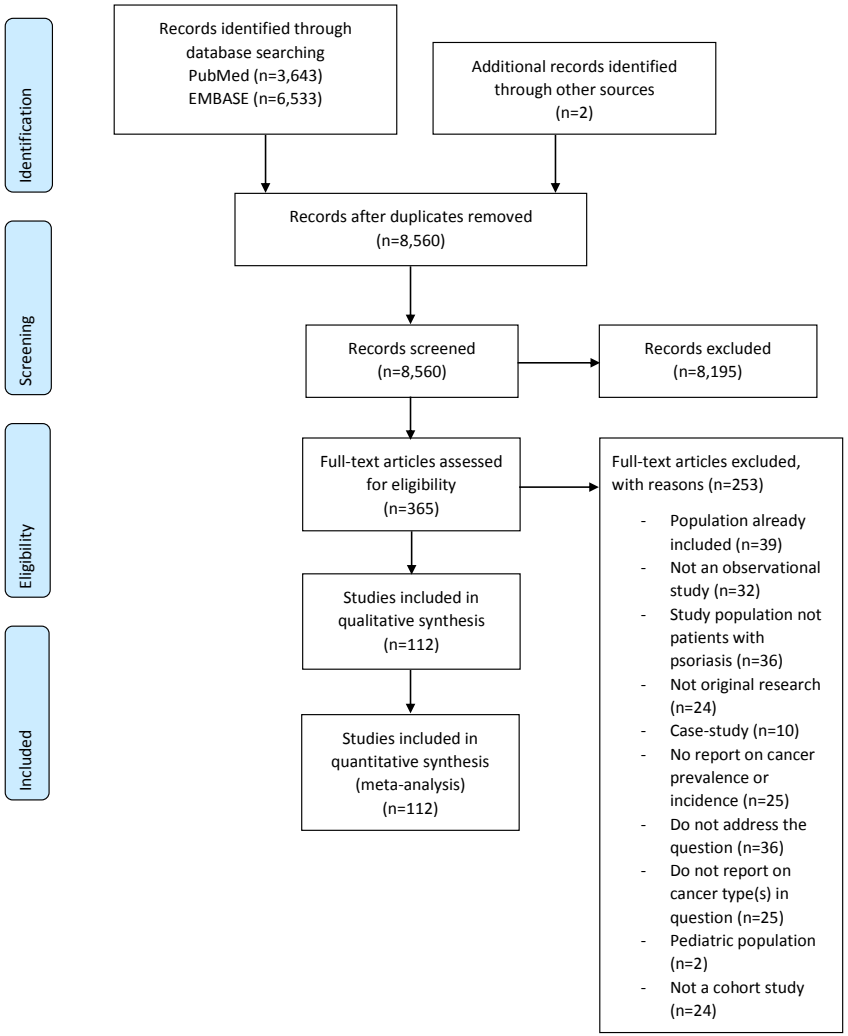
Online Content

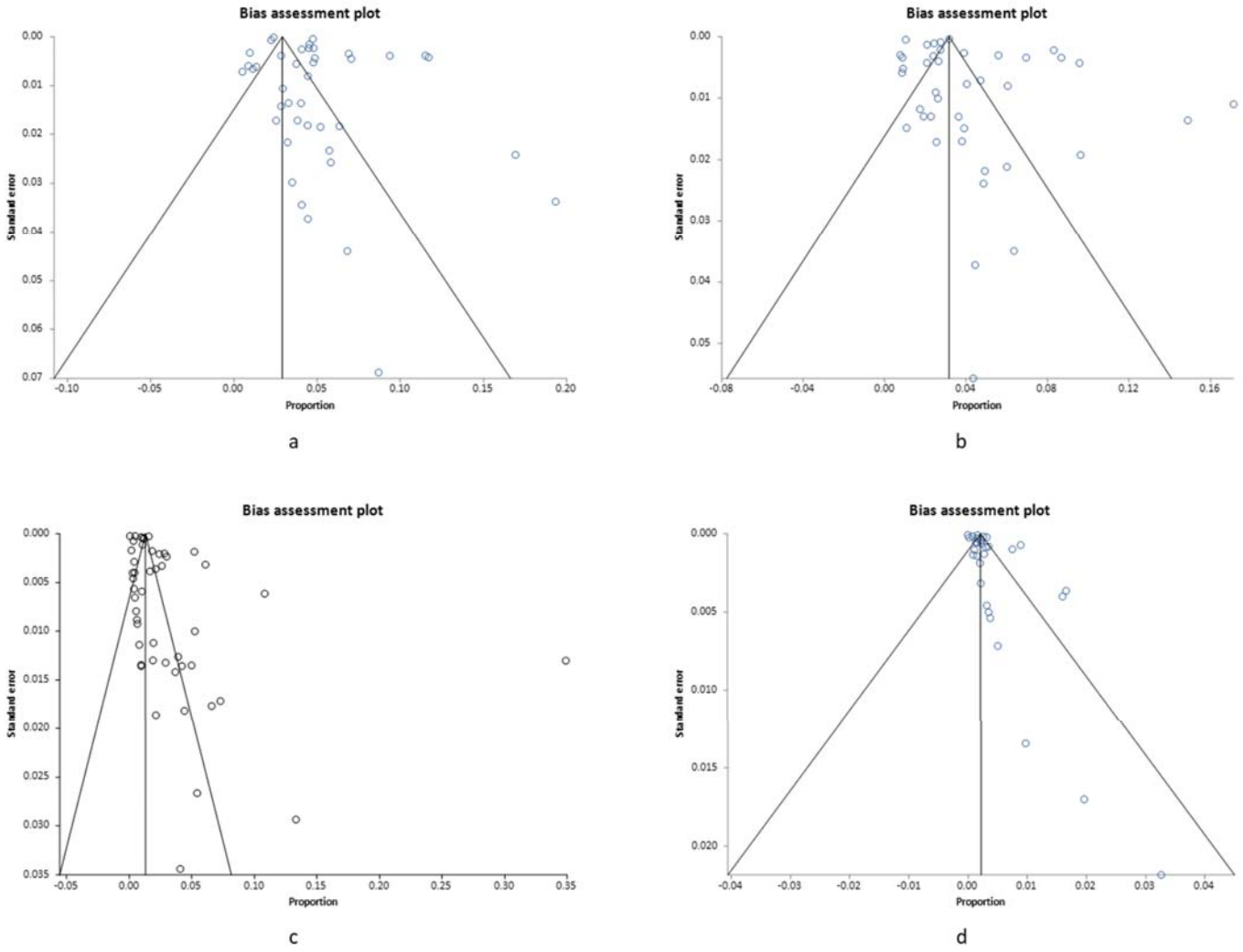
Vaengebjerg S, Skov L, Egeberg A, Loft ND. Prevalence, incidence, and risk of cancer in patients with psoriasis and psoriatic arthritis: a systematic review and meta-analysis. *JAMA Dermatol*. Published online February 19, 2020. doi:10.1001/jamadermatol.2020.0024

This supplementary material has been provided by the authors to give readers additional information about their work.



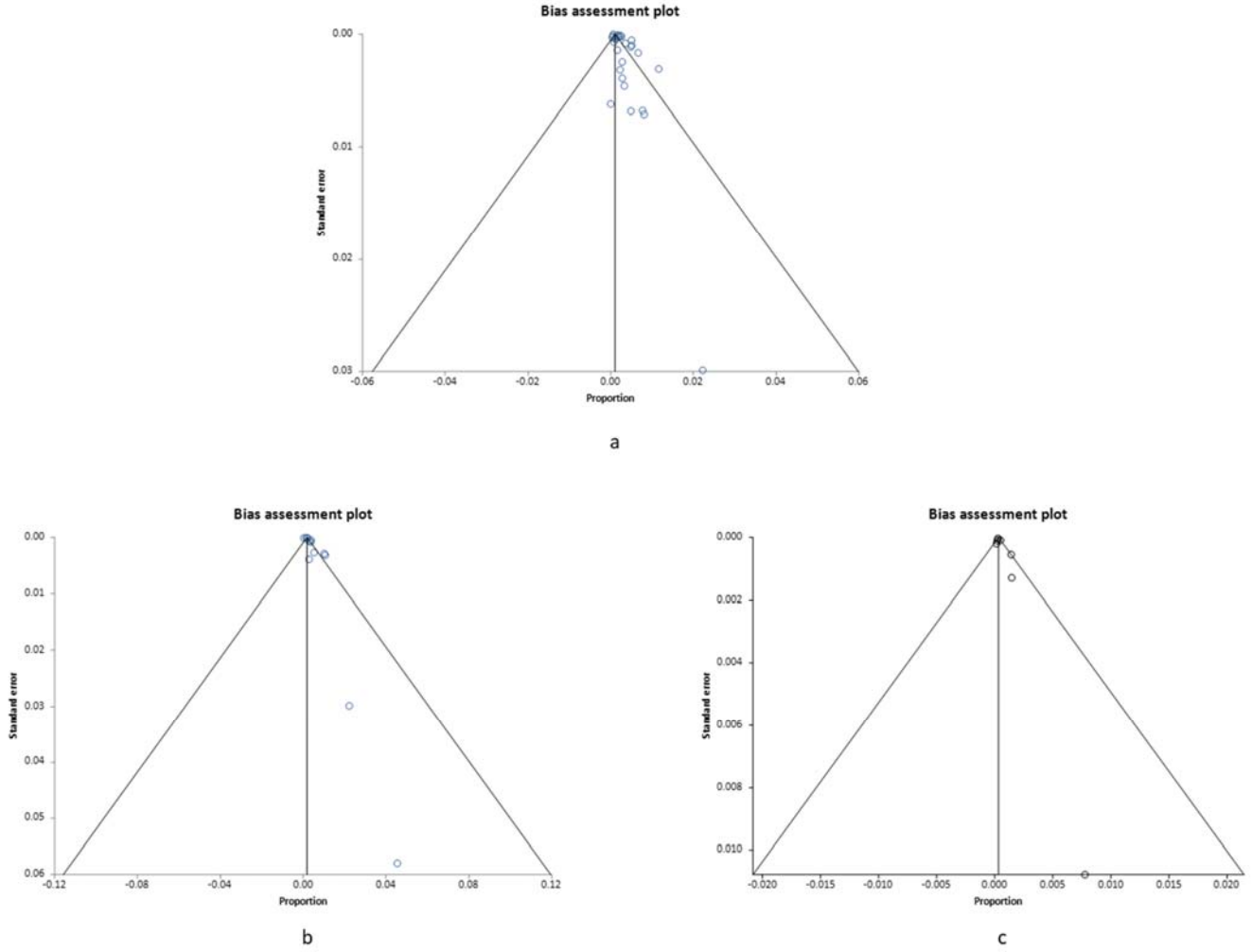
eFigure 1: PRISMA flowchart for selection of included studies.

eFigure 2 – funnel plots for prevalence of cancer and skin cancer



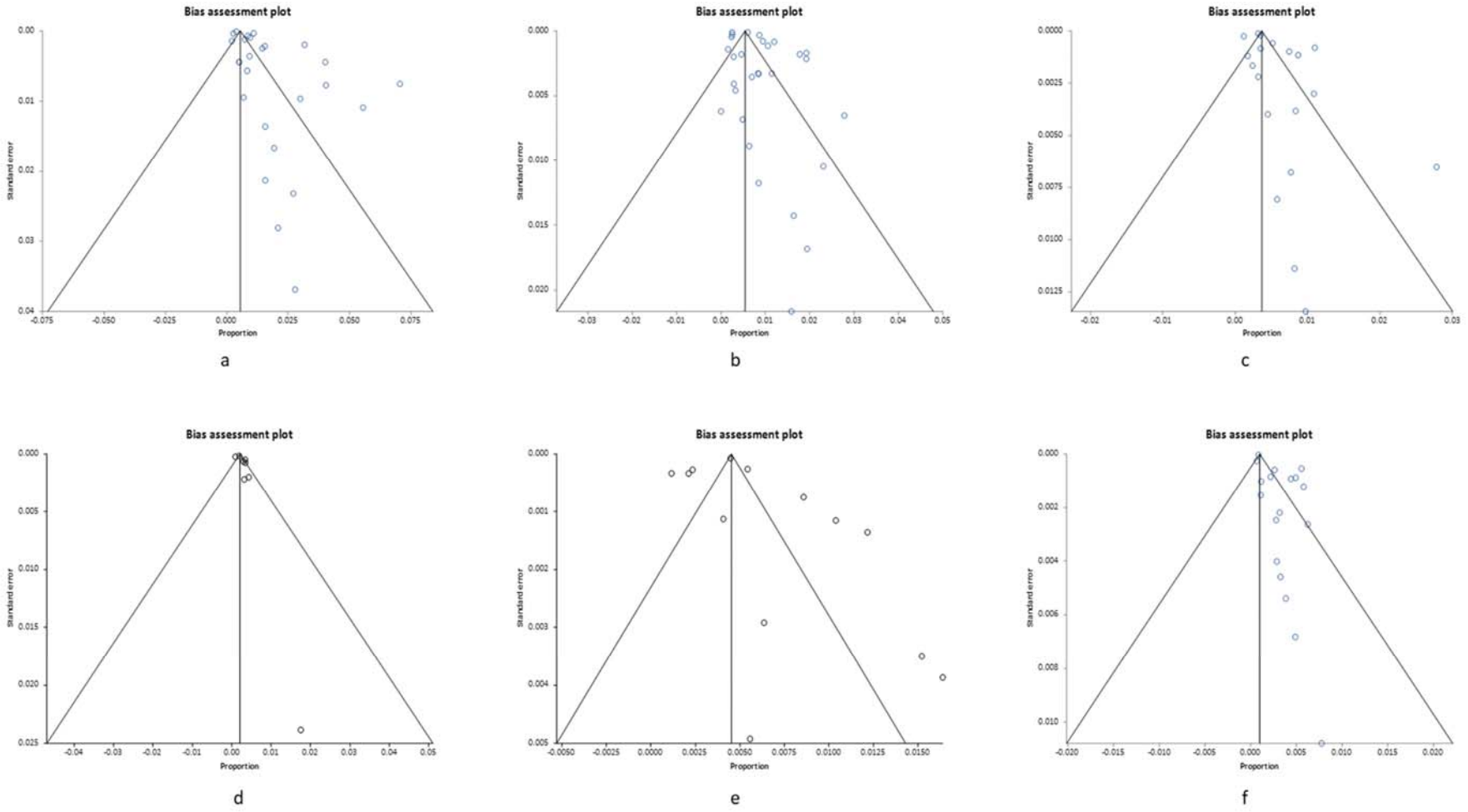
eFigure 2: Funnel plots for prevalence of (a) cancer overall, (b) cancer excluding keratinocyte cancer, (c) keratinocyte cancer, (d) melanoma.

eFigure 3 – funnel plots for prevalence of lymphomas



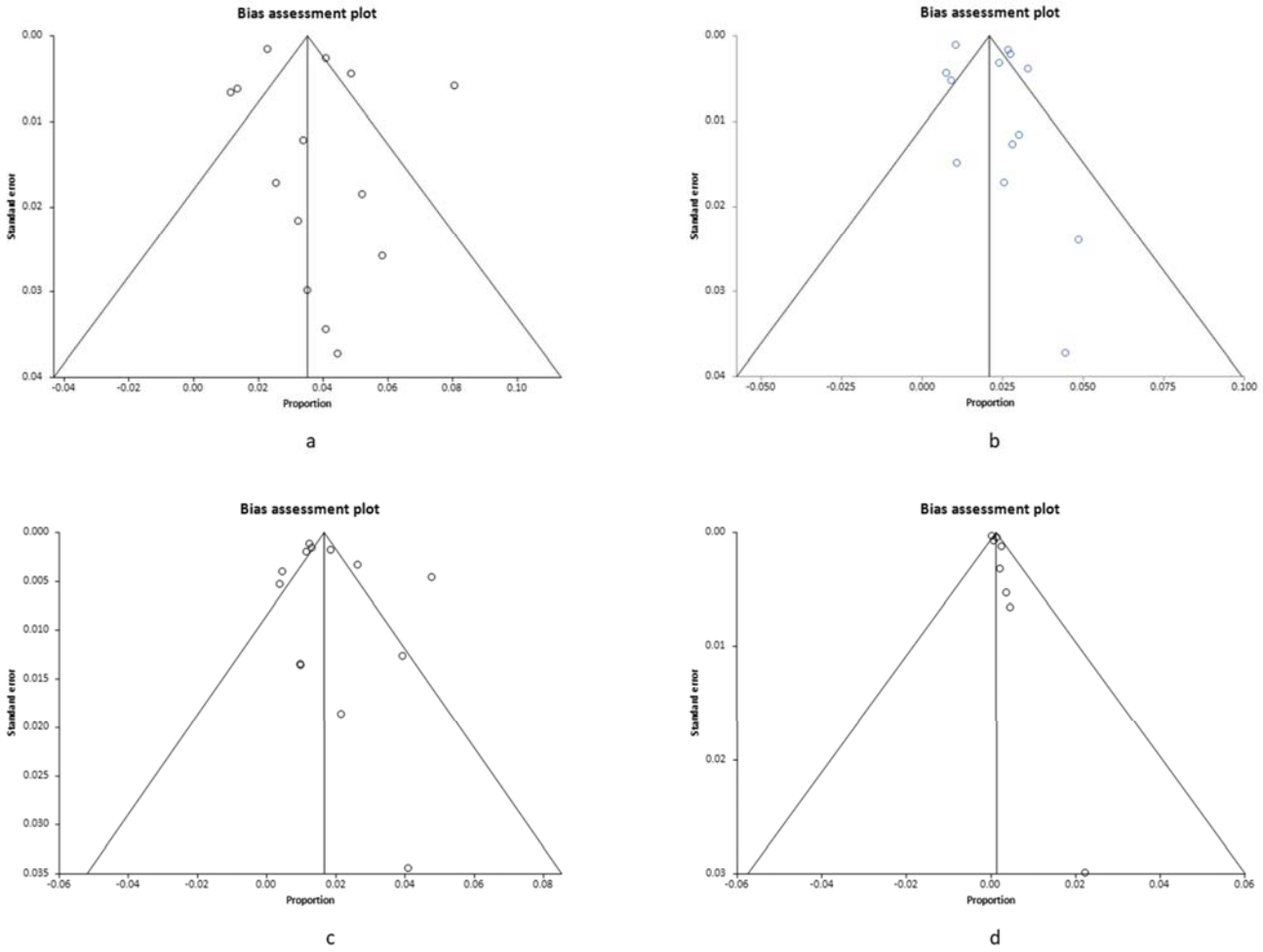
eFigure 3: Funnel plots for prevalence of (a) lymphoma overall, (b) non–Hodgkin's lymphoma, (c) Hodgkin's lymphoma.

eFigure 4 – funnel plots for prevalence of solid cancers



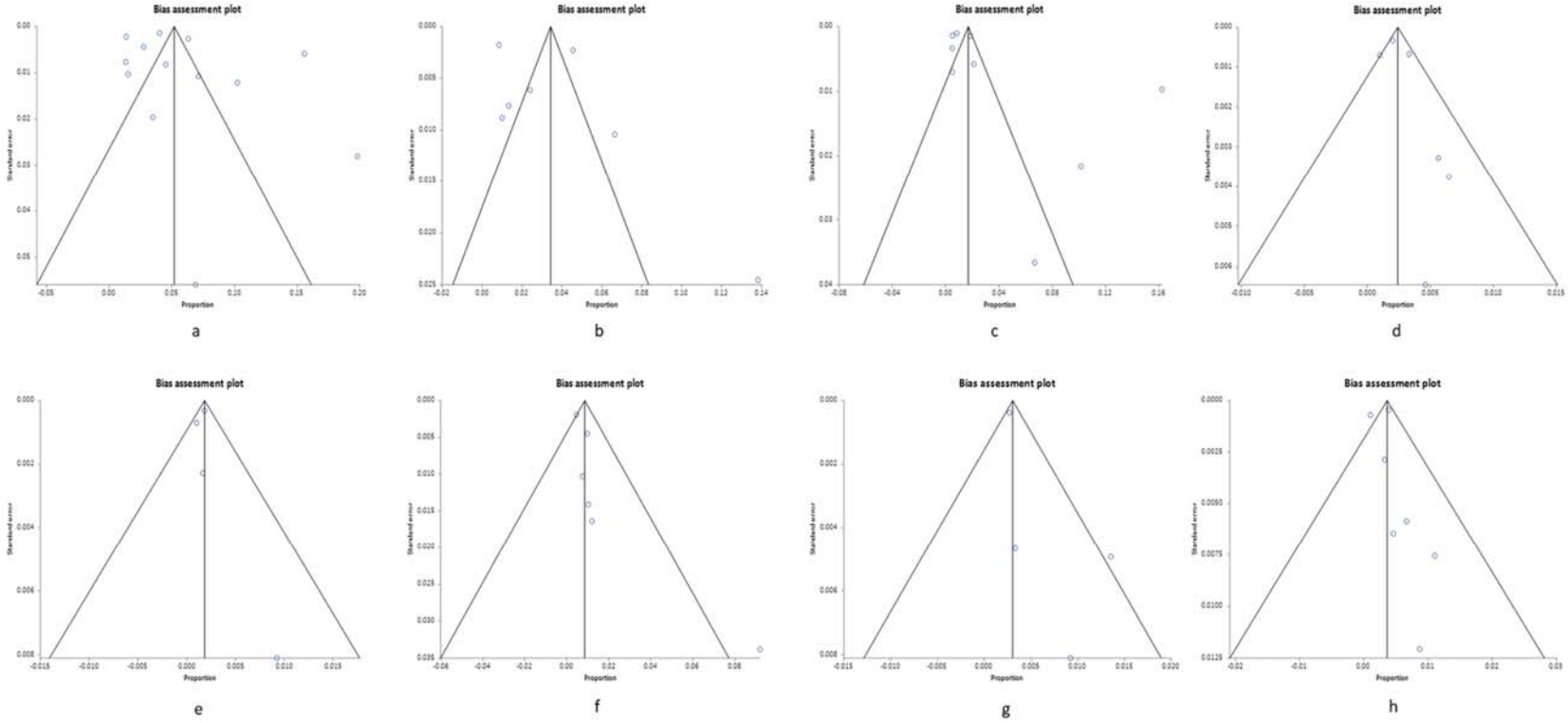
eFigure 4: Funnel plots for prevalence of (a) breast cancer, (b) lung cancer, (c) colon cancer, (d) rectal cancer, (e) colorectal cancer, (f) bladder cancer.

eFigure 5 – funnel plots for prevalence of cancers in patients receiving biological treatment for psoriasis



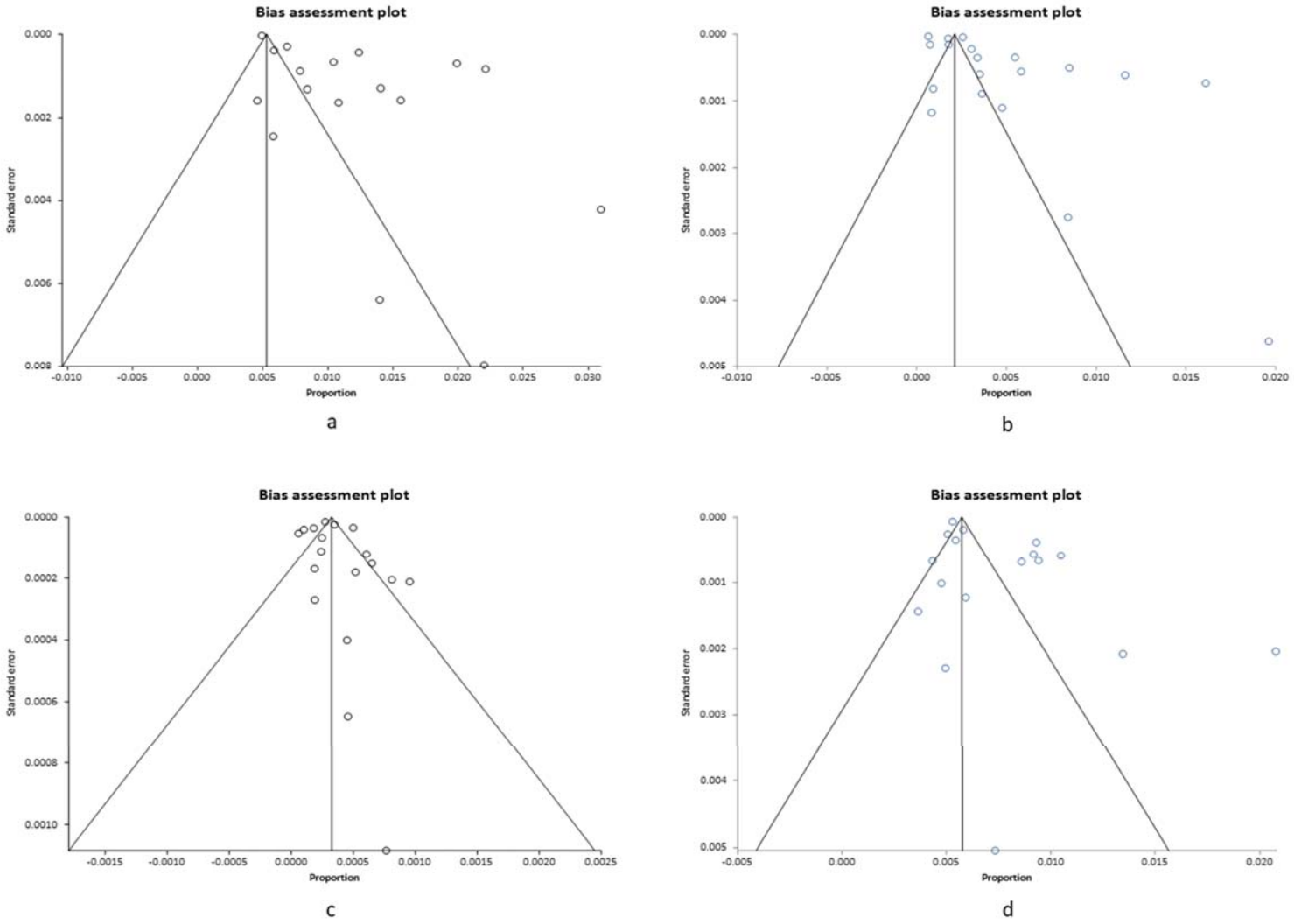
eFigure 5: Funnel plots for prevalence of (a) cancer overall – bio, (b) cancer excluding keratinocyte cancer – bio, (c) keratinocyte cancer – bio (d) lymphoma overall – bio. Bio = Biological treatment.

eFigure 6 – funnel plots for prevalence of cancers in patients with psoriatic arthritis



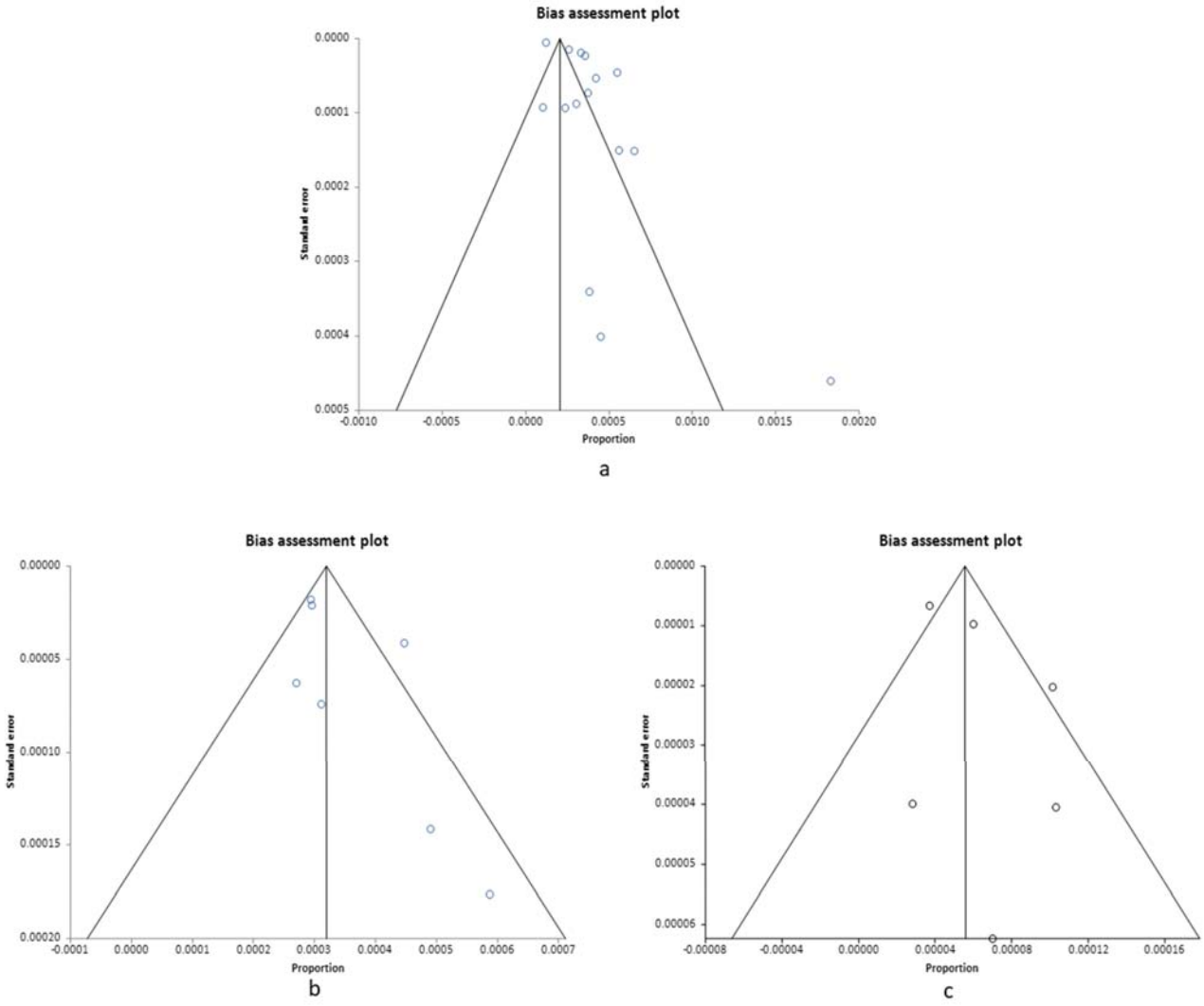
eFigure 6: Funnel plots for prevalence of (a) cancer overall – PsA, (b) cancer minus keratinocyte cancer – PsA, (c) keratinocyte cancer – PsA, (d) melanoma – PsA, (e) lymphoma overall – PsA, (f) breast cancer – PsA, (g) lung cancer – PsA, (h) colorectal cancer – PsA. PsA = Psoriatic arthritis.

eFigure 7 – funnel plots for incidence of cancer and skin cancer



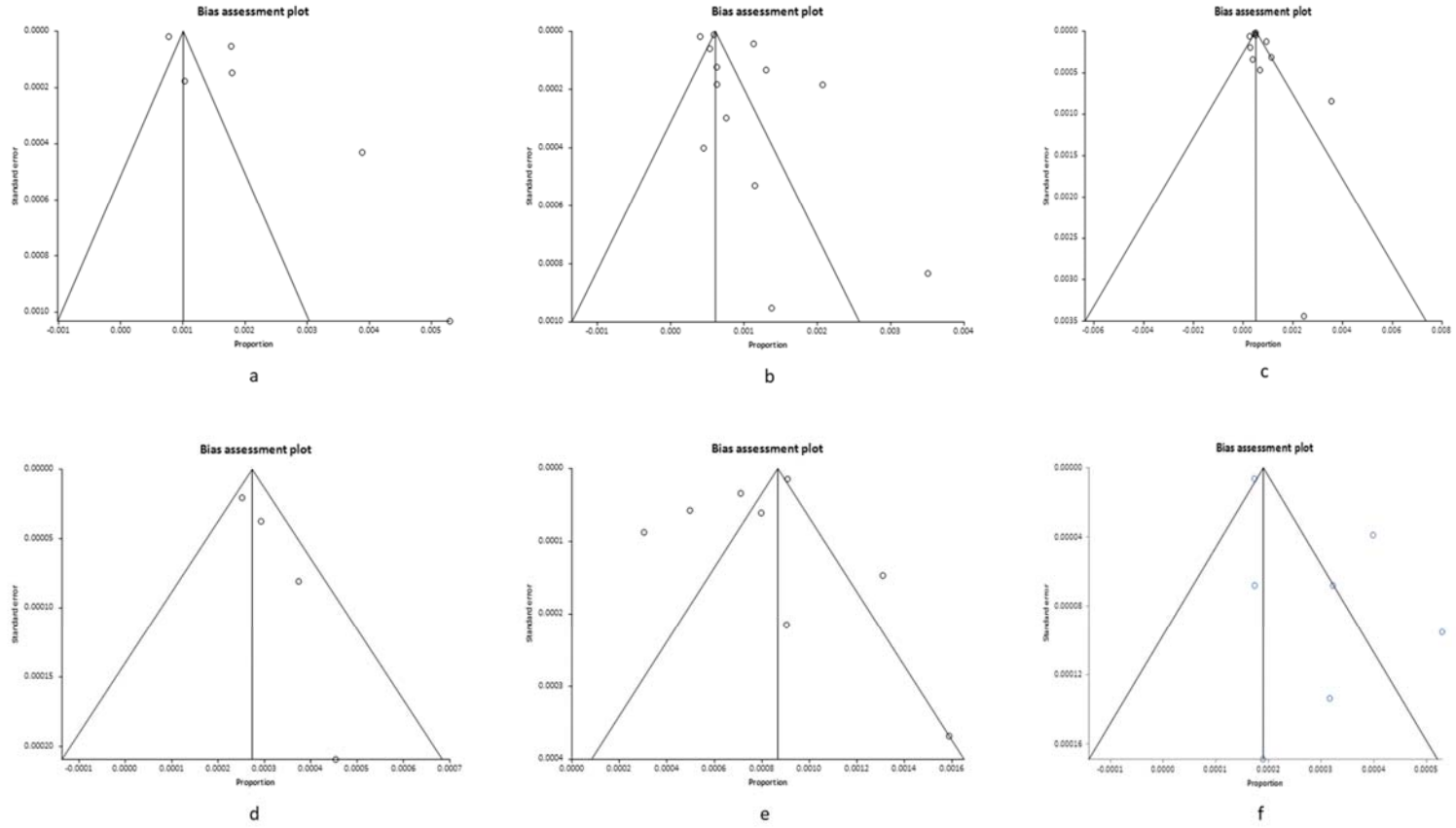
eFigure 7: Funnel plots for incidence of (a) cancer overall, (b) cancer excluding keratinocyte cancer, (c) keratinocyte cancer, (d) melanoma.

eFigure 8 – funnel plots for incidence of lymphomas



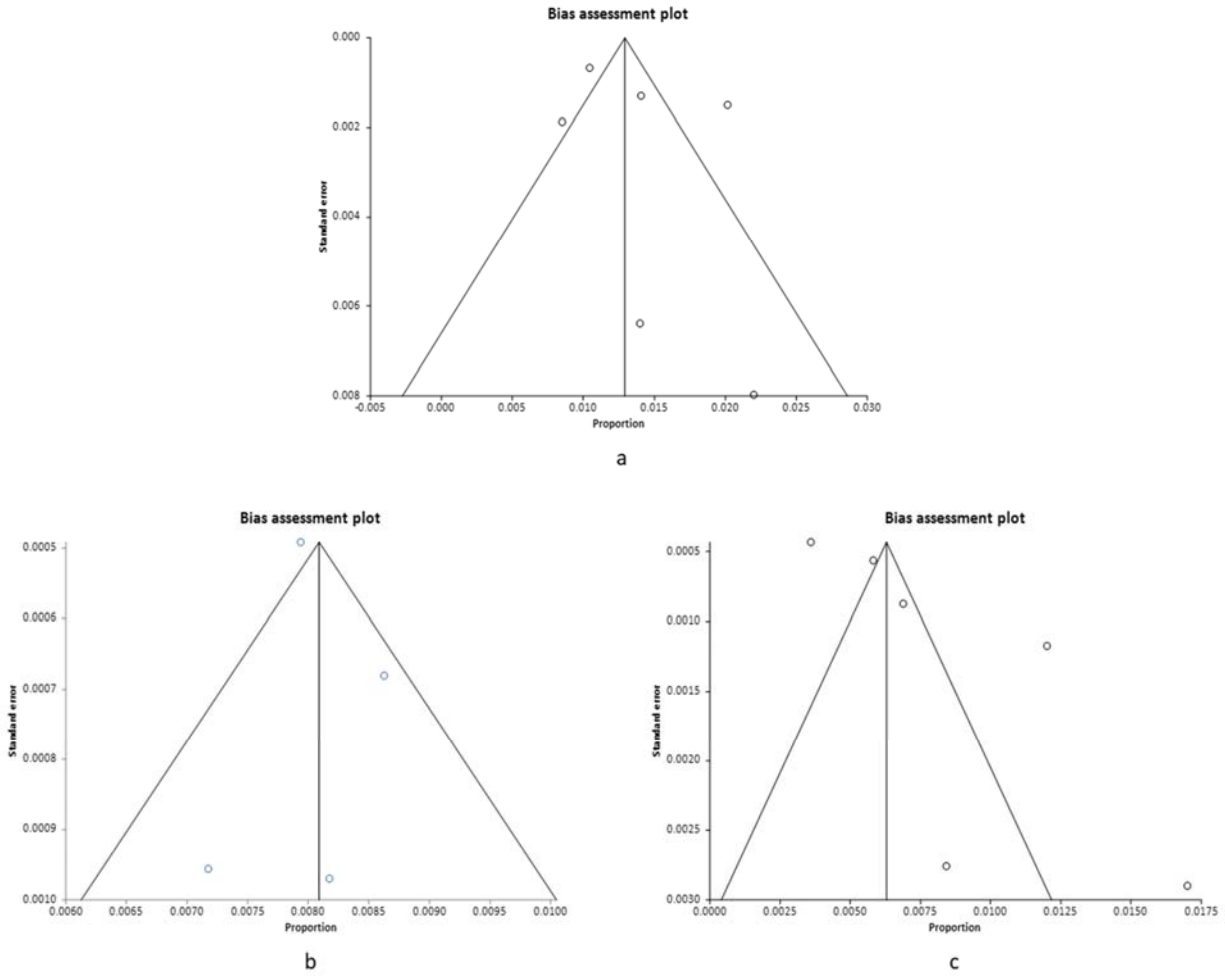
eFigure 8: Funnel plots for incidence of (a) lymphoma overall, (b) non-Hodgkin's lymphoma, (c) Hodgkin's lymphoma.

eFigure 9 – funnel plots for incidence of solid cancers



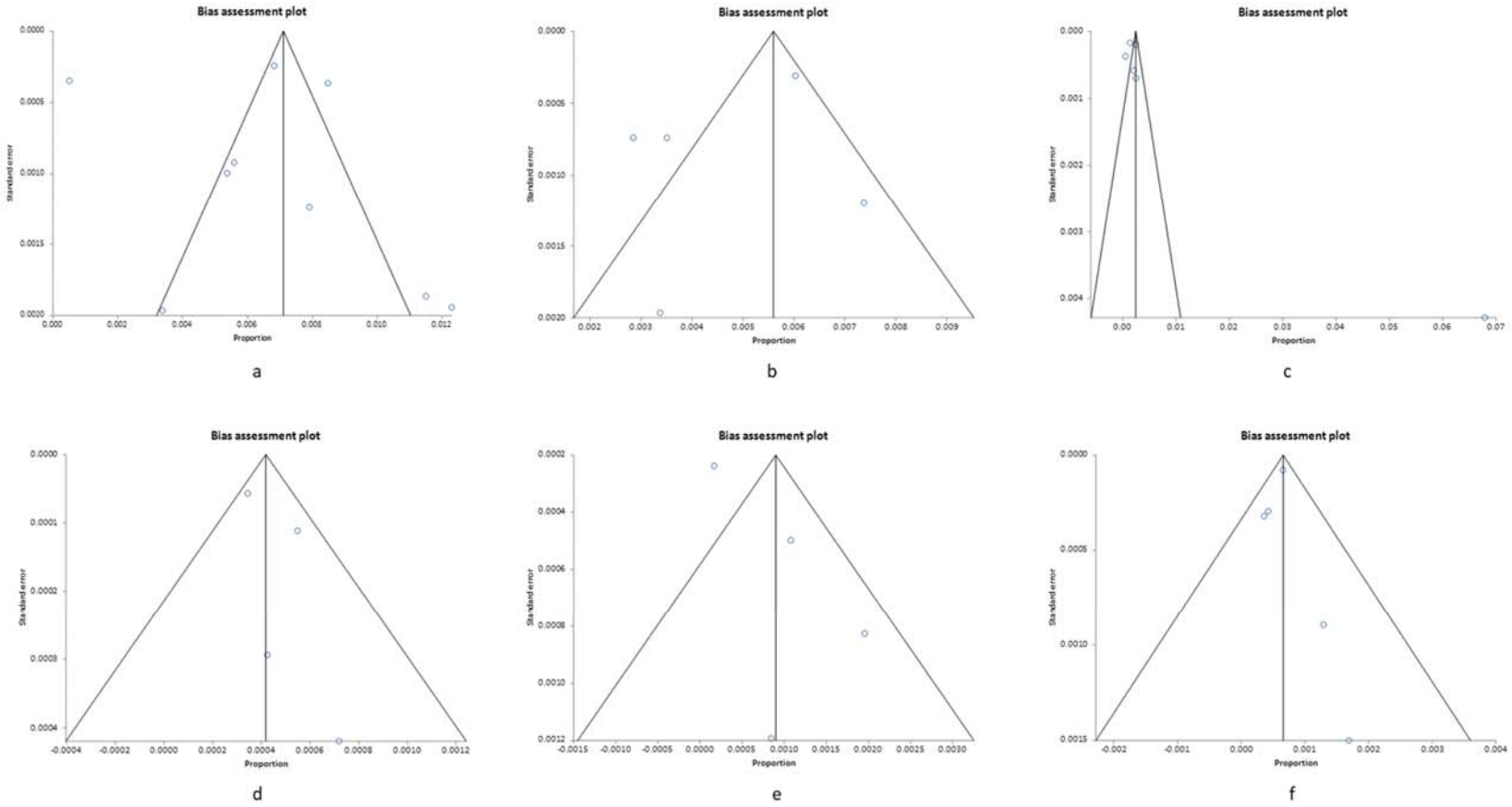
eFigure 9: Funnel plots for incidence of (a) breast cancer, (b) lung cancer, (c) colon cancer, (d) rectal cancer, (e) colorectal cancer, (f) bladder cancer.

eFigure 10 – funnel plots for incidence of cancers in patients receiving biological treatment for psoriasis



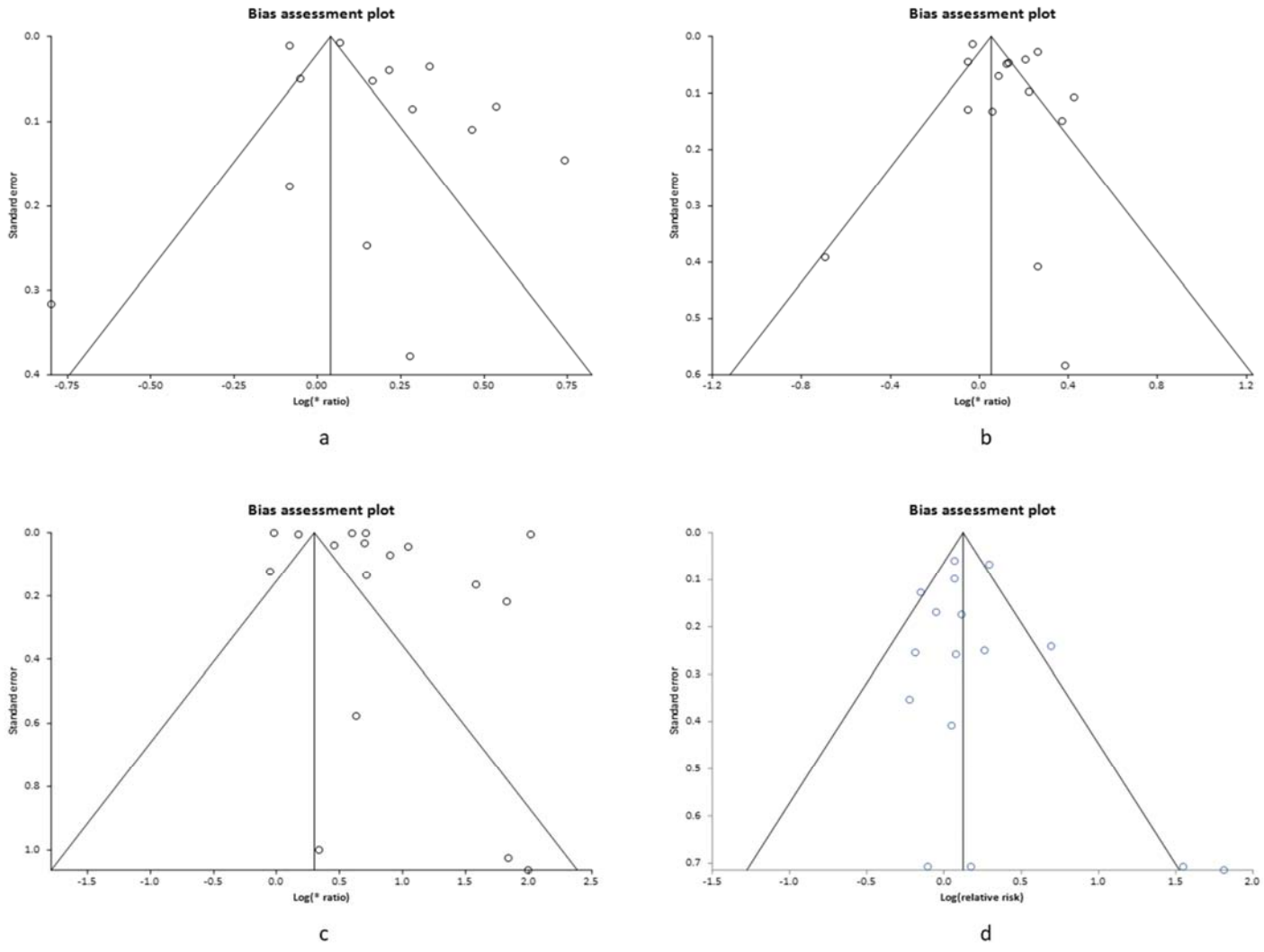
eFigure 10: Funnel plots for incidence of (a) cancer overall – bio, (b) cancer excluding keratinocyte cancer – bio, (c) keratinocyte cancer – bio. No funnel plot is shown for lymphoma overall due to lack of data. Bio = biological treatment.

eFigure 11 – funnel plots for incidence of cancers in patients with psoriatic arthritis



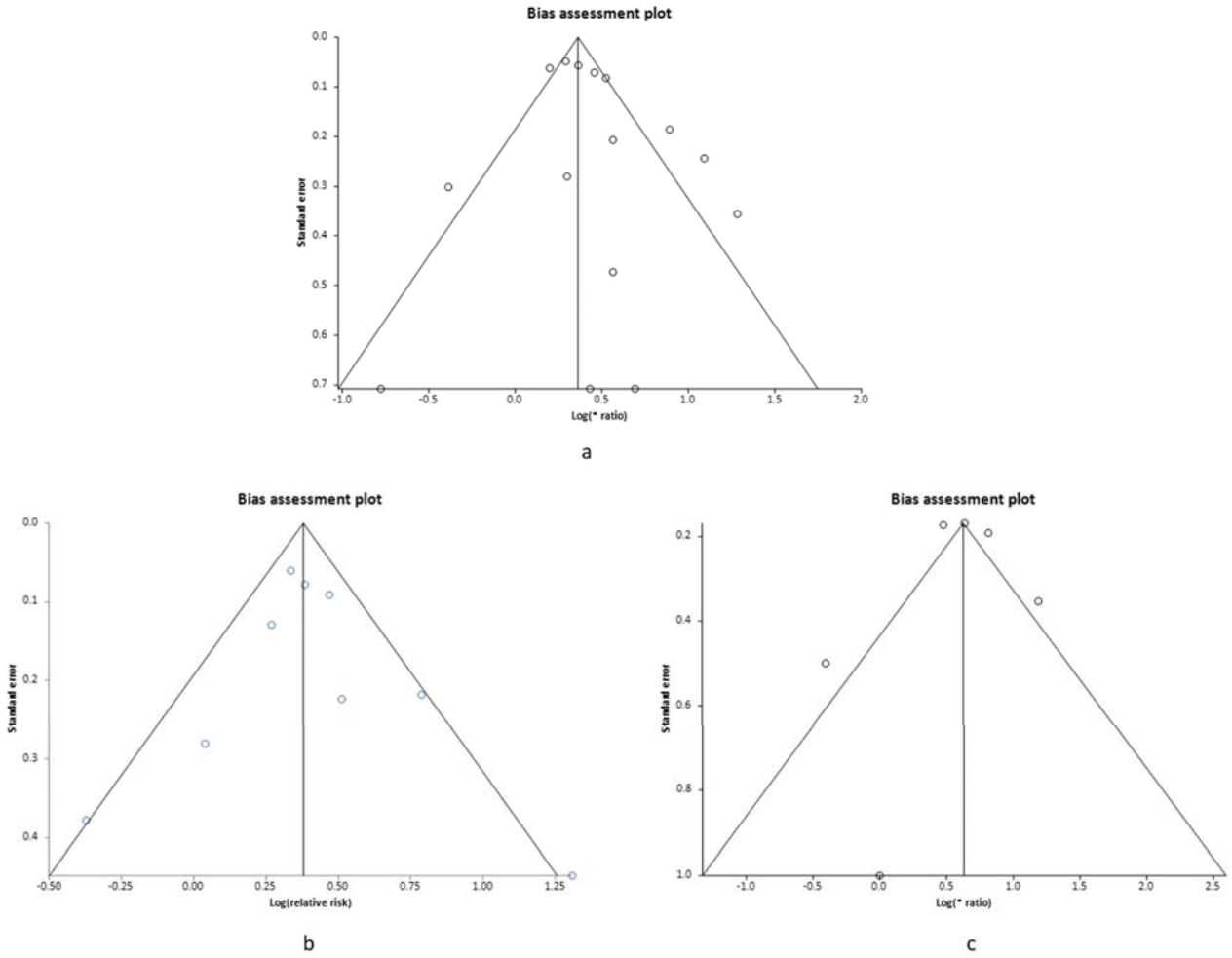
eFigure 11: Funnel plots for incidence of (a) cancer overall – PsA, (b) cancer excluding keratinocyte cancer – PsA, (c) keratinocyte cancer – PsA, (d) melanoma – PsA, (e) breast cancer – PsA, (f) colorectal cancer – PsA. No funnel plots are shown for lymphoma overall or lung cancer due to lack of data. PsA = Psoriatic arthritis.

eFigure 12 – funnel plots for risk ratio of cancer and skin cancer



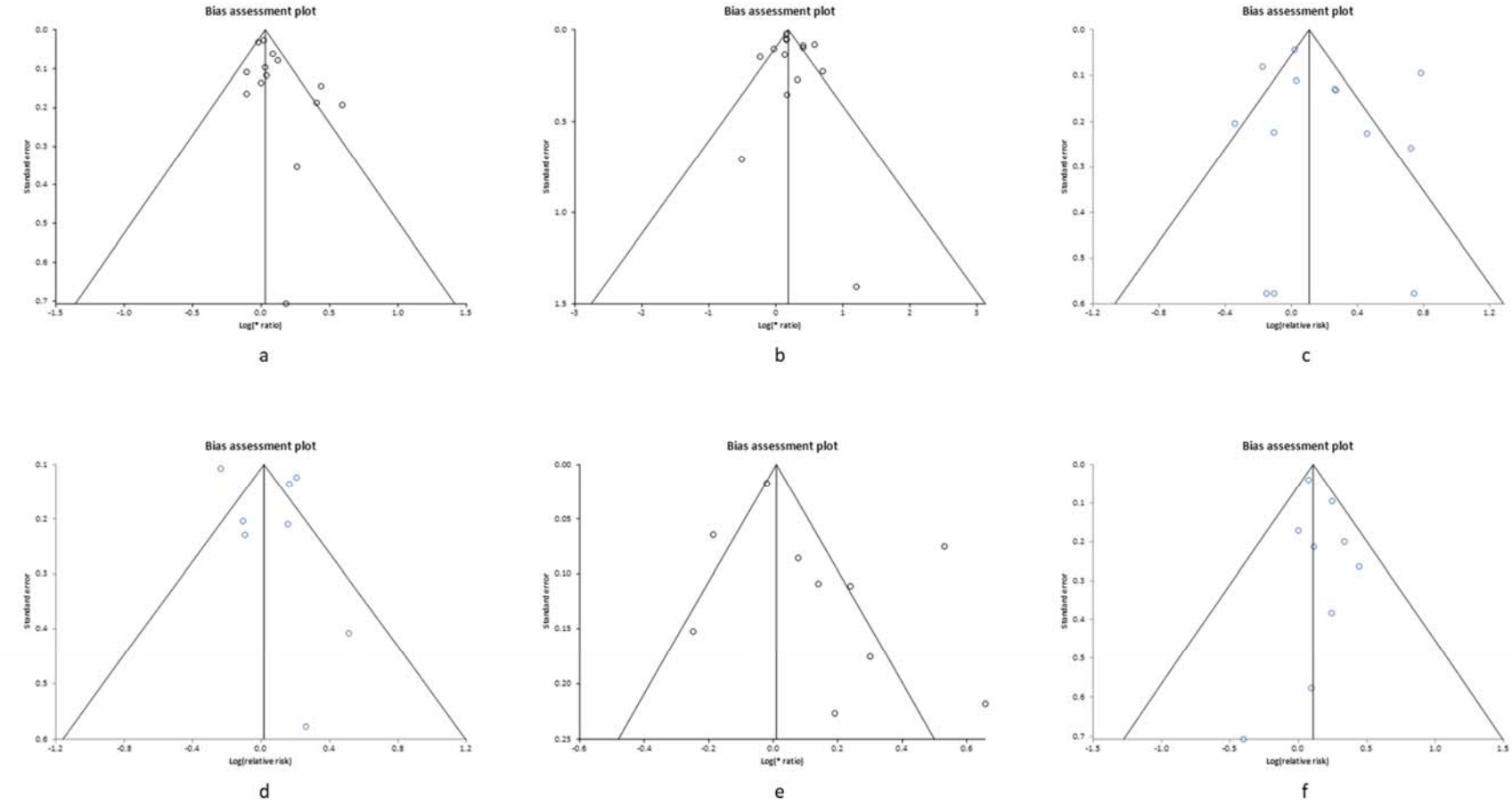
eFigure 12: Funnel plots for risk ratio of (a) cancer overall, (b) cancer excluding keratinocyte cancer, (c) keratinocyte cancer, (d) melanoma.

eFigure 13 – funnel plots for risk ratio of lymphomas



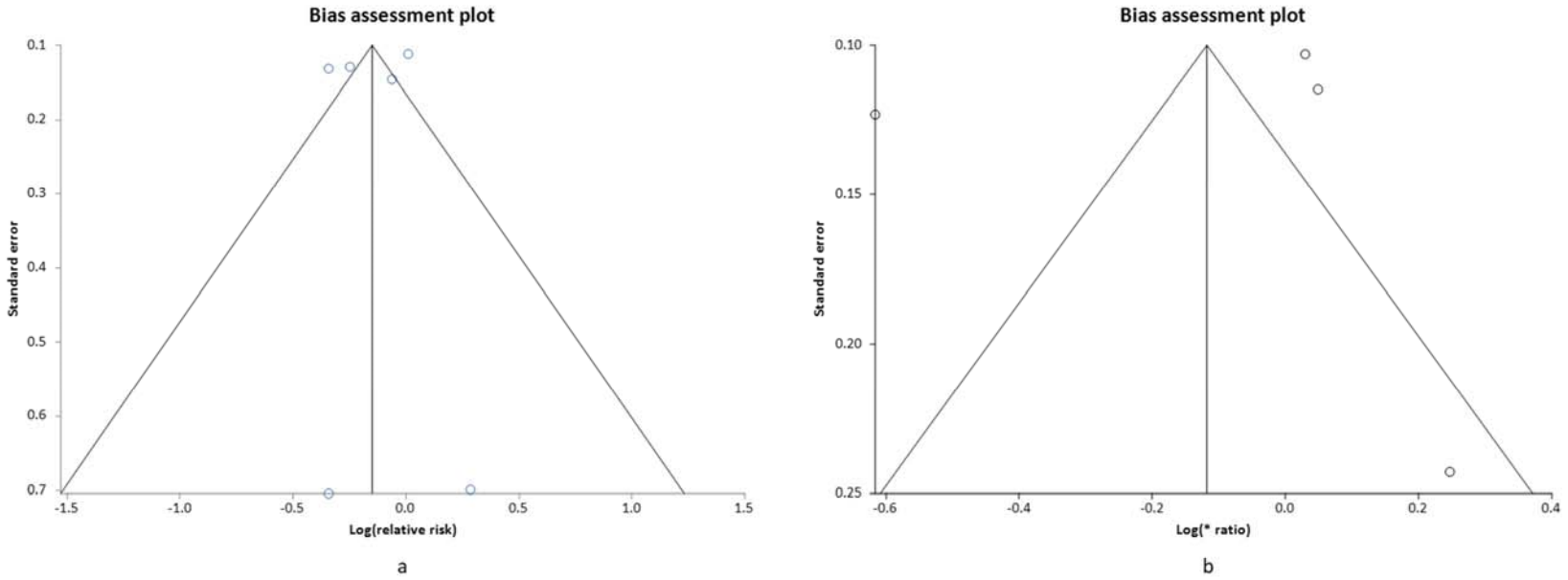
eFigure 13: Funnel plots for risk ratio of (a) lymphoma overall, (b) non-Hodgkin's lymphoma, (c) Hodgkin's lymphoma.

eFigure 14 – funnel plots for risk ratio of solid cancers



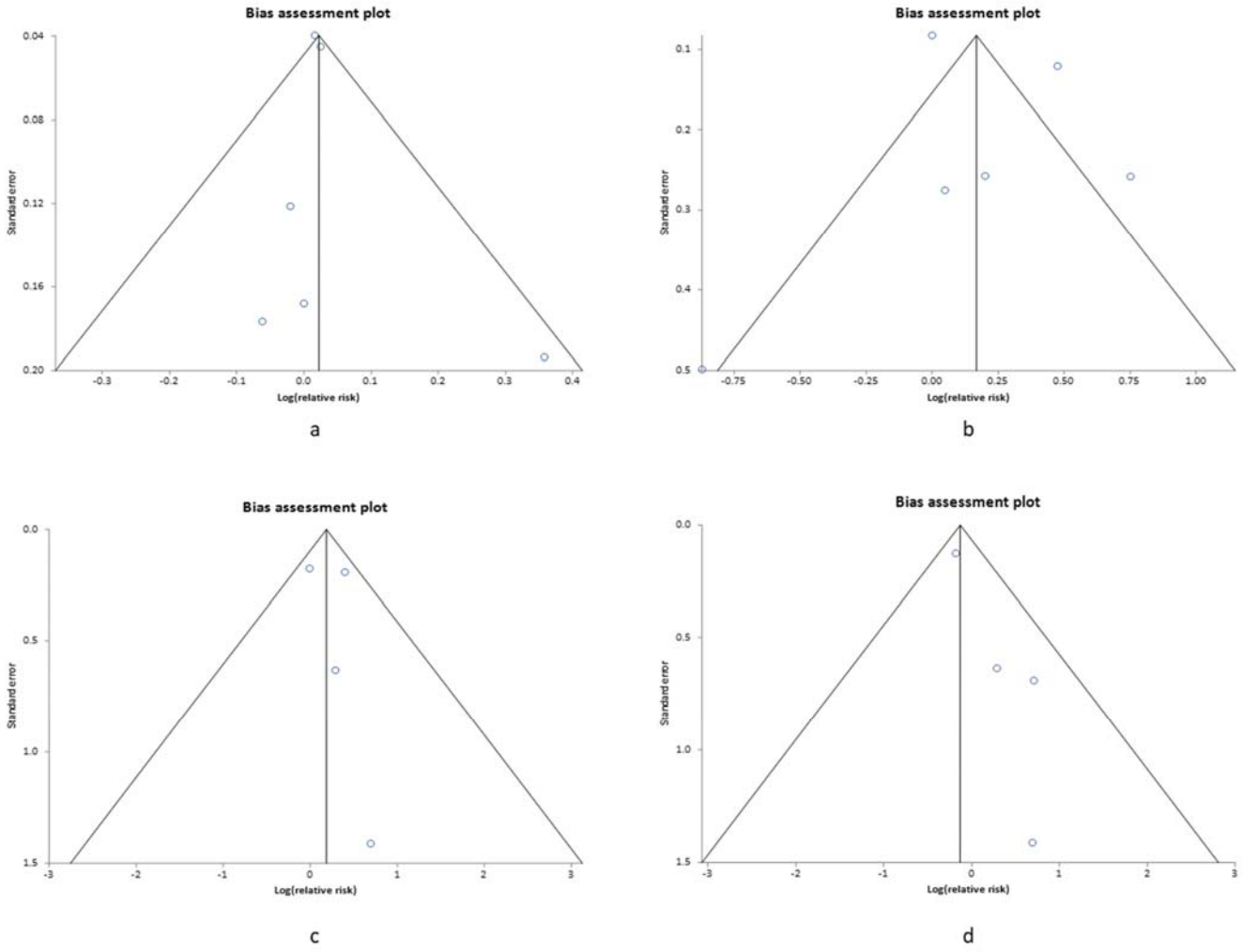
eFigure 14: Funnel plots for risk ratio of (a) breast cancer, (b) lung cancer, (c) colon cancer, (d) rectal cancer, (e) colorectal cancer, (f) bladder cancer.

eFigure 15 – funnel plots for risk ratio of cancer in patients receiving biological treatment



eFigure 15: Funnel plots for risk ratio of (a) cancer excluding keratinocyte cancer – bio, (b) keratinocyte cancer – bio. No funnel plots are shown for cancer overall and lymphoma overall due to lack of data. Bio = Biological treatment.

eFigure 16 – funnel plots for risk ratio of cancer in patients with psoriatic arthritis



eFigure 16: Funnel plots for risk ratio of (a) cancer overall – PsA, (b) keratinocyte cancer – PsA, (c) melanoma – PsA, (d) colorectal cancer – PsA. No funnel plots are show for cancer excluding keratinocyte cancer, lymphoma overall, breast cancer and lung cancer due to lack of data. PsA = Psoriatic arthritis.

eTable 1 – Overview of all included studies

table 1a. Details of studies included in analysis for cancer overall in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference Median (range) or mean +/– SD	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/13	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/44	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Halprin[3] 1982 USA	150/29 150/25	62 (24–92) 62 (24–92)	3/147 3/147	Hospitalized for psoriasis	Skin cancer: biopsy verified Internal cancers: Not reported	–	–	DM–2–patients
Alderson[4] 1983 Scotland	8,405/403	–	–	Discharge records with a psoriasis diagnosis	ICD–O from the Scottish National cancer registry	SIR/P–value 0.95/<0.5	–	–
Nyfors[5] 1983 Denmark	248/10	Mean 52	128/120	Hospital diagnosed psoriasis	personal follow–up by one of the authors	–	Methotrexate	–
Jones[6] 1985 UK	719/32	Not reported	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Peng[7] 1985 China	213/7	–	57/156	Diagnosed by dermatologist	Not reported	–	–	–

Liu[8] 1989 Shanghai	344/3	11–80	136/208	Hospital diagnosed psoriasis	Not reported	–	–	–
Powles[9] 1990 UK	44/3	Mean 48	20/24	Hospital diagnosed psoriasis	Not reported	–	Cyclosporin	–
Grossman[10] 1996 Frankrig	122/7	–	–	Review of hospital records	Not reported	–	Cyclosporin	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/795	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.4 (1.21–1.51)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1,738/83	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.59 (1.3–2.0)	Clime therapy	–
Hannuksela–Svahn[13] (JAAD) 1999a Finland	158/7	41 (12–82)	73/85	Hospital diagnosed psoriasis	Patients were linked to the Finnish National cancer registry via personal identification numbers	–	8–methoxypsoralen bath PUVA	–
Hannuksela–Svahn[14] 2000 Finland	5,687/631	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 1.3 (1.2–1.4)*	–	–
Haustein[15] 2000 Germany	157/6	Mean 48.3	48/109	Hospital records of patients with psoriasis	Not reported	–	Methotrexate	–
Margolis[16] 2001 USA	17,620/798 3,869/165	–	–	ICD–9 codes and National drug codes consistent with	ICD–9 codes for cancer from a Medicaid database	RRR_{adj} ** Severe/mild (95%CI)	–	Patients with severe eczema

				psoriasis from a Medicaid database		1.42(1.32–2.40)/ 0.93(0.86–1.10)		
Paul[17] 2003 International	1,252/47	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	cyclosporine	–
Weischer[18] 2004 Germany	195/1	Mean 45.5–47.1	69/126	Hospital diagnosed psoriasis	Review of cancer records from The Regional Interdisciplinary Cancer Centre	–	Ultraviolet B therapy	–
Smith[19] 2006 UK	22/2	43.4 +/– 11.9	5/18	Hospital diagnosed psoriasis	Not reported	–	Infliximab	–
Ahmad[20] 2006 Ireland	49/2	Mean 51.6	17/32	Treated for psoriasis by a dermatologist	Not reported	–	Etanercept	–
Antoniou[21] 2010 Greece	118/3	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Brunasso[22] 2011 Italy	103/6	–	–	Review of case files	Not reported	–	Biologics	–
van Lümig[23] 2011 The Netherlands	173/9	50.6 +/– 12.1	64/109	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Garcia–Dova[24] 2012 Spain	1,042/10	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–
Lan[25] 2012	8,180/369 163,600/6,273	47.5 +/– 17.3 47.4 +/– 17.3	3,738/4,442 74,760/88,840	ICD–9 codes for psoriasis from The	ICD–O codes for cancer from The	HR_{adj} (CI)	–	Matched controls

Taiwan				National Health Insurance Program database	National Health Insurance Program database	1.27 (1.09–1.49)		
Puig[26] 2012 Spain	444/6	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Staumont–Salle[27] 2012 Frankrig	306/9	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Conti[28] 2013 Italy	45/2	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Gulliver[29] 2014 Canada	3,289/232	Not reported	Not reported	Diagnosed by dermatologist	The Newfoundland and Labrador Medical Care Plan (MCP) was used to link patients to administrative databases	IR/PY 587.8/100,000	–	–
Kimball[30] 2014 USA	2,510/122	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	–	Etanercept	–
Brănişteanu[31] 2015 Romania	57/2	–	–	Diagnosed by dermatologist	Not reported	–	TNF–alpha–inhibitors	–
Feldman[32] 2015 USA	5,492/379 5,492/221	47.62 +/– 1.65 47.62 +/– 1.65	2,444/3,048 2,444/3,048	Two diagnoses of psoriasis (ICD–9–code 696.1) from the OptumHealth Reporting and Insights claims database	ICD–O codes for cancer from the OptumHealth Reporting and Insights claims database	–	–	Matched controls from the OptumHealth Reporting and Insights claims database

Lijnen[33] 2015 The Netherlands	176/5	47 +/– 14	74/102	Not reported	Not reported	–	dimethylfumarate	–
Spehr[34] 2015 Germany	3,322/–	Mean 47	40.5% female	Eligible for inclusion in Psobest registry	Not reported	IR/PY 0.93/100	Biologic– and non–biologic systemic treatment	–
Asgari[35] 2016 USA	5,889/689	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from KPNC Cancer Registry	–	Biologic– and non–biologic systemic treatment	–
Esposito[36] 2016 Italy	350/4	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Fuxench[37] 2016 UK	198,366/9,425 937,716/48,219	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	–	–	Reference patients were from same General Practice as subjects
Vergou[38] 2016 Greece	93/3	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	–
Menter[39] 2017 International	6,051/247	47.0 (18–94)	2,562/3,489	Dermatologist	Not reported	–	Adalimumab	–
Kreimer[40] 2018 Argentina	1,969/56	Not reported	Not reported	Hospital diagnosed psoriasis	Not reported	–	–	–
Lee[41] 2018 Korea	892,089/21,308 4,460,445/99,591	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10	ICD–10 codes (C00–C96) for cancer in the National Health	HR_{adj} (CI) 1.06 (1.05–1.08)	–	Matched controls from National

				code for psoriasis from the National Health Insurance Service database	Insurance Service database			Health Insurance Service
Wu[42] 2018 USA	42,794/959	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	–	–
*Excludes basal cell carcinoma **This result was based on a reference group of patients with hypertension								

table 1b. Details of studies included in analysis for cancer excluding keratinocyte cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/8	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/25	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Halprin[3] 1982 USA	150/9 150/18	62 (24–92) 62 (24–92)	3/147 3/147	Hospitalized for psoriasis	Skin cancer: biopsy verified Internal cancers: Not reported	–	–	DM–2–patients
Nyfors[5] 1983 Denmark	248/9	Mean 52	128/120	Hospital diagnosed psoriasis	personal follow–up by one of the authors	–	Methotrexate	–
Jones[6] 1985 UK	719/29	–	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Lindelof[43] 1990 Sweden	20,328/494	Mean 48	11,292/9,036	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	SIR_{adj} (CI) 0.96 (0.88–1.05)	–	–
Stern[44] 1995 USA	956/45	50 (14)	368/588	Hospital diagnosed psoriasis	Not reported	–	Etretinate	–
Grossman[10] 1996	122/6	–	–	Review of hospital records	Not reported	–	Cyclosporin	–

Frankrig								
Frentz[11] (BJD 141) 1999a Denmark	6,905/599	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	–	–	–
Frentz[12] (BJD 140) 1999b Denmark	1738/46	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	–	Climatotherapy	–
Hannuksela–Svahn[13] (JAAD) 1999a Finland	158/6	41 (12–82)	73/85	Hospital diagnosed psoriasis	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 1.3 (0.5–2.8)	8–methoxypsoralen bath PUVA	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/57	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 1.1 (0.8–1.4)*	Trioxalen bath PUVA	–
Lindelof[46] 1999 Sweden	4,799/459	45.3 (6–93)	2456/2343	Dermatologist	The National Swedish Cancer Registry	–	PUVA	–
Hannuksela–Svahn[14] 2000 Finland	5,687/493	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	–	–	–
Haustein[15] 2000 Germany	157/3	Mean 48.3	48/109	Hospital records of patients with psoriasis	Not reported	–	Methotrexate	–
Paul[17] 2003 International	1,252/26	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	–	Cyclosporine	–
Smith[19] 2006	23/1	43.4 +/– 11.9	5/18	Hospital diagnosed psoriasis	Not reported	–	Infliximab	–

UK								
Väkevä[47] 2008 Finland	63/4	–	–	Dermatologist	The Finnish Cancer Registry	–	Cyclosporine	–
Brauchli[48] 2009 UK	33,760/927 34,001/776		53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR $_{adj}$ (CI) 1.13 (1.02–1.24)	–	Matched controls from the UK General Practice Research Database
Ji[49] 2009 Sweden	15,858/1,317	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	–	–	–
Antoniou[21] 2010 Greece	118/3	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Brunasso[22] 2011 Italy	103/5	–	–	Review of case files	Not reported	–	Biologics	–
van Lümig[23] 2011 The Netherlands	173/3	50.6 +/– 12.1	64/109	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Prizment[50] 2011 USA	719/107 32,191/6,381	67.8 +/– 3 68.1 +/– 3,2	719 32,191	(ICD–9) code 696.1 from Medicare claims of participants in the Iowa's Women's Health Study	ICD–O codes from the State Health Registry of Iowa	HR $_{adj}$ (CI) 1.2 (1.0–1.4)	–	Participants in the Iowa's Women's Health Study
Garcia–Dova[24] 2012 Spain	1,042/8	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–

Puig[26] 2012 Spain	444/4	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Staumont–Salle[27] 2012 France	306/8	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Conti[28] 2013 Italy	45/2	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Kimball[30] 2014 USA	2,510/60	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR_{adj} (CI) 0.95 (0.92–1.21)	Etanercept	–
Yun[51] 2014 USA	–/270	–	–	Enrolled in the Medicare program with a dermatologist visit plus a prescription of psoriasis–specific treatment	ICD9 140–208, except 173.x from the Medicare database	IR/PY 9.2/1000	–	–
Feldman[32] 2015 USA	5,492/214 5,492/140	47.62 +/– 1.65 47.62 +/– 1.65	2,444/3,048 2,444/3,048	Two diagnoses of psoriasis (ICD–9–code 696.1) from the OptumHealth Reporting and Insights claims database	ICD–O codes for cancer from the OptumHealth Reporting and Insights claims database	–	–	Matched controls from the OptumHealth Reporting and Insights claims database
Lijnen[33] 2015 The Netherlands	176/4	47 +/– 14	74/102	Not reported	Not reported	–	dimethylfumarate	–
Menter[52] 2015 International	6,059/166	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	–

Asgari[35] 2016 USA	5,889/329	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	–	Biologic– and non–biologic systemic treatment	–
Esposito[36] 2016 Italy	350/3	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Fuxench[37] 2016 UK	198,366/6,289 937,716/32,241	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	HR_{adj} (CI) 1.06 (1.02–1.09)	–	Reference patients were from same General Practice as subjects
LI[53] 2016 USA	1,120/209 63,770/8,139	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR_{adj} (CI) 1.06 (0.92–1.21)	–	Participants in the Nurses' Health Study
Vergou[38] 2016 Greece	93/1	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	–
Fiorentino[54] 2017 International	12,092/252	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–
Magnano[55] 2017 Italy	359/9	Mean 60	–	Review of clinical records	Not reported	–	–	–
Napolitano[56] 2017 Italy	915/8	Mean 58.7	420/495	Dermatologist	Not reported	–	Systemic treatment	–

Wu[42] 2018 USA	42,794/444	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	–	–
*Also excluding melanomas								

table 1c. Details of studies included in analysis for keratinocyte cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/6	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/19	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Halprin[3] 1982 USA	150/20 150/7	62 (24–92) 62 (24–92)	3/147 3/147	Hospitalized for psoriasis	Skin cancer: biopsy verified Internal cancers: Not reported	–	–	DM–2–patients
Menter[57] 1983 USA	300/15	(3–82)	–	Dermatologist	Not reported	–	Goeckerman regimen	–
Nyfors[5] 1983 Denmark	248/1	Mean 52	128/120	Treated for psoriasis and followed by one of the authors	The National Cancer Registry and personal follow–up	–	Methotrexate	–
Reshad[58] 1984 UK	216/8	Mean 49	101/115	Hospital diagnosed psoriasis	Histopathological verification	–	PUVA	–
Jones[6] 1985 UK	719/3	–	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Leone[59] 1985 USA	205/4	–	–	Dermatologist	Not reported	–	PUVA	–

Torinuki[60] 1988 Japan	151/1	45.5 (15–77)	–	Dermatologist	Dermatologist	–	Methoxalen phototherapy and goeckermans regime	–
Forman[61] 1989 USA	551/29	Mean 49.2	–	Hospital diagnosed psoriasis	Dermatologist and biopsy	–	PUVA	–
Takashima[62] 1990 Japan	214/1	Mean 49.7	83/131	Hospital diagnosed psoriasis	Nor informed	–	PUVA	–
Mali–Gerrits[63] 1991 The Netherlands	227/15 95/1	49 +/– 0.2 46 +/– 1.2	100/127 60/35	Dermatologist	Biopsy	–	PUVA and methotrexate	Partners of patients with psoriasis
van Praag[64] 1993 The Netherlands	260/11	Mean 52.1	94/166	Hospital diagnosed psoriasis	Physical examination	–	PUVA	–
Grossman[10] 1996 Frankrig	122/1	–	–	Review of hospital records	Not reported	–	Cyclosporin	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/196	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 2.46 (2.13–2.83)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1738/37	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	–	Climatotherapy	–
Hannuksela–Svahn[13] (JAAD) 1999a Finland	158/1	41 (12–82)	73/85	Hospital diagnosed psoriasis	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 1.4 (0–7.6)	8–methoxypsoralen bath PUVA	–

Hannuksela–Svahn[14] 2000 Finland	5,687/138	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 3.2 (2.3–4.4)*	–	–
Haustein[15] 2000 Germany	157/3	Mean 48.3	48/109	Hospital records of patients with psoriasis	Not reported	–	Methotrexate	–
Margolis[16] 2001 USA	17,620/798 3,869/165	–	–	ICD–9 codes and National drug codes consistent with psoriasis from a Medicaid database	ICD–9 codes for cancer from a Medicaid database	RRR_{adj} ** Severe/mild (95%CI) 1.42(1.32–2.40)/ 0.93(0.86–1.10)	–	Patients with severe eczema
Paul[17] 2003 International	1,252/21	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 6.2 (3.8–9.5)	Cyclosporine	–
Ahmad[20] 2006 Ireland	49/2	Mean 51.6	17/32	Dermatologist	Not reported	–	Etanercept	–
Warren[65] 2008 UK	102/1	45 +/– 19	59/43	Hospital diagnosed psoriasis	Physical examination	–	Biologics	–
Brunasso[22] 2011 Italy	103/1	–	–	Review of case files	Not reported	–	Biologics	–
Garcia–Dova[24] 2012 Spain	1,042/2	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–
Lee[66] 2012 Taiwan	7,061/25	Mean 42.5	3,207/3,854	ICD–codes	ICD–O and treatment	IRR_{adj} (CI) 7.5 (5.07–11.1)	–	–

					consistent with a cancer diagnosis			
Puig[26] 2012 Spain	444/2	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Staumont–Salle[27] 2012 Frankrig	306/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Stern[67] 2012 USA	1,380/482	44 +/– 16	487/893 male	Hospital diagnosed psoriasis	Pathology reports	IRR $_{adj}$ tumor (CI) 32.0 (30.8–33.19) for SCC 4.7 (4.5–4.9) for BCC	PUVA	–
Kimball[30] 2014 USA	2,510/66	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR (CI) 0.95 (0.73–1.20)	Etanercept	–
Feldman[32] 2015 USA	5,492/165 5,492/81	47.62 +/– 1.65 47.62 +/– 1.65	2,444/3,048 2,444/3,048	Two diagnoses of psoriasis (ICD–9–code 696.1) from the OptumHealth Reporting and Insights claims database	ICD–O codes for cancer from the OptumHealth Reporting and Insights claims database	OR $_{adj}$ 2.1	–	Matched controls from the OptumHealth Reporting and Insights claims database
Lijnen[33] 2015 The Netherlands	176/1	47 +/– 14	74/102	Not reported	Not reported	–	dimethylfumarate	–
van Lümig[68] 2015 The Netherlands	280/11 448/12	46.8 +/– 11.9 56.3 +/–12.9	99/181 304/144	Dermatologist	Cytopathology	HR $_{adj}$ (CI) 6.0 (1.6–22.4)	TNF–alpha inhibitors	Patients with rheumatoid arthritis, diagnosed by

								rheumatologist
Menter[52] 2015 International	6,059/112	47.0 +/– 18–94	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	–
Asgari[35] 2016 USA	5,889/689	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	–	Biologic– and non–biologic systemic treatment	–
Dai[69] 2016 USA	2,645/287 155,289/17,513	62.1 +/– 6.5 –36.7 +/– 4.7 62.6 +/– 6.8 –36.1 +/– 4.7	2,645	Self–reported psoriasis, confirmed using the Psoriasis Screening Tool and validated by mailed questionnaires	SCC: Pathology report, BCC: self–reported	RR_{adj} (CI) 1.51 (1.11–2.05) for SCC 0.95 (0.75–1.18) for BCC	–	Participants in the Nurses Health Studies I and II, who did not have psoriasis
Egeberg[70] 2016 Denmark	67,257/761 5,484,010/57,222	44.1 +/– 16.7 mild 44.0 +/– 15.7 severe 40.3 +/– 19.7 control	34,424/32,833 2,774,726/2,709,284	All Danish patients with psoriasis or psoriatic arthritis from the Danish National Patient Register	(ICD–8 code 173 or ICD–10 code C44) recorded in the Danish National Patient Register.	IRR_{adj} (CI) 1.98 (1.84–2.15) mild 2.30 (1.91–2.78) severe	–	General population
Esposito[36] 2016 Italy	350/1	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Fuxench[37] 2016 UK	198,366/3,136 937,716/15,978	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	HR_{adj} (CI) 1.12 (1.07–1.16)	–	Reference patients were from same General Practice as subjects
Maiorino[71] 2016	92/5	53.5 (20–83)	60/32	Hospital diagnosed psoriasis	Physical examination	–	NB–UVB or PUVA	–

Italy								
Vergou[38] 2016 Greece	93/2	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	–
Paradisi[72] 2017 Italy	72,739/699 25,956/509	–	37,073/35,666 15,801/10,155	ICD–9–CM codes for psoriasis (i.e. 696.1 and 696.0) from a single Centre database	ICD–9–CM codes for keratinocyte cancer (i.e. 173.*) from a single Centre database	OR_{adj} (CI) 0.84 (0.75–0.95)	Phototherapy	Vascular surgery patients
Serrano[73] 2017 USA	14,704/768	(28–89)	–	ICD–9 and –10 codes for psoriasis	ICD–9 and –10 codes for cancer	–	–	–
Avina–Zubieta[74] 2018 Canada	81,568/401 81,568/217	Mean 48.5 Mean 48.5	51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code) from an administrative health database	Cancer–registry, British Columbia, Canada	IRR_{adj} (CI) 1.82 (1.54–2.14)	–	Matched controls from an administrative health database
Lin[75] 2018 Taiwan	16,531/13	Mean 44.88	5,213/11,318	ICD–codes for psoriasis in the Taiwan National Health Insurance Research Database (NHIRD)	Diagnosed by dermatologist or plastic surgeon via skin biopsy or surgical intervention or included in the Registry for Catastrophic Illness Patient Database (RCIPD)	–	NB–UVB	–

Mason[76] 2018 UK	8,860/96	–	–	Included in BADBIR, a pharmacovigilance register of psoriasis patients	Not reported	–	Systemic and biologic therapies	–
Raone[77] 2018 Italy	158/7	–	–	Review of clinical records	Histopathological verification	–	NB–UVB	–
*Excludes basal cell carcinoma **This result was based on a reference group of patients with hypertension								

table 1d. Details of studies included in analysis for melanoma in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Pittelkow[2] 1981 UK	260/1	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Lindelof[43] 1990 Sweden	20,328/33	Mean 48	11,292/9,036	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	Sir_{adj} (CI) 1.1 (0.8–1.6)	–	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/16	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.3 (0.8–2.1)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1,738/2	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	Sir_{adj} (CI) 1.19 (0.1–6.3)	Climatotherapy	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/2	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 0.9 (0.1–3.2)	Trioxalen bath PUVA	–
Lindelof[46] 1999 Sweden	4,799/15	45,3 (6–93)	2456/2343	Dermatologist	The National Swedish Cancer Registry	SIR (CI) Female: 1.1 (0.4–2.3) Male: 1.1 (0.5–2.2)	PUVA	–
Hannuksela–Svahn[14] 2000	5,687/8	–	2,555/3,132	The national discharge register linked with the	Patients were linked to the Finnish National cancer	SIR_{adj} (CI) 0.8 (0.3–1.6)	–	–

Finland				Population Central register	registry via personal identification numbers			
Stern[78] 2001 USA	1,380/23	50 +/– 12 For those who had melanoma	849/531	Hospital diagnosed psoriasis	Not reported	–	PUVA	–
Paul[17] 2003 International	1,252/2	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	Cyclosporine	–
Weischer[18] 2004 Germany	195/1	Mean 45.5–47.1	69/126	Hospital diagnosed psoriasis	Review of cancer records from The Regional Interdisciplinary Cancer Centre	–	Ultraviolet B therapy	–
Hearn[79] 2008 UK	2,130/6	–	–	Review of clinical records	the Scottish Cancer Registry via ICD–O	SIR_{adj} (95–CI) 1.05 (0.03–5.86)	NB–UVB	–
Warren[65] 2008 UK	102/2	45 +/– 19	59/43	Hospital diagnosed psoriasis	Physical examination		Biologics	–
Brauchli[48] 2009 UK	33,760/29 34,001/33	–	53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR_{adj} (CI) 0.83 (0.50–1.36)	–	Matched controls from the UK General Practice Research Database
Ji[49] 2009 Sweden	15,858/35	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	Sir_{adj} (CI) 0.95 (0.66–1.32)	–	–
Brunasso[22] 2011 Italy	103/1	–	–	Review of case files	Not reported	–	Biologics	–

Garcia–Dova[24] 2012 Spain	1,042/1	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–
Lee[66] 2012 Taiwan	7,061/2	Mean 42.5	3,207/3,854	ICD–codes in the National Health Insurance Research Database (NHIRD) of Taiwan	ICD–O in the National Health Insurance Research Database (NHIRD) of Taiwan and treatment consistent with a cancer diagnosis	IRR_{adj} (CI) 6.12 (1.53–24.47)	–	–
Puig[26] 2012 Spain	444/1	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Staumont–Salle[27] 2012 Frankrig	306/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Le[80] 2013 USA	17,568/158	Median 55	–	ICD–codes in the Humedica database	ICD–O in the Humedica database	–	systemic treatment	–
van Lümig[68] 2015 The Netherlands	280/1 448/–	46.8 +/– 11.9 56.3 +/–12.9	99/181 304/144	Dermatologist	Cytopathology	–	TNF–alpha inhibitors	Patients with rheumatoid arthritis, diagnosed by rheumatologist
Menter[52] 2015 International	6,059/10	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	–
Asgari[35] 2016 USA	5,889/21	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment	ICD–O codes for cancer from Kaiser	–	Biologic– and non–biologic	–

				in the Kaiser Permanente Northern California database	Permanente Northern California Cancer Registry		systemic treatment	
Egeberg[70] 2016 Denmark	67,257/219 5,484,010/28,841	44.1 +/– 16.7 mild 44.0 +/– 15.7 severe 40.3 +/– 19.7 control	34,424/32,833 2,774,726/2,709,284	All Danish patients with psoriasis or psoriatic arthritis from the Danish National Patient Register	(ICD–8 code 172 or ICD–10 code C43)recorded in the Danish National Patient Register.	IRR $_{adj}$ (CI) 1.19 (1.03–1.37) (mild) 1.09 (0.75–1.58) (severe)	–	General population
Fuxench[37] 2016 UK	198,366/340 937,716/1,587	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	HR $_{adj}$ (CI) 1.15 (1.02–1.30)	–	Reference patients were from same General Practice as subjects
LI[53] 2016 USA	1,120/18 63,770/380	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis, confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR $_{adj}$ (CI) 1.95 (1.21–3.13)	–	Participants in the Nurses' Health Study
Maiorino[71] 2016 Italy	92/3	53.5 (20–83)	60/32	Hospital diagnosed psoriasis	Physical examination	–	NB–UVB or PUVA	–
Reddy[81] 2016 USA	8,161/62 807,604/7,105	–	4,271/3,890 496,730/310,874	3 visits with primary diagnosis registered as "psoriasis" in Kaiser Permanente Southern California (KPSC)	ICD–codes for cancer in Kaiser Permanente Southern California (KPSC)	–	–	Matched controls from the Kaiser Permanente Southern California
Fiorentino[54] 2017 International	12,092/28	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–

Avina–Zubieta[74] 2018 Canada	81,568/218 81,568/200	Mean 48.5 Mean 48.5	51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code) from an administrative health database	Cancer–registry, British Columbia, Canada	IRR_{adj} (CI) 1.07 (0.88–1.29)	–	Matched controls from an administrative health database
Lin[75] 2018 Taiwan	16,531/1	Mean 44.88	5,213/11,318	ICD–codes for psoriasis in the Taiwan National Health Insurance Research Database (NHIRD)	Diagnosed by dermatologist or plastic surgeon via skin biopsy or surgical intervention or included in the Registry for Catastrophic Illness Patient Database (RCIPD)	–	NB–UVB	–

table 1e. Details of studies included in analysis for lymphoma overall in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/1	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/2	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Halprin[3] 1982 USA	150/0 150/1	62 (24–92) 62 (24–92)	3/147 3/147	Hospitalized for psoriasis	Skin cancer: biopsy verified Internal cancers: Not reported	–	–	DM–2–patients
Nyfors[5] 1983 Denmark	248/2	Mean 52	128/120	Treated for psoriasis and followed by one of the authors	The National Cancer Registry and personal follow–up	–	Methotrexate	–
Jones[6] 1985 UK	719/2	–	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Lindelof[43] 1990 Sweden	20,328/11	Mean 48	11,292/9,036 female	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	–	–	–
Hannuksela–Svahn[14] 2000 Finland	5,687/29	–	2,555/3,132	The national discharge register linked with the	Patients were linked to the Finnish National cancer registry via personal	–	–	–

				Population Central register	identification numbers			
Gelfand[82] 2003 UK	2,718/18 105,203/258	Mean 70.63 Mean 71.08	1540/1,178 61,412/43,791	OXMIS–code for psoriasis in the General Practice research database	OXMIS code for lymphoma the General Practice research database	RR_{adj} (CI) 2.94 (1.82–4.74)	–	Patients in the GPRD who did not have psoriasis
Paul[17] 2003 International	1,252/2	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	Cyclosporine	–
Gelfand[83] 2006 UK	153,197/248 765,950/970	Mean 41.51 (mild) 48.51 (severe) 35.76 (reference)	80,518/72,679 399,712/366,238	OXMIS–code for psoriasis in the General Practice research database	OXMIS code for lymphoma the General Practice research database	HR_{adj} (CI) 1.35 (1.17–1.55)	–	Non–matched controls
Stern[84] 2006 USA Supplemented by Stern[85] 1997 USA	1380/16	59 +/– 13	849/531	Hospital diagnosed psoriasis	Not reported	–	PUVA	–
Brauchli[48] 2009 UK	33,760/67 34,001/36		53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR_{adj} (CI) 1.76 (1.19–2.58)	–	Matched controls from the UK General Practice Research Database
Roelofzen[86] 2009 The Netherlands	4,315/21	Mean 31,1	48%/52%	Hospital diagnosed psoriasis	Medical files and questionnaires supplemented by record linkage to the National Cancer Registry	–	Coal tar	–

Lee[66] 2012 Taiwan	7,061/8	Mean 42.5	3,207/3,854	ICD–codes in the National Health Insurance Research Database (NHIRD) of Taiwan	ICD–O in the National Health Insurance Research Database (NHIRD) of Taiwan and treatment consistent with a cancer diagnosis	IRR_{adj} (CI) 3.61 (1.81–7.22)	–	–
Puig[26] 2012 Spain	444/1	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Staumont–Salle[27] 2012 Frankrig	306/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Conti[28] 2013 Italy	45/1	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Le[80] 2013 USA	17,568/88	Median 55	Not reported	ICD–codes in the Humedica database	ICD–O in the Humedica database	–	systemic treatment	–
Fallah[87,88] Ann Oncol 25 2014a,b Sweden	131,215/310	–	52.8%/47.2	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	–	–	–
Kimball[30] 2014 USA	2,510/2	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR_{adj} (CI) 0.46 (0.06–1.67)	Etanercept	–
Menter[52] 2015 International	6,059/2	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	–
Asgari[35] 2016 USA	5,889/21	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment	ICD–O codes for cancer from Kaiser	–	Biologic– and non–biologic	–

				in the Kaiser Permanente Northern California database	Permanente Northern California Cancer Registry		systemic treatment	
Fuxench[37] 2016 UK	198,366/320 937,716/1305	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	HR_{adj} (CI) 1.34 (1.18–1.51)	–	Reference patients were from same General Practice as subjects
Magnano[55] 2017 Italy	359/1	Mean 60		Review of clinical records	Not reported	–	–	–
Kamstrup[89] 2018 Denmark	58,096/151 4,303,731/6,696	54.8 +/– 16.1 48.6 +/– 18.0	51.2%/48.8% 50.8%/49.2%	diagnostic code or receipt of at least two prescriptions of topical vitamin D derivates from administrative registries.	ICD–10 codes for lymphomas	–	–	General population
Lee[41] 2018 Korea	892,089/539 4,460,445/2018	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10 code for psoriasis from the National Health Insurance Service database	ICD–10 codes (C00–C96) for cancer in the National Health Insurance Service database	HR_{adj} (CI) 1.33 (1.21–1.46)	–	Matched controls from National Health Insurance Service
Wu[42] 2018 USA	42,794/80	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims	–	–	–

				MarketScan Commercial Claims and Encounters Database	and Encounters Database			

table 1f. Details of studies included in analysis for non-Hodgkin's lymphoma in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Lindelof[43] 1990 Sweden	20,328/7	Mean 48	11,292/9,036	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	–	–	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/20	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.4 (0.8–2.2)	–	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/5	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 3.7 (1.2–8.6)	Trioxalen bath PUVA	–
Hannuksela–Svahn[14] 2000 Finland	5,687/21	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 2.2 (1.4–3.4)	–	–
Gelfand[83] 2006 UK	153,197/206 765,950/810	Mean 41.51 (mild) 48.51 (severe) 35.76 (Control)	80,518/72,679 399,712/366,238	OXMIS–code for psoriasis in the General Practice research database	OXMIS code for lymphoma the General Practice research database	HR_{adj} (CI) 1.14 (0.96–1.35)	–	Non–matched controls
Smith[19] 2006 UK	22/1	43.4 +/– 11.9	5/18	Hospital diagnosed psoriasis	Not reported	–	Infliximab	–

Stern[84] 2006 USA Supplemented by Stern[85] 1997 USA	1380/14	59 +/– 13	849/531	Hospital diagnosed psoriasis	Normal follow–up and National death index database	–	PUVA	–
Ji[49] 2009 Sweden	15,858/60	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	SIR_{adj} (CI) 1.31 (1.00–1.69)	–	–
Conti[28] 2013 Italy	45/1	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Fallah[87] Ann Oncol 25 (2025–2030) 2014a Sweden	131,215/275	–	52.8%/47.2	The Swedish Hospital Discharge Register	The nationwide Swedish Cancer Registry	SIR_{adj} (CI) 1.4 (1.2–1.6)	–	–
LI[53] 2016 USA	1,120/13 63,770/527	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis, confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR_{adj} (CI) 1.03 (0.59–1.78)	–	Participants in the Nurses' Health Study
Magnano[55] 2017 Italy	359/1	Mean 60		Review of clinical records	Not reported	–	–	–
Kamstrup[89] 2018 Denmark	58,053/123 4,303,731/5,772	54.8 +/– 16.1 48.6 +/– 18.0	51.2%/48.8% 50.8%/49.2%	diagnostic code or receipt of at least two prescriptions of topical vitamin D derivates from	ICD–10 codes for lymphomas	HR_{adj} (CI) 1.02 (0.84–1.24)*	–	General population

				administrative registries.				
*Excluding cutaneous T–cell lymphoma								

table 1g. Details of studies included in analysis for Hodgkin's lymphoma in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Lindelof[43] 1990 Sweden	20,328/4	Mean 48	11,292/9,036 female	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	–	–	–
Olsen[90] 1992 Denmark	6910/1	Mean 50	3582/3328	National hospital discharge register	National cancer registry	SIR_{adj} (CI) 1.0 (0.1–4.9)	–	–
Hannuksela–Svahn[14] 2000 Finland	5,687/8	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 3.3 (1.4–6.4)	–	–
Gelfand[83] 2006 UK	153,197/42 765,950/160	Mean 41.51 (mild) 48.51 (severe) 35.76 (Reference)	80,518/72,679 399,712/366,238	OXMIS–code for psoriasis in the General Practice research database	OXMIS code for lymphoma the General Practice research database	HR_{adj} (CI) 1.48 (1.05–2.08)	–	Non–matched controls
Stern[84] 2006 USA Supplemented by Stern[85] 1997 USA	1380/2	59 +/– 13	849/531	Hospital diagnosed psoriasis	Normal follow–up and National death index database	–	PUVA	–
Laws[91] 2011 UK/Ireland	129/1	46.0 +/– 11.4	60/69	Diagnosed at clinical center	Not reported	–	Ustekinumab	–

Fallah[88] Ann Oncol 25 (1397–1404) 2014b Sweden	131,215/35	–	52.8%/47.2%	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	SIR $_{adj}$ (CI) 1.9 (1.3–2.6)	–	–
Kamstrup[89] 2018 Denmark	58,096/28 4,303,731/924	54.8 +/– 16.1 48.6 +/– 18.0	51.2%/48.8% 50.8%/49.2%	diagnostic code or receipt of at least two prescriptions of topical vitamin D derivates from administrative registries.	ICD–10 codes for lymphomas	HR $_{adj}$ (CI) 1.50 (1.01–2.23)	–	General population

table 1h. Details of studies included in analysis for breast cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Nyfors[5] 1983 Denmark	248/2	Mean 52	128/120	Treated for psoriasis and followed by one of the authors	The National Cancer Registry and personal follow–up	–	Methotrexate	–
Lindelof[43] 1990 Sweden	20,328/107	Mean 48	11,292/9,036	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	Sir_{adj} (CI) 1.03 (0.85–1.25)	–	–
Stern[44] 1995 USA	956/11	50 +/– 14	368/588	Hospital diagnosed psoriasis	Not reported	–	Etretinate	–
Stern[92] 1997 USA	1380/27	44 +/– 16	487/893	Hospital diagnosed psoriasis	Pathology report, discharge summary or death certificate	RR_{adj} (CI) 1.81 (1.19–2.64)	PUVA	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/54	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR 0.9	–	–
Frentz[12] (BJD 140) 1999b Denmark	1,738/8	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.31 (0.6–2.6)	Climatotherapy	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/3	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 0.7 (0.1–1.9)	Trioxalen bath PUVA	–
Hannuksela–Svahn[14]	5,687/37	–	2,555/3,132	The national discharge register	Patients were linked to the Finnish	SIR_{adj} (CI) 0.9 (0.6–1.2)	–	–

2000 Finland				linked with the Population Central register	National cancer registry via personal identification numbers			
Haustein[15] 2000 Germany	157/1	Mean 48.3	48/109	Hospital records of patients with psoriasis	Not reported	–	Methotrexate	–
Paul[17] 2003 International	1,252/2	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	Cyclosporine	–
Brauchli[48] 2009 UK	33,760/153 34,001/139		53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR_{adj} (CI) 1.04 (0.83–1.31	–	Matched controls from the UK General Practice Research Database
Roelofzen[86] 2009 The Netherlands	4,315/83	Mean 31.1	48%/52%	Diagnosed with psoriasis at a hospital	Assessed through medical files and questionnaires, supplemented by record linkage to the National Cancer Registry	HR_{adj} (CI) 03 (0.43–2.50)	Coal tar	–
Antoniou[21] 2010 Greece	118/1	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Chen[93] 2011 Taiwan	3,686/3	44.00 +/– 19.62	1,445/2,241	ICD–codes from the Longitudinal Health Insurance Database	"Cancer catastrophic illness certificate", which requires cytological or pathological evidence	–	–	–
van Lümig[23] 2011 The Netherlands	173/1	50.6 +/– 12.1	64/109	Hospital diagnosed psoriasis	Not reported	SIR_{adj} (CI) 2.7 (0.1–15.1)	Biologics	–

Prizment[50] 2011 USA	719/29 32,191/2,037	67.8 +/– 3 68.1 +/– 3.2	719 32,191	(ICD–9) code 696.1 from Medicare claims of participants in the Iowa's Women's Health Study	ICD–O codes from the State Health Registry of Iowa	HR $_{adj}$ (CI) 1.0 (0.7–1.5)	–	Participants in the Iowa's Women's Health Study
Garcia–Dova[24] 2012 Spain	1,042/2	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–
Hemminki[94] (Gynecol Oncol.) 2012a Sweden	8,162/258	–	8,162	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	SIR $_{adj}$ (CI) 1.09 (0.96–1.23)	–	–
Staumont–Salle[27] 2012 Frankrig	306/2	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Lijnen[33] 2015 The Netherlands	176/2	47 +/– 14	74/102	Not reported	Not reported	–	dimethylfumarate	–
Esposito[36] 2016 Italy	350/1	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	dimethylfumarate	–
Fuxench[37] 2016 UK	198,366/1,118 937,716/6281	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	–	Biologics	Reference patients were from same General Practice as subjects
LI[53] 2016 USA	1,120/86 63,770/4,034	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis, confirmed	Not reported	HR $_{adj}$ (CI) 1.04 (0.97–1.12)	–	Participants in the Nurses' Health Study

				using the Psoriasis Screening Tool questionnaire				
Fiorentino[54] 2017 International	12,092/40	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–
Lee[41] 2018 Korea	892,089/1,643 4,460,445/8,069	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10 code for psoriasis from the National Health Insurance Service database	ICD–10 codes (C00–C96) for cancer in the National Health Insurance Service database	HR_{adj} (CI) 1.02 (0.97–1.08)	–	Matched controls from National Health Insurance Service
Wu[42] 2018 USA	42,794/59	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	–	–

table 1i. Details of studies included in analysis for lung cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/1	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/6	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Halprin[3] 1982 USA	150/0 150/4	62 (24–92) 62 (24–92)	3/147 3/147	Hospitalized for psoriasis	Skin cancer: biopsy verified Internal cancers: Not reported	–	–	DM–2–patients
Alderson[4] 1983 Scotland	8405/83	–	–	Discharge records with a psoriasis diagnosis	ICD–O from the Scottish National cancer registry	SIR (P–value) 0.97 (<0.09)	–	–
Jones[6] 1985 UK	719/5	–	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Liu[8] 1989 Shanghai	344/1	11–80	136/208	Hospital diagnosed psoriasis	Not reported	–	–	–
Stern[44] 1995 USA	956/8	50 +/– 14	368/588	Hospital diagnosed psoriasis	Not reported	–	Etretinate	–
Grossman[10] 1996 Frankrig	122/2	–	–	Review of hospital records	Not reported	–	Cyclosporin	–

Frentz[11] (BJD 141) 1999a Denmark	6,905/133	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.5 (1.3–1.9)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1738/8	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.18 (0.5–2.3)	Climatotherapy	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/8	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 1.0 (0.4–2.0)	Trioxalen bath PUVA	–
Hannuksela–Svahn[14] 2000 Finland	5,687/101	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 1.5 (1.2–1.8)	–	–
Haustein[15] 2000 Germany	157/1	Mean 48.3	48/109	Hospital records of patients with psoriasis	Not reported	–	Methotrexate	–
Paul[17] 2003 International	1,252/2	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	Cyclosporine	–
Väkevä[47] 2008 Finland	63/1	–	–	Dermatologist	The Finnish Cancer Registry	–	Cyclosporine	–
Brauchli[48] 2009 UK	33,760/85 34,001/101	–	53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR_{adj} (CI) 0.79 (0.60–1.06)	–	Matched controls from the UK General Practice Research Database
Ji[49] 2009 Sweden	15,858/150	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish	ICD–7 codes for cancer from the	SIR_{adj} (CI) 1.78 (1.51–2.09)	–	–

				hospital discharge register	Swedish Cancer Registry			
Roelofzen[86] 2009 The Netherlands	4,315/83	Mean 31.1	48%/52%	Diagnosed with psoriasis at a hospital	Assessed through medical files and questionnaires, supplemented by record linkage to the National Cancer Registry	HR_{adj} (CI) 0.97 (0.38–2.46	Coal tar	–
Antoniou[21] 2010 Greece	118/1	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	–
Brunasso[22] 2011 Italy	103/2	–	–	Review of case files	Not reported	SIR_{adj} (CI) 5.92 (0.72–21.37)	Biologics	–
Prizment[50] 2011 USA	719/20 32,191/722	67.8 +/– 3 68.1 +/– 3.2	719 32,191	(ICD–9) code 696.1 from Medicare claims of participants in the Iowa's Women's Health Study	ICD–O codes from the State Health Registry of Iowa	HR_{adj} 1.3 (0.8–2.0)	–	Participants in the Iowa's Women's Health Study
Garcia–Dova[24] 2012 Spain	1,042/3	45 +/– 14	397/645	Hospital diagnosed psoriasis	Not reported	–	Biologic – and non–biologic systemic therapy	–
Staumont–Salle[27] 2012 France	306/8	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Le[80] 2013 USA	17,568/211	Median 55	Not reported	ICD–codes in the Humedica database	ICD–O in the Humedica database	–	systemic treatment	–
Fuxench[37] 2016	198,366/497 937,716/2,128	46.21 +/– 17.36 mild	102,541/95,825 524,672/413,044	At least one diagnostic Read	a series of Read codes for cancer	HR_{adj} (CI)	–	Reference patients were

UK		49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference		code for psoriasis used in The Health Improvement Network (THIN)	used in The Health Improvement Network (THIN)	1.15 (1.03–1.27)		from same General Practice as subjects
LI[53] 2016 USA	1,120/14 63,770/429	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis, confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR_{adj} (CI) 1.05 (0.61–1.79)	–	Participants in the Nurses' Health Study
Fiorentino[54] 2017 International	12,092/29	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–
Avina–Zubieta[74] 2018 Canada	81,568/705 81,568/589	Mean 48.5 Mean 48.5	51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code) from an administrative health database	Cancer–registry, British Columbia, Canada	IRR_{adj} (CI) 1.17 (1.05–1.31)	–	Matched controls from an administrative health database
Lee[41] 2018 Korea	892,089/2,596 4,460,445/11,096	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10 code for psoriasis from the National Health Insurance Service database	ICD–10 codes (C00–C96) for cancer in the National Health Insurance Service database	HR_{adj} (CI) 1.16 (1.11–1.21)	–	Matched controls from National Health Insurance Service

table 1j. Details of studies included in analysis for colon cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Pittelkow[2] 1981 UK	260/2	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Jones[6] 1985 UK	719/6	–	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Stern[95] 1988 USA	1,380/15	50 +/– 14	368/588	Hospital diagnosed psoriasis	Patient interviews, medical records and interviews of next of kin	SIR_{adj} (CI) 2.06 (1.3–3.2)	PUVA	–
Lindelof[43] 1990 Sweden	20,328/24	Mean 48	11,292/9,036 female	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	–	–	–
Grossman[10] 1996 Frankrig	122/1	–	–	Review of hospital records	Not reported	–	Cyclosporin	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/60	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.3 (1.0–1.6)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1738/3	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 0.86 (0.2–2.5)	Climatotherapy	–

Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/3	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 0.9 (0.2–2.7)	Trioxalen bath PUVA	–
Hannuksela–Svahn[14] 2000 Finland	5,687/20	–	2,555/3,132	The national discharge register linked with the Population Central register	Patients were linked to the Finnish National cancer registry via personal identification numbers	SIR_{adj} (CI) 0.9 (0.5–1.3)	–	–
Paul[17] 2003 International	1,252/3	43.3 +/– 14	32%/68%	Not reported	Malignancies were verified by the investigators	SIR_{adj} (CI) 2.1 (1.6–2.9)	Cyclosporine	–
Ji[49] 2009 Sweden	15,858/82	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	SIR_{adj} (CI) 1.03 (0.82–1.27)	–	–
Brunasso[22] 2011 Italy	103/1	–	–	Review of case files	Not reported	SIR_{adj} (CI) 7.13 (0.18–39.73)	Biologics	–
Hemminki[96] (Ann Oncol.) 2012b Sweden	222,027 person–years/112	–	–	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	SIR_{adj} (CI) 2.19 (0.98–1.44)	–	–
van Lümig[23] 2011 The Netherlands	173/1	50.6 +/– 12.1	64/109	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
Prizment[50] 2011 USA	719/22 32,191/925	67.8 +/– 3 68.1 +/– 3.2	719 32,191	(ICD–9) code 696.1 from Medicare claims of participants in the Iowa's Women's Health Study	ICD–O codes from the State Health Registry of Iowa	HR_{adj} 1.6 (1.0–2.4)	–	Participants in the Iowa's Women's Health Study

Lan[25] 2012 Taiwan	8,180/61 163,600/930	47.5 +/– 17.3 47.4 +/– 17.3	3,738/4,442 74,760/88,840	ICD–9 codes for psoriasis from The National Health Insurance Program database	ICD–O codes for cancer from The National Health Insurance Program database	–	–	Matched controls
Puig[26] 2012 Spain	444/2	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	–
Le[80] 2013 USA	17,568/193	Median 55	Not reported	ICD–codes for psoriasis in the Humedica database	ICD–O for cancer in the Humedica database	–	systemic treatment	–
Fuxench[37] 2016 UK	198,366/629 937,716/3,080	46.21 +/– 17.36 mild 49.20 +/– 15.03 moderate 49.73 +/– 17.53 reference	102,541/95,825 524,672/413,044	At least one diagnostic Read code for psoriasis used in The Health Improvement Network (THIN)	a series of Read codes for cancer used in The Health Improvement Network (THIN)	HR_{adj} (CI) 1.08 (0.98–1.20)	–	Reference patients were from same General Practice as subjects
Avina–Zubieta[74] 2018 Canada	81,568/286 81,568/332	Mean 48.5 Mean 48.5	51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code) from an administrative health database	Cancer–registry, British Columbia, Canada	IRR_{adj} (CI) 0.84 (0.72–0.99)	–	Matched controls from an administrative health database

table 1k. Details of studies included in analysis for rectal cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Stern[95] 1988 USA	1,380/6	50 +/– 14	368/588	Hospital diagnosed psoriasis	Patient interviews, medical records and interviews of next of kin	SIR_{adj} (CI) 1.67 (0.8–3.1)	PUVA	–
Lindelof[43] 1990 Sweden	20,328/19	Mean 48	11,292/9,036	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	–	–	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/24	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 0.9 (0.6–1.4)	–	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/3	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 1.3 (0.3–3.8)	Trioxalen bath PUVA	–
Ji[49] 2009 Sweden	15,858/54	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	SIR_{adj} (CI) 1.18 (0.89–1.27)	–	–
Hemminki[96] (Ann Oncol.) 2012b Sweden	222,027 person–years/65	–	–	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	SIR_{adj} (CI) 1.23 (0.95–1.56)	–	–
Lan[25] 2012	8,180/24 163,600/409	47.5 +/– 17.3 47.4 +/– 17.3	3,738/4,442 74,760/88,840	ICD–9 codes for psoriasis from The	ICD–O codes for cancer from The	–	–	Matched controls

Taiwan				National Health Insurance Program database	National Health Insurance Program database			
Brănişteanu[31] 2015 Romania	57/1	–	–	Diagnosed by dermatologist	Not reported	–	TNF–alpha–inhibitors	–
Avina–Zubieta[74] 2018 Canada	81,568/157 81,568/194	Mean 48.5 Mean 48.5	51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code) from an administrative health database	Cancer–registry, British Columbia, Canada	IRR_{adj} (CI) 0.79 (0.64– 0.98)	–	Matched controls from an administrative health database

table 1l. Details of studies included in analysis for colorectal cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Stern[95] 1988 USA	1,380/21	50 +/– 14	368/588	Hospital diagnosed psoriasis	Patient interviews, medical records and interviews of next of kin	–	PUVA	–
Lindelof[43] 1990 Sweden	20,328/43	Mean 48	11,292/9,036 female	The Swedish psoriasis association's membership registry	The Swedish National Cancer Registry	SIR_{adj} (CI) 0.76 (0.6–1.1)	–	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/84	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	–	–	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/6	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	–	Trioxalen bath PUVA	–
Brauchli[48] 2009 UK	33,760/79 34,001/55		53.1%/46.9% 53.2%/46.8%	A diagnosis of psoriasis in the UK General Practice Research Database	A cancer diagnosis in the UK General Practice Research Database and appropriate treatment	IRR_{adj} (CI) 1.35 (0.97–1.90)	–	Matched controls from the UK General Practice Research Database
Ji[49] 2009 Sweden	15,858/136	–	–	ICD–7, 8, 9 and 10 codes for psoriasis from the Swedish hospital discharge register	ICD–7 codes for cancer from the Swedish Cancer Registry	–	–	–

Chen[93] 2011 Taiwan	3,686/15	44.00 +/– 19.62	1,445/2,241	ICD–codes from the Longitudinal Health Insurance Database	"Cancer catastrophic illness certificate", which requires cytological or pathological evidence	HR_{adj} (CI) 1.70 (1.01–2.86)	–	–
Hemminki[96] (Ann Oncol.) 2012b Sweden	222,027 person–years/172	–	–	The Swedish Hospital Discharge Register	The Swedish Cancer Registry	–	–	–
Lan[25] 2012 Taiwan	8,180/85 163,600/930	47.5 +/– 17.3 47.4 +/– 17.3	3,738/4,442 74,760/88,840	ICD–9 codes for psoriasis from The National Health Insurance Program database	ICD–O codes for cancer from The National Health Insurance Program database	–	–	Matched controls
LI[53] 2016 USA	1,120/20 63,770/697	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis, confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR_{adj} (CI) 1.11 (0.71–1.73)	–	Participants in the Nurses' Health Study
Fiorentino[54] 2017 International	12,092/14	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–
Magnano[55] 2017 Italy	359/2	Mean 60		Review of clinical records	Not reported	–	–	–
Avina–Zubieta[74] 2018 Canada	81,568/443 81,568/526	Mean 48.5 Mean 48.5	51.5%/49.5% 51.5%/49.5%	Diagnostic codes for psoriasis (1 by dermatologist, 2 by non–dermatologist or hospitalized with diagnostic code)	Cancer–registry, British Columbia, Canada	–	–	Matched controls from an administrative health database

				from an administrative health database				
Lee[41] 2018 Korea	892,089/3,987 4,460,445/20,437	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10 code for psoriasis from the National Health Insurance Service database	ICD–10 codes (C00–C96) for cancer in the National Health Insurance Service database	HR_{adj} (CI) 0.96 (0.93–0.99)	–	Matched controls from National Health Insurance Service

table 1m. Details of studies included in analysis for bladder cancer in patients with psoriasis								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Bailin[1] 1975 USA	205/1	–	–	Hospital diagnosed psoriasis	Not reported	–	Methotrexate	–
Pittelkow[2] 1981 UK	260/1	–	–	Records from patients hospitalized for psoriasis	Skin cancer: biopsy Other cancers: Self–reported	–	Coal tar	–
Alderson[4] 1983 Scotland	8,405/22	–	–	Discharge records with a psoriasis diagnosis	ICD–O from the Scottish National cancer registry	SIR (p–value) 1.12 (<0.75)	–	–
Jones[6] 1985 UK	719/2	Not reported	414/305	Not reported	Data sources from the West of Scotland cancer registry	–	Tar	–
Frentz[11] (BJD 141) 1999a Denmark	6,905/34	–	3,487/3,418	ICD–8: 696 from the Danish National hospital discharge register	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 1.0 (0.7–1.4)	–	–
Frentz[12] (BJD 140) 1999b Denmark	1,738/2	Mean 43	866/872	Hospital diagnosed psoriasis	ICD–O from The National Danish cancer registry	SIR_{adj} (CI) 0.67 (0.1–2.3)	Climatotherapy	–
Hannuksela–Svahn[45] (BJD) 1999b Sweden and Finland	944/3	Mean 43–44	363/581	Hospital diagnosed psoriasis	The National Swedish and Finnish Cancer Registries	SIR (CI) 1.1 (0.2–3.2)	Trioxalen bath PUVA	–
Hannuksela–Svahn[14] 2000	5,687/25	–	2,555/3,132	The national discharge register linked with the	Patients were linked to the Finnish National cancer	Sir_{adj} (CI) 1.4 (0.9–2.1)	–	–

Finland				Population Central register	registry via personal identification numbers			
Roelofzen[86] 2009 The Netherlands	4,315/25 8,885/33	Mean 31,1	48%/52%	Hospital diagnosed psoriasis	Medical files and questionnaires supplemented by record linkage to the National Cancer Registry	HR_{adj} (CI) 0.51 (0.14–1.92)	Coal tar	Patients with hospital diagnosed eczema
Chen[93] 2011 Taiwan	3,686/8	44.00 +/– 19.62	1,445/2,241	ICD–codes from the Longitudinal Health Insurance Database	"Cancer catastrophic illness certificate", which requires cytological or pathological evidence	HR_{adj} (CI) 3.18 (1.54–6.57)	–	–
Laws[91] 2011 UK/Ireland	129/1	46.0 +/– 11.4	60/69	Diagnosed at a clinical center	Not reported	–	Ustekinumab	–
Liu[97] Sweden 2012	19,777/110	–	–	ICD–codes for psoriasis from the Swedish hospital discharge register	ICD–O codes for cancer from the Swedish Cancer Registry	SIR_{adj} (CI) 1.28 (1.06–1.55)	–	–
Staumont–Salle[27] 2012 France	306/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic systemic treatment	–
Esposito[36] 2016 Italy	350/1	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	Biologics	–
LI[53] 2016 USA	1,120/7 63,770/232	61.0 +/– 6.8 60.8 +/– 6.8	1,220 63,770	Self–reported psoriasis confirmed using the Psoriasis Screening Tool questionnaire	Not reported	HR_{adj} (CI) 1.10 (0.52–2.35)	–	Participants in the Nurses' Health Study

Fiorentino[54] 2017 International	12,092/8	48 +/– 13.91	5,456/6,636	Dermatologist	Cancers were reported by treating dermatologist	–	Systemic treatment	–
Napolitano[56] 2017 Italy	915/1	Mean 58.7	420/495	Dermatologist	Not reported	–	Systemic treatment	–
Lee[41] 2018 Korea	892,089/762 4,460,445/3,538	48.3 +/– 16.57 4.3 +/– 16.57	430,917/461,172	At least two hospital/clinic visits with an ICD–10 code for psoriasis from the National Health Insurance Service database	ICD–10 codes (C00–C96) for cancer in the National Health Insurance Service database	HR_{adj} (CI) 1.05 (0.97–1.13)	–	Matched controls from National Health Insurance Service

table 1n. Details of studies included in analysis for cancer overall for patients with psoriasis treated with biologics								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Ahmad[20] 2006 Ireland	49/2	Mean 51.6	17/32	Treated for psoriasis by a dermatologist	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Antoniou[21] 2010 Greece	118/3	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Brunasso[22] 2011 Italy	103/6	–	–	Review of case files	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
van Lümig[23] 2011 The Netherlands	173/9	50.6 +/– 12.1	64/109	Hospital diagnosed psoriasis	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Puig[26] 2012 Spain	444/6	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	Patients with psoriasis receiving conventional therapy
Staumont–Salle[27] 2012 Frankrig	266/9	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologics	Patients with psoriasis receiving

								conventional therapy
Conti[28] 2013 Italy	45/2	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Kimball[30] 2014 USA	2,510/122	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Brănişteanu[31] 2015 Romania	57/2	–	–	Diagnosed by dermatologist	Not reported	–	TNF–alpha–inhibitors	Patients with psoriasis receiving conventional therapy
Spehr[34] 2015 Germany	–	Mean 47	40.5% female	Eligible for inclusion in Psobest registry	Not reported	IR/PY 0.86/100 0.7/100	Biologics	Patients with psoriasis receiving conventional therapy
Asgari[35] 2016 USA	2,285/184 3,604/505	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	–	Biologics	Patients with psoriasis receiving conventional therapy
Esposito[36] 2016 Italy	350/4	48.4 +/– 13.1	42%/68 %	Hospital diagnosed psoriasis	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy

Vergou[38] 2016 Greece	93/3	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	Patients with psoriasis receiving conventional therapy
Menter[39] 2017 International	6,051/247	47.0 +/– 18–94	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	Patients with psoriasis receiving conventional therapy
Wu[42] 2018 USA	9,878/225 32,794/734	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	Biologics	Patients with psoriasis receiving conventional therapy

table 1o. Details of studies included in analysis for cancer excluding keratinocyte cancer for patients with psoriasis treated with biologics								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Antoniou[21] 2010 Greece	118/3	49 (19–80)	36/82	Hospital diagnosed psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Brunasso[22] 2011 Italy	103/5	–	–	Review of case files	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Puig[26] 2012 Spain	444/4	46.48 +/– 13.6	45.5%/65.5%	Patients treated for psoriasis in on of 59 dermatology units in Spain	Physical examination and laboratory test every three months	–	Etanercept	Patients with psoriasis receiving conventional therapy
Staumont–Salle[27] 2012 France	266/8	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Conti[28] 2013 Italy	45/2	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Kimball[30] 2014 USA	2,510/60	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR_{adj} (CI) 0.78 (0.59–1.00)	Etanercept	Patients receiving nonbiologic

								systemic therapies from the MarketScan database
Menter[52] 2015 International	6,059/166	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	Patients with psoriasis receiving conventional therapy
Papp[98] 2015 International	10,009/267 2,084/57	–	4391/5618	Dermatologist	Assessed by the study physician following review of patient data (including histopathology when available)	–	Biologics	Patients with psoriasis receiving non–biologic systemic treatment in the PSOLAR registry
Asgari[35] 2016 USA	2,285/75 3,604/254	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	HR_{adj} (CI) 0.86 (0.66–1.13)	Biologics	Patients with psoriasis receiving conventional therapy
Vergou[38] 2016 Greece	93/1	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	Patients with psoriasis receiving conventional therapy
Magnano[55] 2017 Italy	214/6 145/3	Mean 60		Review of clinical records	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy

Napolitano[56] 2017 Italy	534/4 381/4	Mean 58.7	420/495	Dermatologist	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Wu[42] 2018 USA	9,878/103 32,916/341	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	Biologics	Patients with psoriasis receiving conventional therapy

table 1p. Details of studies included in analysis for keratinocyte cancer for patients with psoriasis treated with biologics								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Ahmad[20] 2006 Ireland	49/2	Mean 51.6	17/32	Treated for psoriasis by a dermatologist	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Warren[65] 2008 UK	102/1	45 +/– 19	59/43	Hospital diagnosed psoriasis	Physical examination		Biologics	Patients with psoriasis receiving conventional therapy
Brunasso[22] 2011 Italy	103/1	–	–	Review of case files	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Puig[26] 2012 Spain	444/2	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	Patients with psoriasis receiving conventional therapy
Staumont–Salle[27] 2012 Frankrig	266/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologic– and non–biologic Biologics	Patients with psoriasis receiving conventional therapy
Kimball[30] 2014 USA	2,510/66	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR_{adj} (CI) 0.54 (0.42–0.69)	Etanercept	Patients receiving nonbiologic

								systemic therapies from the MarketScan database
Egeberg[99] 2015 Denmark	3,225/37	46.5 +/– 15.5	1,217/2,008	The DERMBIO registry contains data on all Danish patients with moderate–to–severe plaque psoriasis treated with biologics	Not reported		Biologics	Patients with psoriasis receiving conventional therapy
van Lümig[68] 2015 The Netherlands	280/11	46.8 +/– 11.9	99/181	Dermatologist	Cytopathology	–	TNF–alpha inhibitors	Patients with psoriasis receiving conventional therapy
Menter[52] 2015 International	6,059/112	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	Patients with psoriasis receiving conventional therapy
Asgari[35] 2016 USA	2,285/109 3,604/280	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	HR_{adj} (CI) 1.42 (1.12–1.80)	Biologics	Patients with psoriasis receiving conventional therapy
Vergou[38] 2016 Greece	93/2	Mean 48.7	43/50	Hospital diagnosed psoriasis	Not reported	–	Ustekisumab	Patients with psoriasis receiving conventional therapy

Mason[76] 2018 UK	5,672/74 3,188/22	–	–	Included in BADBIR	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Wu[42] 2018 USA	9,878/122	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	Biologics	Patients with psoriasis receiving conventional therapy

table 1q. Details of studies included in analysis for lymphoma overall for patients with psoriasis treated with biologics								
Reference/ year of publication/ country	Psoriasis all/ psoriasis with cancer/ reference all/ reference with cancer	Age Psoriasis/reference	Sex Psoriasis females/males/ reference females/males	Assessment of psoriasis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Puig[26] 2012 Spain	444/1	46.48 +/– 13.6	45.5%/65.5%	Hospital diagnosed psoriasis	Physical examination and laboratory test every three months	–	Etanercept	Patients with psoriasis receiving conventional therapy
Staumont–Salle[27] 2012 Frankrig	266/1	Mean 47	104/202	Hospital diagnosed psoriasis	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Conti[28] 2013 Italy	45/1	58.29 +/– 13.12	14/31	Hospital diagnosed psoriasis	Not reported	–	Etanercept	Patients with psoriasis receiving conventional therapy
Kimball[30] 2014 USA	2,510/2	46.3 +/– 13.6	1,194 /1,317	Patients eligible for etanercept for their psoriasis	Not reported	SIR_{adj} (CI) 0.26 (0.03–0.95)	Etanercept	Patients receiving nonbiologic systemic therapies from the MarketScan database
Menter[52] 2015 International	6,059/2	47.0 (18–94)	2,566/3,493	Dermatologist	Not reported	–	Adalimumab	Patients with psoriasis receiving conventional therapy

Asgari[35] 2016 USA	2,285/6 3,604/15	51.00 +/– 15	2,914/2,975	ICD–9 code 696.1 and systemic psoriasis treatment in the Kaiser Permanente Northern California database	ICD–O codes for cancer from Kaiser Permanente Northern California Cancer Registry	HR_{adj} (CI) 1.01 (0.38–2.70)	Biologics	Patients with psoriasis receiving conventional therapy
Magnano[55] 2017 Italy	214/1	Mean 60		Review of clinical records	Not reported	–	Biologics	Patients with psoriasis receiving conventional therapy
Wu[42] 2018 USA	9,878/15 32,916/65	–	22,154/20,640	2 ICD–codes for psoriasis, one by a dermatologist, from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	ICD–O codes for cancer from the Truven Health Analytics MarketScan Commercial Claims and Encounters Database	–	Biologics	Patients with psoriasis receiving conventional therapy

table 1r. Details of studies included in analysis for cancer overall in patients with PsA								
Reference/ year of publication/ country	Psoriatic arthritis all/ Psoriatic arthritis with cancer/ reference all/ reference with cancer	Age Psoriatic arthritis /reference Median (range) or mean +/– SD	Sex Psoriatic arthritis females/males/ reference females/males	Assessment of Psoriatic arthritis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Rohekar[100] 2008 Canada	665/68	–	38/30	Diagnosed by rheumatologist and included in the Toronto PsA Cohort	Pathology, laboratory, or radiography reports	SIR_{adj} (CI) 0.98 (0.77–1.24)	–	–
Wade[101] 2013 USA	3,874/604	–	53.5%/46.7%	2 claims with an ICD–9 code 696.0 from the MarketScan database	Not reported	–	–	–
Gross[102] 2014 USA	4,216/40 26,133/307	51.1 +/– 12.5 57.6 +/– 13.5	1,524/2,692 14,676/11,457	Diagnosed by rheumatologist and included in the CORRONA registry	Physician–reported, confirmed by treating rheumatologist	IRR_{adj} (CI) 1.17 (0.82–1.69)	–	Patients in the CORRONA registry with rheumatoid arthritis
Mahbouba[103] 2014 Turkey	29/2	44 (22–61)	13/16	Not reported	Not reported	–	–	–
Fagerli[104] 2015 UK	709/34	45.7 +/– 11.2	378/331	Diagnosed by rheumatologist and included in the British Society for Rheumatology Register	ICD–10 codes for cancer in the national cancer registry	SIR_{adj} (CI) 0.94 (0.65–1.34)	TNF–alpha–inhibitors	–
Hagiwara[105] 2015 Japan	115/4	64.3 (24–90)	84/31	Fulfilled the CASPAR criteria	Not reported	–	–	–

de Vlam[106] 2015 Belgium	301/4	48.3 +/– 10.8	135/166	Physician diagnosed and included in the PROVE study	–	–	Etanercept	–
Chiricozzi[107] 2016 Italy	199/3	52.3 +/– 12.1	98/101	Hospital diagnosed PsA	Not reported	–	Adalimumab	–
Costa[108] 2016 Italy	618/44	52.1 +/– 12.8	377/241	Fulfilled the CASPAR criteria	Laboratory–, radiography or pathology–data confirming malignancies	–	TNF–alpha–inhibitors and DMARDs	–
Hagberg[109]* 2016 UK	8,493/547 82,601/4,961	47.11 +/– 14.61 47.76 +/– 14.35	4,352/4,141 43,373/39,228	diagnosis codes for psoriatic arthritis in the UK Clinical Practice Research Datalink (CPRD).	Automated searches of the electronic records of all patients in the study	–	–	Patients from the CPRD with no psoriasis or psoriatic arthritis, matched on age, sex, and general practice attended
Hellgren[110] 2016 Denmark and Sweden	19,791/793 74,010/3,227	–	–	(ICD10=M07.0–3 and L40.5) code by a dermatologist in registers ARTIS or DANBIO	The Danish and Swedish national cancer registers	RR_{adj} (CI) TNF–I–treated: 0.9 (0.7–1.1) TNF–I–naïve: 1.0 (0.8–1.2)	TNF–alpha–inhibitors	matched general population comparators from Sweden
Wilton[111] 2016 USA	217/11 434/25	43.9 +/– 14.2 44.0 +/– 14.2	40%/60% 40%/60%	Fulfilled the CASPAR criteria	A cancer diagnosis in the Mayo Clinic Cancer Registry or from medical charts (keratinocyte cancer)	HR_{adj} (CI) 1.41 (0.96–2.07)	–	Age– and sex–matched controls
Mease[112] 2018	1493/–	–	–	Diagnosed by rheumatologist and	Physician–reported, confirmed by	IR/ PY 11.4/1,000	–	–

USA				included in the CORRONA registry	treating rheumatologist			
*The study reported on all hematologic, keratinocyte cancer and solid cancers, which is interpreted as all cancers.								

table 1s. Details of studies included in analysis for cancer excluding keratinocyte cancer in patients with PsA								
Reference/ year of publication/ country	Psoriatic arthritis all/ Psoriatic arthritis with cancer/ reference all/ reference with cancer	Age Psoriatic arthritis /reference Median (range) or mean +/– SD	Sex Psoriatic arthritis females/males/ reference females/males	Assessment of Psoriatic arthritis	Assessment of cancer	Results	Treatment investigated	Characteristics of reference population
Gross[102] 2014 USA	4,216/25 26,133/198	51.1 +/– 12.5 57.6 +/– 13.5	1,524/2,692 14,676/11,457	Diagnosed by rheumatologist and included in the CORRONA registry	Physician–reported, confirmed by treating rheumatologist	IRR_{adj} (CI) 1.17 (0.82–1.69)	–	Patients in the CORRONA registry with rheumatoid arthritis
Fagerli[104] 2015 UK	709/17	45.7 +/– 11.2	378/331	Diagnosed by rheumatologist and included in the British Society for Rheumatology Register	ICD–10 codes for cancer in the national cancer registry	SIR_{adj} (CI) 0.94 (0.65–1.34)	TNF–alpha–inhibitors	–
de Vlam[106] 2015 Belgium	301/4	48.3 +/– 10.8	135/166	Physician diagnosed and included in the PROVE study	–	–	Etanercept	–
Costa[108] 2016 Italy	618/41	52.1 +/– 12.8	377/241	Fulfilled the CASPAR criteria	Laboratory–, radiography or pathology–data confirming malignancies	–	TNF–alpha–inhibitors and DMARDs	–
Hagberg[109]* 2016 UK	8,493/387 82,601/3,400	47.11 +/– 14.61 47.76 +/– 14.35	4,352/4,141 43,373/39,228	diagnosis codes for psoriatic arthritis in the UK Clinical Practice Research Datalink (CPRD).	Automated searches of the electronic records of all patients in the study	–	–	Patients from the CPRD with no psoriasis or psoriatic arthritis, matched on age, sex, and

								general practice attended
Wilton[111] 2016 USA	217/30 434/45	43.9 +/– 14.2 44.0 +/– 14.2	40%/60% 40%/60%	Fulfilled the CASPAR criteria	A cancer diagnosis in the Mayo Clinic Cancer Registry or from medical charts (keratinocyte cancer)	HR_{adj} (CI) 1.41 (0.96–2.07)	–	Age– and sex–matched controls
Chiricozzi[107] 2016 Italy	199/2	52.3 +/– 12.1	98/101	Hospital diagnosed PsA	Not reported	–	Adalimumab	–
*The study reported on all hematologic and solid cancers, which is interpreted as all cancers excluding keratinocyte cancer.								

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eTable 2 – Newcastle Ottawa scale

	Selection	comparability	Outcome	Total
Bailin (1975)[1]	2		1	3
Pittelkow (1981)[2]	1		2	3
Halprin (1982)[3]	3		1	4
Alderson (1983)[4]	2	2	2	6
Nyfors (1983)[5]	1	2	2	5
Jones (1985)[6]	2	2	2	6
Peng (1985)[7]	2		0	2
Liu (1989)[8]	2		1	3
Powles (1990)[9]	1		2	3
Grossman (1996)[10]	2		1	3
Frentz (1999a)[11]	2		2	4
Frentz (1999b)[12]	1	2	3	6
Hannuksela–Svahn (1999a)[13]	1	2	2	5
Hannuksela–Svahn (2000)[14]	2	2	3	7
Haustein (2000)[15]	2		1	3
Margolis (2001)[16]	4	2	2	8
Paul (2003)[17]	2	2	1	5
Weischer (2004)[18]	2		3	5
Smith (2006)[19]	1		2	3

Ahmad (2006)[20]	1		1	2
Antoniou (2010)[21]	1		0	1
Brunasso (2011)[22]	1	1	1	3
van Lümig (2011)[23]	1	2	1	4
Garcia–Doval (2012)[24]	2		0	2
Lan (2012)[25]	3	2	2	7
Puig (2012)[26]	1		1	2
Staumont–Salle (2012)[27]	1		1	2
Conti (2013)[28]	2		1	3
Gulliver (2014)[29]	2		0	2
Kimball (2014)[30]	2	2	2	6
Brănişteanu (2015)[31]	2		2	4
Feldman (2015)[32]	3	2	1	6
Lijnen (2015)[33]	1		1	2
Spehr (2015)[34]	2		0	2
Asgari (2016)[35]	2		2	4
Esposito (2016)[36]	1		1	2
Fuxench (2016)[37]	4	2	2	8
Vergou (2016)[38]	1		2	3
Menter (2017)[39]	1		3	4
Kreimer (2018)[40]	2		0	2

Lee (2018)[41]	4	2	2	8
Wu (2018)[42]	1	2	1	4
Lindelof (1990)[43]	1	2	2	5
Stern (1995)[44]	1		1	2
Hannuksela–svahn (1999b)[45]	1		3	4
Lindelof (1999)[46]	2	1	3	6
Väkevä (2008)[47]	2	2	2	6
Brauchli (2009)[48]	4	2	1	7
Ji (2009)[49]	3	2	2	7
Prizment (2011)[50]	4	2	3	9
Yun (2014)[51]	3	2	1	6
Menter (2015)[52]	1		2	3
Li (2016)[53]	4	2	2	8
Fiorentino (2017)[54]	3		1	4
Magnano (2017)[55]	1		2	3
Napolitano (2017)[56]	2		0	2
Menter (1983)[57]	1		1	2
Reshad (1984)[58]	1		1	2
Leone (1985)[59]	1		1	2
Torinuki (1988)[60]	1		2	3
Forman (1989)[61]	1		2	3

Takashima (1990)[62]	1		1	2
Mali–Gerrit (1991)[63]	2		2	4
van Praag (1993)[64]	1		2	3
Warren (2008)[65]	1		0	1
Lee (2012)[66]	4	2	2	8
Stern (2012)[67]	2	2	3	7
van Lümig (2015)[68]	3	2	2	7
Dai (2016)[69]	4	2	3	9
Egeberg (2016)[70]	4	2	3	9
Maiorino (2016)[71]	1		3	4
Paradisi (2017)[72]	2	2	2	6
Serrano (2017)[73]	2		2	4
Avina–Zubieta (2018)[74]	3	2	3	8
Lin (2018)[75]	3		3	6
Mason (2018)[76]	2		0	2
Raone (2018)[77]	3		3	6
Stern (2001)[78]	2		3	5
Hearn (2008)[79]	2	2	3	7
Le (2013)[80]	2		1	3
Reddy (2016)[81]	4	2	2	8
Gelfand (2003)[82]	4	2	2	8

Gelfand (2006)[83]	3	2	3	8
Stern (2006)[84]	2	2	3	7
Stern (1997)[85]	2	2	3	7
Roelofzen (2009)[86]	2		3	5
Fallah (2014a)[87]	2	2	3	7
Fallah (2014b)[88]	2	2	3	7
Kamstrup (2018)[89]	4	2	2	8
Olsen (1992)[90]	2	2	3	7
Laws (2012)[91]	1		1	2
Stern (1997)[92]	2	2	3	7
Chen (2011)[93]	4	2	2	8
Hemminiki (2012)[94]	3	2	3	8
Stern (1988)[95]	2	2	3	7
Hemminiki (2011)[96]	3	2	3	8
Liu (2012)[97]	3	2	3	8
Papp (2015)[98]	1		2	3
Egeberg (2018)[99]	1		1	2
Rohekar (2008)[100]	3	2	2	7
Wade (2013)[101]	2		0	2
Gross (2014)[102]	3	2	2	7
Mahbouba (2014)[103]	1		0	1

Fagerli (2015)[104]	2	2	3	7
Hagiwara (2016)[105]	3		2	5
de Vlam (2015)[106]	1		2	3
Chiricozzi (2017)[107]	1		1	2
Costa (2016)[108]	3	2	3	8
Hagberg (2016)[109]	4	2	2	8
Hellgren (2017)[110]	4	2	3	9
Wilton (2016)[111]	4	2	2	8
Mease (2018)[112]	3		2	5
Lange (2016)[113]	3		2	5
Carmona (2011)[114]	3	2	2	7

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eTable 3 – Egger bias of prevalence according to different cancer types

Group	Number of studies	Number of patients	Egger bias (95% CI)	P–value
Cancer overall	41	1,214,030	4.32 (1.09–7.55)	0.0101
Cancer excluding keratinocyte cancer	41	373,597	3.06 (0.15–6.27)	0.0614
keratinocyte cancer	48	374,895	4.29 (1.31–7.28)	0.0057
Melanoma	31	519,267	2.42 (0.55–4.28)	0.013
Lymphoma overall	28	1,598,836	2.94 (1.26–4.62)	0.0013
Non–Hodgkin's lymphoma	13	395,213	2.13 (–0.39–4.66)	0.0901
Hodgkin's lymphoma	8	376,984	0.92 (–0.51–2.35)	0.1651
Breast cancer	26	613,429	3.56 (1.19–5.92)	0.0048
Lung cancer	29	825,435	2.27 (–0.31–4.86)	0.0824
Colon cancer	19	362,314	1.84 (–0.15–3.83)	0.0676
Rectal cancer	8	135,220	1.63 (–0.96–4.21)	0.1743
Colorectal cancer	13	1,077,432	0.92 (–3.06–4.90)	0.6211
Bladder cancer	18	959,642	1.92 (0.68–3.16)	0.0047
Biologics – Cancer overall	14	22,422	1.21 (–1.46–3.87)	0.343

Biologics – Cancer excluding keratinocyte cancer	13	32,558	1.39 (–1.43–4.20)	0.3017
Biologics – Keratinocyte cancer	13	30,966	1.17 (–1.42–3.75)	0.342
Biologics – Lymphoma overall	8	21,701	0.91 (–0.24–2.06)	0.1009
PsA – Cancer overall	13	39,608	3.13 (–3.51–9.77)	0.3221
PsA – Cancer excluding keratinocyte cancer	7	13,507	2.82 (–6.42–12.06)	0.4682
PsA – Keratinocyte cancer	9	23,096	4.67 (–1.94–11.28)	0.1385
PsA – Melanoma	6	32,408	0.89 (–1.22–3.00)	0.3063
PsA – Lymphoma overall	4	23,546	0.18 (–2.94–3.30)	0.826
PsA – Breast cancer	6	2,546	1.19 (–0.32–2.71)	0.094
PsA – Lung cancer	4	20,924	1.12 (–1.71–3.96)	0.2302
PsA – Colorectal cancer	7	24,234	0.31 (–1.74–2.35)	0.716

PsA = Psoriatic arthritis. Bio = Biological treatment.

eTable 4 – Egger bias of incidence according to different cancer types

Group	Number of studies	Patient years	Egger bias (95% CI)	
Cancer overall	17	4,637,131	6.95 (3.09–10.80)	0.0016
Cancer excluding keratinocyte cancer	17	277,062	3.29 (0.75–5.83)	0.0147
keratinocyte cancer	19	198,191	7.51 (1.65–13.37)	0.0151
Melanoma	18	2,819,678	0.72 (–1.15–2.59)	0.4273
Lymphoma overall	13	7,946,421	4.11 (1.40–6.81)	0.006
Non–Hodgkin's lymphoma	7	2,096,160	1.49 (–0.91–3.89)	0.171
Hodgkin's lymphoma	6	2,045,729	1.31 (–1.46–4.07)	0.2604
Breast cancer	15	2,898,716	7.44 (–3.22–18.11)	0.1247
Lung cancer	13	6,650,880	2.77 (–1.10–6.64)	0.1438
Colon cancer	11	2,259,188	0.90 (–1.07–2.86)	0.3299
Rectal cancer	4	922,621	1.51 (–0.15–3.18)	0.0597
Colorectal cancer	8	5,540,749	1.89 (–7.01–3.24)	0.4029
Bladder cancer	7	939,408	2.23 (–0.50–4.95)	0.0894
Biologics – Cancer overall	6	45,005	1.81 (–3.94–7.55)	0.4317
Biologics – Cancer excluding keratinocyte cancer	4	20,863	–0.44 (–7.21–6.33)	0.8071

Biologics – Keratinocyte cancer	6	70,904	5.15 (–0.02–10.33)	0.0507
Biologics – Lymphoma overall	3	41,997	–	–
PsA – Cancer overall	9	23,630	1.06 (–7.58–9.70)	0.7804
PsA – Cancer excluding keratinocyte cancer	5	13,091	–2.04 (–8.80–4.73)	0.4089
PsA – Keratinocyte cancer	6	22,620	7.31 (–5.18–19.80)	0.1793
PsA – Melanoma	4	31,482	1.02 (–2.43–4.46)	0.3327
PsA – Lymphoma overall	3	23,329	–	–
PsA – Breast cancer	4	2,375	1.94 (–2.20–6.09)	0.1811
PsA – Lung cancer	2	20,042	–	–
PsA – Colorectal cancer	5	23,902	0.07 (–1.66–1.80)	0.9076

PsA = Psoriatic arthritis. Bio = Biological treatment.

eTable 5 – Egger bias of risk estimates according to different cancer types

Group	Number of studies	Number of patients	Egger bias (95% CI)	P–value
Cancer overall	14	1,147,009	2.32 (–1.15–5.79)	0.1715
Cancer excluding keratinocyte cancer	15	292,228	1.61 (–0.82–4.03)	0.1758
keratinocyte cancer	17	387,173	35.95 (–45.79–117.68)	0.3634
Melanoma	16	456.924	0.33 (–0.92–1.57)	0.5833
Lymphoma overall	15	1,512,417	0.80 (–0.76–2.37)	0.2862
Non–Hodgkin's lymphoma	9	377,594	0.32 (–1.81–2.46)	0.7316
Hodgkin's lymphoma	6	375,475	–0.79 (–4.35–2.77)	0.5714
Breast cancer	13	582,645	1.11 (–0.06–2.27)	0.0611
Lung cancer	14	789,630	0.61 (–1.11–2.34)	0.4531
Colon cancer	13	341,673*	0.89 (–1.82–3.60)	0.4837
Rectal cancer	8	135,163*	1.01 (–1.67–3.70)	0.391
Colorectal cancer	10	1,060,351*	1.82 (–0.96–4.60)	0.1689
Bladder cancer	9	940,980	0.42 (–0.59–1.44)	0.3563
Biologics – Cancer overall	3	12,163**	–	–

Biologics – Cancer excluding keratinocyte cancer	6	25,430	0.08 (–2.74–2.90)	0.943
Biologics – Keratinocyte cancer	4	20,345	1.24 (–25.68–28.17)	0.8609
Biologics – Lymphoma overall	3	14,673	–	–
PsA – Cancer overall	6	32,979	0.35 (–1.42–2.12)	0.6124
PsA – Cancer excluding keratinocyte cancer	3	11,680	–	–
PsA – Keratinocyte cancer	6	20,786	0.23 (–4.62–5.08)	0.9012
PsA – Melanoma	4	31,081	0.43 (–3.80–4.67)	0.7017
PsA – Lymphoma overall	3	22,928	–	–
PsA – Breast cancer	3	1,611	–	–
PsA – Lung cancer	3	20,623	–	–
PsA – Colorectal cancer	4	23,200	1.02 (–0.17–2.21)	0.066

*Includes a study by Hemminiki et al. (2011) which does not report number of patients with psoriasis.

** Includes a study by Spehr et al. (2015) which does not report number of patients with psoriasis.

PsA = Psoriatic arthritis. Bio = Biological treatment.

eTable 6 – Prevalence and quality assessment according to different cancer types – sensitivity analysis – year of publication

Group	Number of studies	Number of patients	Prevalence, % (95% CI)	I^2, % (95% CI)	Cochran Q
			Random effects		
Cancer overall, –1999	11	19,046	5.81 (3.64–8.44)	97 (95.3–97.6)	338.39 (df = 10) P < 0.0001
Cancer overall, 2000–2009	7	24,983	4.60 (02.57–7.18)	96.8 (95.6–97.5)	188.21 (df = 6) P < 0.0001
Cancer overall, 2010–	21	1,169,536	3.96 (3.11–4.90)	99.5 (99.5–99.5)	4,047.88 (df = 20) P < 0.0001
Cancer excluding keratinocyte cancer, –1999	13	37,532	5.28 (3.36–7.61)	98.3 (98–98.5)	695.39 (df = 12) P < 0.0001
Cancer excluding keratinocyte cancer, 2000–2009	7	56,800	4.59 (2.29–7.64)	99.2 (99.1–99.3)	782.80 (df = 6) P < 0.0001
Cancer excluding keratinocyte cancer, 2010–	21	279,265	3.23 (2.39–4.19)	98.7 (98.6–98.8)	1,546.43 (df = 20) P < 0.0001
Keratinocyte cancer, –1999	18	13,020	2.86 (1.98–3.89)	86.2 (79.7–89.9)	122.92 (df = 17) P < 0.0001

Keratinocyte cancer, 2000–2009	5	7,247	2.28 (1.91–2.67)	2.8 (0–65.1)	4.12 (df = 4) P = 0.3904
Keratinocyte cancer, 2010–	25	536,899	2.43 (1.79–3.16)	99.5 (99.5–99.5)	4,805.38 (df = 24) P < 0.0001
Melanoma, –1999	6	34,964	0.21 (0.16–0.28)	18.1 (0–67.7)	6.11 (df = 5) P = 0.2959
Melanoma, 2000–2009	8	60,364	0.35 (0.17–0.59)	90.4 (83.7–93.5)	72.70 (df = 7) P < 0.0001
Melanoma, 2010–	17	423,939	0.33 (0.22–0.47)	96.3 (95.5–96.9)	437.14 (df = 16) P < 0.0001
Lymphoma overall, –1999	6	21,910	0.38 (0.08–0.89)	70.6 (0–85.5)	16.98 (df = 5) P = 0.0045
Lymphoma overall, 2000–2009	7	202,309	0.40 (0.26–0.58)	92.4 (87.3–94.8)	78.47 (df = 6) P < 0.0001
Lymphoma overall, 2010–	15	1,374,617	0.19 (0.13–0.28)	97.8 (97.4–98.1)	639.42 (df = 14) P < 0.0001
Non–Hodgkin's lymphoma, –1999	3	28,177	0.22 (0.03–0.62)	94.1 (86.3–96.6)	34.16 (df = 2) P < 0.0001
Non–Hodgkin's lymphoma, 2000–2009	5	176,144	0.42 (0.19–0.73)	94.5 (90.7–96.3)	73.01 (df = 4) P < 0.0001

Non–Hodgkin's lymphoma, 2010–	5	190,892	0.28 (0.19–0.38)	80.7 (40.8–90.1)	20.76 (df = 4) P = 0.0004
Hodgkin's lymphoma, –1999	2	27,238	0.02 (0.01–0.04)	0 (/–/)	0.0 (df = 1) P = 0.9616
Hodgkin's lymphoma, 2000–2009	3	160,264	0.09 (0.01–0.24)	85.7 (31.8–93.5)	14.01 (df = 2) P = 0.0009
Hodgkin's lymphoma, 2010–	3	189,482	0.04 (0.02–0.07)	78.3 (0–91.3)	9.22 (df = 2) P = 0.0099
Breast cancer, –1999	7	16,991	1.84 (1.10–2.76)	88.1 (77.3–92.5)	50.61 (df = 6) P < 0.0001
Breast cancer, 2000–2009	5	23,002	1.66 (0.63–3.17)	95.7 (93.2–97)	93.82 (df = 4) P < 0.0001
Breast cancer, 2010–	14	573,436	1.51 (0.90–2.14)	99 (98.9–99.1)	1,283.72 (df = 13) P < 0.0001
Lung cancer, –1999	11	20,748	0.98 (0.63–1.41)	79.6 (61.4–87.1)	49.02 (df = 10) P < 0.0001
Lung cancer, 2000–2009	7	61,092	0.94 (0.39–1.73)	97.8 (97.1–98.2)	271.12 (df = 6) P < 0.0001
Lung cancer, 2010–	11	743,595	0.75 (0.51–1.02)	98.7 (98.4–98.8)	746.72 (df = 10) P < 0.0001
Colon cancer, –1999	8	32,396	0.58 (0.24–1.08)	92.9 (88.8–95)	97.92 (df = 7)

					P < 0.0001
Colon cancer, 2000–2009	3	22,797	0.43 (0.30–0.58)	46.1 (0–83.7)	3.71 (df = 2)
					P = 0.1564
Colon cancer, 2010–	8	307,121	0.75 (0.50–1.05)	96.7 (95.6–97.4)	212.98 (df = 7)
					P < 0.0001
Rectal cancer, –1999	4	29,557	0.28 (0.10–0.55)	87.2 (62.6–93.2)	23.36 (df = 3)
					P < 0.0001
Rectal cancer, 2000–2009	–	–	–	–	–
Rectal cancer, 2010–	3	89,805	0.25 (0.13–0.39)	69.1 (0–88.9)	6.47 (df = 2)
					P = 0.0394
Colorectal cancer, –1999	4	29,557	0.82 (0.22–1.80)	97.2 (95.7–98)	107.55 (df = 3)
					P < 0.0001
Colorectal cancer, 2000–2009	2	49,618	0.50 (0.04–1.30)	98.8 (/–/)	84.94 (df = 1)
					P < 0.0001
Colorectal cancer, 2010–	7	998,257	0.55 (0.40–0.72)	95.2 (93–96.5)	125.69 (df = 6)
					P < 0.0001
Bladder cancer, –1999	7	19,176	0.34 (0.22–0.48)	36.8 (0–72.3)	9.50 (df = 6)
					P = 0.1473
Bladder cancer, 2000–2009	2	10,002	0.51 (0.38–0.66)	0 (/–/)	0.97 (df = 1)
					P = 0.325
Bladder cancer, 2010–	9	930,464	0.29 (0.12–0.53)	95.7 (94.1–96.7)	184.78 (df = 8)

P < 0.0001

eTable 7 – Incidence and quality assessment according to different cancer types – sensitivity analysis – year of publication

Group	Number of studies	Patient years	Incidence, per 1,000 PY (95% CI)	I^2, % (95% CI)	Cochran Q
			Random effects		
Cancer overall, –1999	4	81,146	9.04 (6.28–12.30)	88.9 (70.8–93.9)	27.12 (df = 3)
					P < 0.0001
Cancer overall, 2000–2009	3	121,994	12.02 (4.27–23.62)	99.4 (99.3–99.5)	363.08 (df = 2)
					P < 0.0001
Cancer overall, 2010–	10	4,433,990	13.14 (8.43–18.86)	99.2 (99.1–99.3)	1,125.87 (df = 9)
					P < 0.0001
Cancer excluding keratinocyte cancer, –1999	5	84,484	7.12 (4.47–10.60)	92.5 (85.9–95.3)	53.65 (df = 4)
					P < 0.0001
Cancer excluding keratinocyte cancer, 2000–2009	3	240,855	5.53 (4.92–6.18)	63 (0–87.4)	5.40 (df = 2)
					P = 0.0671
Cancer excluding keratinocyte cancer, 2010–	9	1,338,149	8.65 (6.58–11.00)	97.7 (97.1–98.1)	340.96 (df = 8)
					P < 0.0001
keratinocyte cancer, –1999	5	82,166	4.38 (2.55–6.69)	88 (72.1–93.1)	33.33 (df = 4)
					P < 0.0001

keratinocyte cancer, 2000–2009	2	81,992	3.03 (0.79–6.71)	92.1 (/–/)	12.70 (df = 1) P = 0.0004
keratinocyte cancer, 2010–	12	2,501,550	4.52 (3.01–6.33)	99.6 (99.6–99.7)	3,039.53 (df = 11) P < 0.0001
Melanoma, –1999	3	79,941	0.26 (0.16–0.38)	0 (0–72.9)	0.03 (df = 2) P = 0.9851
Melanoma, 2000–2009	5	289,706	0.33 (0.14–0.60)	88.3 (73.3–93.2)	34.33 (df = 4) P < 0.0001
Melanoma, 2010–	10	2,450,031	0.44 (0.33–0.56)	89.4 (82.9–92.7)	85.07 (df = 9) P < 0.0001
Lymphoma overall, –1999	–	–	–	–	–
Lymphoma overall, 2000–2009	6	974,273	0.51 (0.36–0.68)	81.3 (51.8–89.7)	26.74 (df = 5) P < 0.0001
Lymphoma overall, 2010–	8	6,976,504	0.31 (0.19–0.44)	98 (97.5–98.4)	355.21 (df = 7) P < 0.0001
Non–Hodgkin's lymphoma, –1999	–	–	–	–	–
Non–Hodgkin's lymphoma, 2000–2009	3	801,466	0.31 (0.24–0.40)	38.6 (0–82.1)	3.26 (df = 2) P = 0.1961
Non–Hodgkin's lymphoma, 2010–	3	1,230,521	0.41 (0.27–0.57)	88.6 (57.0–94.5)	17.55 (df = 2) P = 0.0002

Hodgkin's lymphoma, –1999	–	–	–	–	–
Hodgkin's lymphoma, 2000–2009	3	801,614	0.07 (0.05–0.09)	5.7 (0–74.4)	2.12 (df =2) P = 0.3464
Hodgkin's lymphoma, 2010–	2	1,208,653	0.07 (0.02–0.15)	92.7 (/–/)	13.69 (df = 1) P = 0.0002
Breast cancer, –1999	–	–	–	–	–
Breast cancer, 2000–2009	2	121,245	1.41 (0.77–2.25)	90.3 (/–/)	10.30 (df =1) P = 0.0013
Breast cancer, 2010–	4	2,777,471	2.47 (1.45–3.76)	99.4 (99.3–99.5)	525.17 (df = 3) P < 0.0001
Lung cancer, –1999	3	79,941	1.38 (0.62–2.43)	83.3 (3.8–92.7)	12.00 (df = 2) P = 0.0025
Lung cancer, 2000–2009	3	240,923	0.80 (0.31–1.52)	94.3 (87–96.7)	35.39 (df = 2) P < 0.0001
Lung cancer, 2010–	7	6,330,016	0.84 (0.59–1.12)	98.2 (97.8–98.5)	337.26 (df = 6) P < 0.0001
Colon cancer, –1999	4	93,165	0.75 (0.42–1.16)	63.5 (0–85.5)	8.21 (df = 3) P = 0–0419
Colon cancer, 2000–2009	2	82,013	0.40 (0.09–0.93)	57 (/–/)	2.32 (df = 1) P = 0.1275

Colon cancer, 2010–	5	2,084,010	0.58 (0.44–0.74)	89.2 (76.3–93.7)	37.16 (df = 4) P < 0.0001
Rectal cancer, –1999	2	77,397	0.40 (0.27–0.55)	0 (/–/)	0.30 (df = 1) P = 0.5838
Rectal cancer, 2000–2009	–	–	–	–	–
Rectal cancer, 2010–	2	845,224	0.26 (0.23–0.30)	6.6 (/–/)	1.07 (df = 1) P = 0.3009
Colorectal cancer, –1999	2	77,397	1.37 (1.12–1.64)	0 (/–/)	0.71 (df = 1) P = 0.3982
Colorectal cancer, 2000–2009	–	–	–	–	–
Colorectal cancer, 2010–	5	5,304,446	0.73 (0.58–0.89)	92.6 (86–95.3)	53.73 (df = 4) P < 0.0001
Bladder cancer, –1999	2	74,719	0.42 (0.17–0.77)	55.4 (/–/)	2.24 (df = 1) P = 0.1342
Bladder cancer, 2000–2009	–	–	–	–	–
Bladder cancer, 2010–	4	4,747,307	0.26 (0.13–0.43)	94.1 (88.6–96.3)	50.82 (df = 3) P < 0.0001

eTable 8 – Risk estimates and quality assessment according to different cancer types – sensitivity analysis – year of publication

Group	Number of studies	Number of patients	Risk ratio (95% CI) Random effects	I^2, % (95% CI)	Cochran Q
Cancer overall, –1999	7	18,323	1.10 (0.87–1.40)	89.8 (81.4–93.4)	58.58 (df = 6) P < 0.0001
Cancer overall, 2000–2009	3	24,559	1.45 (1.15–1.84)	83.7 (8.5–92.8)	12.27 (df = 2) P = 0.0022
Cancer overall, 2010–	4	1,104,127	1.15 (1.01–1.30)	98.3 (97.6–98.7)	174.90 (df = 3) P z 0.0001
Cancer excluding keratinocyte cancer, –1999	7	12,806	1.11 (0.97–1.27)	77.1 (41.5–87.4)	26.24 (df = 6) P = 0.0002
Cancer excluding keratinocyte cancer, 2000–2009	3	49,681	1.22 (1.08–1.39)	68.5 (0–88.7)	6.35 (df = 2) P = 0.0417
Cancer excluding keratinocyte cancer, 2010–	5	208,307	1.13 (0.96–1.33)	84.8 (59.8–91.7)	26.32 (df = 4) P < 0.0001
keratinocyte cancer, –1999	6	9,897	3.00 (2.40–3.74)	69.2 (0–84.9)	16.21 (df = 5) P = 0.0063
keratinocyte cancer, 2000–2009	2	6,939	3.08 (0.81–11.75)	97.4 (/–/)	37.99 (df = 1)

					P <0.0001
keratinocyte cancer, 2010–	9	365,337	1.90 (1.32–2.73)	100 (0–infinity)	302,651.13 (df = 8) P < 0.0001
Melanoma, –1999	5	34,704	1.15 (0.90–1.45)	0 (0–64.1)	0.44 (df = 4)
					P = 0.9787
Melanoma, 2000–2009	5	58,687	0.98 (0.71–1.35)	29.7 (0–73.8)	5.69 (df = 4)
					P = 0.2236
Melanoma, 2010–	6	363,533	1.19 (0.98–1.45)	78.3 (39.1–88.5)	23.04 (df = 5)
					P = 0.0003
Lymphoma overall, –1999	2	21,047	0.80 (0.42–1.50)	11.6 (/–/)	1.13 (df = 1)
					P = 0.2876
Lymphoma overall, 2000–2009	7	202,309	1.89 (1.51–2.36)	44.7 (0–75.1)	10.86 (df = 6)
					P = 0.0928
Lymphoma overall, 2010–	6	1,289,061	1.44 (1.24–1.66)	75.7 (27.1–87.4)	20.60 (df = 5)
					P = 0.001
Non–Hodgkin’s lymphoma, –1999	3	28,177	1.58 (0.71–3.52)	76.4 (0–90.8)	8.48 (df = 2)
					P = 0.0121
Non–Hodgkin’s lymphoma, 2000–2009	3	174,742	1.52 (1.23–1.88)	52.4 (0–85)	4.20 (df = 2)
					P = 0.1224
Non–Hodgkin’s lymphoma, 2010–	3	190,488	1.45 (1.26–1.66)	31 (0–80.4)	2.90 (df = 2)
					P = 0.2349

Hodgkin's lymphoma, –1999	2	27,238	0.73 (0.30–1.74)	0 (/–/)	0.13 (df = 1) P = 0.702
Hodgkin's lymphoma, 2000–2009	2	158,884	2.16 (1.09–4.29)	69.4 (/–/)	3.26 (df = 1) P = 0.0708
Hodgkin's lymphoma, 2010–	2	189,353	2.05 (1.60–2.63)	0 (/–/)	0.48 (df = 1) P = 0.4865
Breast cancer, –1999	4	16,132	1.19 (0.92–1.55)	61.7 (0–85)	7.84 (df = 3) P = 0.0495
Breast cancer, 2000–2009	4	22,954	1.14 (0.87–1.50)	58.5 (0–84.1)	7.22 (df = 3) P = 0.0651
Breast cancer, 2010–	5	543,559	1.02 (0.95–1.09)	50.5 (0–80)	8.07 (df = 4) P = 0.0889
Lung cancer, –1999	3	17,048	1.21 (0.85–1.72)	80.3 (0–91.8)	10.17 (df = 2) P = 0.0062
Lung cancer, 2000–2009	6	60,935	1.24 (0.91–1.70)	82.3 (55.9–90.2)	28.30 (df = 5) P < 0.0001
Lung cancer, 2010–	5	712,366	1.19 (1.11–1.26)	33.5 (0–74.9)	6.01 (df = 4) P = 0.1983
Colon cancer, –1999	5	31,295	1.14 (0.76–1.73)	66.5 (0–85)	11.93 (df = 4) P =0.0179
Colon cancer, 2000–2009	3	22,797	1.02 (0.85–1.24)	0 (0–72.9)	1.88 (df = 2)

					P = 0.3899
Colon cancer, 2010–	5	288,833*	1.29 (0.92–1.82)	94.4 (90.4–96.3)	71.38 (df = 4)
					P < 0.0001
Rectal cancer, –1999	4	29,557	0.99 (0.76–1.30)	0 (0–67.9)	2.22 (df = 3)
					P = 0.5288
Rectal cancer, 2000–2009	–	–	–	–	–
Rectal cancer, 2010–	3	89,748*	1.03 (0.75–1.41)	75.3 (0–90.5)	8.10 (df = 2)
					P = 0.0174
Colorectal cancer, –1999	3	28,613	1.17 (0.76–1.79)	83.2 (1.4–92.7)	11.88 (df = 2)
					P = 0.0026
Colorectal cancer, 2000–2009	2	49,618	1.15 (0.94–1.39)	23.3 (/–/)	1.30 (df = 1)
					P = 0.2535
Colorectal cancer, 2010–	5	982,120*	1.15 (0.90–1.47)	93.8 (89.1–95.9)	64.86 (df = 4)
					P < 0.0001
Bladder cancer, –1999	4	17,992	1.03 (0.80–1.33)	0 (0–67.9)	0.57 (df = 3)
					P = 0.9041
Bladder cancer, 2000–2009	2	10,002	1.46 (1.07–1.99)	0 (/–/)	0.11 (df = 1)
					P = 0.7443
Bladder cancer, 2010–	3	912,986	1.14 (1.00–1.29)	31.7 (0–80.6)	2.93 (df = 2)
					P = 0.2311

*Includes a study by Hemminiki et al. (2011) which does not report number of patients with psoriasis.

eTable 9 – Risk estimates and quality assessment according to different cancer types – sensitivity analysis – high quality

Group	Number of studies	Number of patients	Risk ratio (95% CI) Random effects	I^2, % (95% CI)	Cochran Q
Cancer overall	5	1,121,942	1.12 (1.01–1.25)	97.6 (96.7–98.2)	168.38 (df = 4) P < 0.0001
Cancer excluding keratinocyte cancer	5	249,923	1.14 (0.97–1.33)	95.9 (93.6–97.1)	98.04 (df = 4) P = 0.0012
keratinocyte cancer	7	362,864	1.94 (1.31–2.86)	100 (100–100)	302,647.09 (df = 6) P < 0.0001
Melanoma	10	420,968	1.11 (0.94–1.30)	66.4 (19–81.2)	26.77 (df = 9) P = 0.0015
Lymphoma overall	11	1,484,545	1.63 (1.43–1.86)	74.8 (48.6–84.7)	39.67 (df = 10) P < 0.0001
Non–Hodgkin's lymphoma	6	365,230	1.47 (1.32–1.62)	30.5 (0–71.8)	7.19 (df = 5) P = 0.2066
Hodgkin's lymphoma	5	355,147	1.97 (1.61–2.433)	10.1 (0–67.6)	4.45 (df = 4) P = 0.3483
Breast cancer	8	564,528	1.04 (0.96–1.13)	60.4 (0–79.9)	17.69 (df = 7)

					P = 0.0134
Lung cancer	8	767,671	1.29 (1.13–1.46)	84 (67.8–90.2)	43.67 (df = 7)
					P < 0.0001
Colon cancer	8	310,378*	1.26 (0.80–1.62)	91.1 (85.2–9.9)	78.46 (df = 7)
					P < 0.0001
Rectal cancer	5	106,986*	1.09 (0.87–1.38)	63.3 (0–84)	10.91 (df = 4)
					P = 0.0276
Colorectal cancer	8	1,033,118*	1.21 (1.01–1.46)	90.9 (85.0–93.8)	77.30 (df = 7)
					P < 0.0001
Bladder cancer	4	918,673	1.16 (1.03–1.32)	29.7 (0.0–76.5)	4.27 (df = 3)
					P = 0.2339

*Includes a study by Hemminiki et al. (2011) which does not report number of patients with psoriasis.

