
Combined	Fixed-effects	1.18(0.91-1.53)	0.70(0.52-0.95)
	Random-effects	1.23(0.88-1.72)	0.70(0.52-0.95)

Notes

[a] See Table 9.1 for details of adjustment factors and other study details.

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TABLE 9.3

Relative risk (95% CI) of lung cancer by nicotine level of brand smoked

Study details	Population considered, adjustment factors and number of cases[a]	Sex	Relative risk (95% CI)		
MRFIT (Kuller et al, 1991)			Nicotine level (mg)[b]		
USA Multicentre Prospective 1973-1976 Followed to 1985	Cigarette smokers at screen 1 Adjusted for age, serum cholesterol, diastolic blood pressure and cigarettes/day 95M cases		1.5+ (base)	1.1-1.4	≤1.0
		Male	1.00	0.66 (0.42-1.04)	0.68 (0.40-1.17)
			Per mg nicotine[c]		
		Male	1.51 (0.74-3.09)		
MRFIT (Ockene et al, 1990)			Per mg nicotine[c]		
As above	As above but adjusted also for tar yield, filter/non-filter, age at start, alcohol and serum thiocyanate	Male	6.75 (0.49-94.2)		

Notes
[a] Number of cases considered in analyses.
[b] RR and CI converted from values given with ≤1.0 mg as base.
[c] Estimated from regression coefficients and standard errors.

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TABLE 9.4

Relative risk (95% CI) of lung cancer in bidi vs. cigarette smokers

Study details	Population considered, adjustment factors and number of cases	Sex - cigs/day, duration, religion	Relative risk (95% CI)		
NOTANI (Notani et al, 1977)				Product smoked	
India Bombay Case-control 1963-1971	Smokers of bidis or cigarettes	Male -	Cigs only (base)	Mixed	Bidis only
	Unadjusted for any variables except where stated	Total (unadjusted)	1.00	0.70 (0.43-1.13)	1.38 (1.01-1.88)
		<10/day	1.00		3.76 (1.53-9.23)
		10-19/day	1.00		1.15 (0.68-1.94)
		20+/day	1.00		1.07 (0.67-1.70)
	549 M cases	Total (adjusted for cigs/day)	1.00		1.38 (1.01-1.88)
JUSSAW (Jussawalla and Jain, 1979)				Product smoked	
India Bombay Case-control 1964-1973	Smokers of bidis or cigarettes	Male -	Cigs only (base)	Mixed	Bidis only
	Unadjusted for any variables except where stated	Total (unadjusted)	1.00	6.72 (2.78-16.2)	3.24 (2.25-4.68)
		<10/day	1.00		5.00 (2.19-11.4)
		10-19/day	1.00		3.54 (2.08-6.04)
		20+/day	1.00		2.68 (1.17-6.14)
	643 M cases	Total (adjusted for cigs/day)	1.00		3.60 (2.43-5.34)
		<20 years	1.00		2.19 (1.30-3.70)
		20-29 years	1.00		5.03 (2.49-1.02)
		30+ years	1.00		4.14 (1.84-9.33)
		Total (adjusted for duration)	1.00		3.17 (2.18-4.61)
		Hindus	1.00	7.86 (1.76-35.2)	2.81 (1.64-4.81)
		Muslims	1.00	5.43 (1.15-25.7)	1.97 (0.94-4.14)
		Christians	1.00	5.33 (1.10-26.0)[a]	6.26 (2.39-16.4)
		Others	1.00		1.71 (0.26-11.4)
		Total (adjusted for religion)	1.00	6.15 (2.52-15.0)	2.84 (1.93-42.0)

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TABLE 9.5

Relative risk (95% CI) of lung cancer in smokers of brands local and not local to Okinawa

Study details	Population considered, adjustment factors and numbers of cases	Sex - lung cancer type	Relative risk (95% CI)	
WAKAI (Wakai et al, 1977)			Brand smoked	
			Not local (base)	Local
Japan Okinawa Case-control 1988-1991	Current and ex-smokers of cigarettes Adjusted for age, cigs/day, duration inhalation, age at start, fraction smoked per cig, years since quit and filter/plain 235M	Male - all - squamous cell carcinoma - adenocarcinoma	 1.00 1.00 1.00	 1.45(1.02-2.07) 1.75(1.10-1.78) 1.35(0.83-2.17)

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TABLE 9.6

Relative risk (95% CI) of lung cancer in pilli[a] vs. pölli smokers[b]

Study details	Population considered, adjustment factors and number of cases	Sex	Relative risks (95% CI)	
PERNU (Pernu, 1960)			Type of cigarette	
			Pölli (base)	Pilli
Finland	Current or ex-smokers for 10+			
Helsinki	years	Male	1.00	0.96 (0.76-1.23)
Case-control		Female	1.00	0.39 (0.13-1.12)
1944-58	Unadjusted			
	1138M + 17F cases			

Notes

[a] Pillis have an attached “holder” made of cardboard, but no actual filter.

[b] Pöllis include short cigarettes smoked with short wooden mouthpiece and cigarettes of American-type.

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TABLE 10.1

Summary of meta-analyses for major cigarette type comparisons

Comparison	Sex/histological type	Number of estimates Total (significant)[a]		Meta analysis relative risk (95% CI)
Filter/plain[b]	Males	28	(13-)	0.58(0.55-0.62)
	Females	14	(5-)	0.67(0.59-0.75)
	Sexes combined	43	(19-)	0.59(0.56-0.63)
	Sexes combined - sq. carcinoma[b]	11	(4-)	0.56(0.50-0.62)
	- adenocarcinoma[c]	8	(2-)	0.84(0.71-1.00)
Low tar/high tar[c]	Males	13	(4-)	0.77(0.69-0.86)
	Females	9	(4-)	0.82(0.70-0.97)
	Sexes combined	22	(8-)	0.79(0.72-0.86)
Ever hand rolled/	Males	10	(4+)	1.43(1.27-1.61)
manuf. cigs only[d]	Females	5	(1+)	1.21(0.87-1.69)
	Sexes combined	15	(5+)	1.41(1.26-1.57)
Ever black/	Males	8	(4+)	1.69(1.46-1.94)
blond only[e]	Females	3	(0)	1.91(1.11-3.29)
	Sexes combined	12	(5+)	1.71(1.50-1.96)
Mentholated/non	Males	3	(0)	1.18(0.91-1.53)
mentholated	Females	3	(0)	0.70(0.52-0.95)
cigarettes[f]	Sexes combined	6	(0)	0.94(0.78-1.15)

Notes

[a] n– implies n decreases significant at $p < 0.05$, n+ indicates significant increases.

[b] Using most extreme groups for comparison where more than two groups being compared.

[c] Lowest vs. highest tar groups from data provided.

[d] See Table 7.2 for meta-analyses for hand rolled only and mixed hand rolled/manufactured.

[e] See Table 8.2 for meta-analyses for black only and mixed black/blond.

[f] Regular menthol vs. no or minimal menthol use.