Twin Research and Human Genetics

**Twins and their risks of cancer as children, teenagers or young adults: Updated meta-analysis and retrospective Swedish cohort study**

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The Supplement summarises the sets of terms (and results per line of each search term used) deployed in the 4 searches conducted between October 2016 and September 2021. The searches were conducted by Helen Elwell in close consultation over their specification with Michael Murphy. He iteratively reviewed all the potentially relevant abstracts retrieved, as new papers emerged over the period potentially containing relevant data, particularly about assisted reproduction and childhood cancer risk. The aim was to achieve as complete a capture as possible of all papers containing data that could directly contribute to the meta-analysis. The 367 abstracts retrieved in the final search were jointly reviewed by Michael Murphy and Rema Ramakrishnan

Helen Elwell is one of the Library and Evidence Support Information Specialists (LESIS) in the Corporate & Member Development Department of the British Medical Association (BMA). Her work on the subject of this paper was Peer reviewed by her LESIS colleagues Nikki Myall, Kirsty Morrison and Chloe Turner at the BMA.

**September 2021**

Database: Embase <1974 to 2021 September 20>, Ovid MEDLINE(R) ALL <1946 to September 20, 2021>

Search Strategy:

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1 exp Neoplasms/ (8347727)

2 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$).mp. (9981131)

3 exp Leukemia/ (565945)

4 exp Sarcoma/ (341815)

5 exp Lymphoma/ (495142)

6 (sarcoma$ or lymphoma$).mp. (868334)

7 (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$).mp. (1516492)

8 or/1-7 (11169449)

9 adolescent/ or exp child/ or exp infant/ (7311531)

10 (child$ or adolescen$ or teenage$ or prenatal$ or postnatal$ or birth or infant$ or infancy or paediatric$ or pediatric$ or offspring).mp. (9203545)

11 in utero.mp. (67472)

12 or/9-11 (9404270)

13 8 and 12 (1187724)

14 exp multiple birth offspring/ or exp twins/ (69414)

15 exp Pregnancy, Multiple/ (38638)

16 (twin$ adj2 pregnancy).mp. (21703)

17 multiple birth$.mp. (6430)

18 (twin birth$ or quadruplets or quintuplets or triplets or twins).mp. (111854)

19 Diseases in twins/ (40047)

20 twin membership.mp. (16)

21 exp Reproductive Techniques, Assisted/ (190252)

22 exp infertility therapy/ (116544)

23 (assisted reproducti$ or fertility treatment$ or assisted conception or ART).mp. (371360)

24 or/14-23 (646081)

25 13 and 24 (15215)

26 exp risk/ (4000425)

27 risk$1.mp. (7305078)

28 cancer susceptibility/ (41723)

29 (cancer$ adj3 (susceptib$ or incidence or prevalen$)).mp. (234536)

30 ((sarcoma$ or lymphoma$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$ or neoplasm$ or malignan$ or tumor$ or tumour$) adj3 (susceptib$ or incidence or prevalen$)).mp. (80413)

31 or/26-30 (7530903)

32 25 and 31 (5413)

33 exp \*Neoplasms/ or exp \*Leukemia/ or exp \*Sarcoma/ or exp \*Lymphoma/ (6679111)

34 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$ or (sarcoma$ or lymphoma$) or (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).tw. (8313896)

35 or/33-34 (9826294)

36 32 and 35 (4529)

37 exp \*multiple birth offspring/ or exp \*twins/ or exp \*Pregnancy, Multiple/ or \*Diseases in twins/ (55846)

38 ((twin$ adj2 pregnancy) or multiple birth$ or (twin birth$ or quadruplets or quintuplets or triplets or twins) or twin membership).tw. (91033)

39 exp \*Reproductive Techniques, Assisted/ (107459)

40 exp \*infertility therapy/ (57398)

41 (assisted reproducti$ or fertility treatment$ or assisted conception or ART).tw. (308697)

42 or/37-41 (493601)

43 36 and 42 (3445)

44 exp \*risk/ or \*cancer susceptibility/ (395758)

45 (cancer$ adj3 (susceptib$ or incidence or prevalen$)).tw. (147724)

46 ((sarcoma$ or lymphoma$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$ or neoplasm$ or malignan$ or tumor$ or tumour$) adj3 (susceptib$ or incidence or prevalen$)).tw. (79147)

47 or/44-46 (609608)

48 43 and 47 (432)

49 (multiple birth offspring or quadruplets or quintuplets or triplets or twins).ti. (29758)

50 (childhood adj2 (cancer$ or malignan$ or tumor$ or tumour$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).ti. (25392)

51 (risk$ adj3 (cancer$ or malignan$ or tumor$ or tumour$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).ti. (110575)

52 or/50-51 (134962)

53 49 and 52 (78)

54 (multiple birth offspring or quadruplets or quintuplets or triplets or twins).ti. (29758)

55 (cancer$ or malignan$ or tumor$ or tumour$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$).ti. (4588725)

56 (child$ or neonat$ or infancy or infant$ or p?ediatric).ti. (2731700)

57 54 and 55 and 56 (64)

58 48 or 53 or 57 (528)

59 remove duplicates from 58 (368) \*

*\*An additional duplicate reference was identified during a final check of the results in EndNote. The final total number of references is 367.*

**February 2021**

Database: Embase <1974 to 2021 February 17>, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily <1946 to February 17, 2021>

Search Strategy:

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1 exp Neoplasms/ (8058701)

2 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$).mp. (9645911)

3 exp Leukemia/ (547128)

4 exp Sarcoma/ (332968)

5 exp Lymphoma/ (478682)

6 (sarcoma$ or lymphoma$).mp. (841303)

7 (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$).mp. (1473878)

8 or/1-7 (10814934)

9 adolescent/ or exp child/ or exp infant/ (7115097)

10 (child$ or adolescen$ or teenage$ or prenatal$ or postnatal$ or birth or infant$ or infancy or paediatric$ or pediatric$ or offspring).mp. (8976590)

11 in utero.mp. (66033)

12 or/9-11 (9175202)

13 8 and 12 (1152110)

14 exp multiple birth offspring/ or exp twins/ (68605)

15 exp Pregnancy, Multiple/ (37708)

16 (twin$ adj2 pregnancy).mp. (20979)

17 multiple birth$.mp. (6325)

18 (twin birth$ or quadruplets or quintuplets or triplets or twins).mp. (110232)

19 Diseases in twins/ (39965)

20 twin membership.mp. (16)

21 exp Reproductive Techniques, Assisted/ (179364)

22 exp infertility therapy/ (108237)

23 (assisted reproducti$ or fertility treatment$ or assisted conception or ART).mp. (351589)

24 or/14-23 (615570)

25 13 and 24 (14294)

26 exp risk/ (3854566)

27 risk$1.mp. (6987429)

28 cancer susceptibility/ (41470)

29 (cancer$ adj3 (susceptib$ or incidence or prevalen$)).mp. (227692)

30 ((sarcoma$ or lymphoma$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$ or neoplasm$ or malignan$ or tumor$ or tumour$) adj3 (susceptib$ or incidence or prevalen$)).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy] (78115)

31 or/26-30 (7206720)

32 25 and 31 (5053)

33 exp \*Neoplasms/ or exp \*Leukemia/ or exp \*Sarcoma/ or exp \*Lymphoma/ (6443939)

34 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$ or (sarcoma$ or lymphoma$) or (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).tw. (8032136)

35 or/33-34 (9512098)

36 32 and 35 (4218)

37 exp \*multiple birth offspring/ or exp \*twins/ or exp \*Pregnancy, Multiple/ or \*Diseases in twins/ (55237)

38 ((twin$ adj2 pregnancy) or multiple birth$ or (twin birth$ or quadruplets or quintuplets or triplets or twins) or twin membership).tw. (89410)

39 exp \*Reproductive Techniques, Assisted/ (100986)

40 exp \*infertility therapy/ (52557)

41 (assisted reproducti$ or fertility treatment$ or assisted conception or ART).tw. (289711)

42 or/37-41 (467841)

43 36 and 42 (3233)

44 exp \*risk/ or \*cancer susceptibility/ (375438)

45 (cancer$ adj3 (susceptib$ or incidence or prevalen$)).tw. (142509)

46 ((sarcoma$ or lymphoma$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$ or neoplasm$ or malignan$ or tumor$ or tumour$) adj3 (susceptib$ or incidence or prevalen$)).tw. (77003)

47 or/44-46 (582370)

48 43 and 47 (412)

49 limit 48 to abstracts (407)

50 limit 49 to english language (390)

51 remove duplicates from 50 (277)

**March 2020**

Database: Embase <1974 to 2020 March 18>, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily <1946 to March 18, 2020>

Search Strategy:

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1 exp Neoplasms/ (7655197)

2 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$).mp. (9068600)

3 exp Leukemia/ (524828)

4 exp Sarcoma/ (319697)

5 exp Lymphoma/ (459446)

6 (sarcoma$ or lymphoma$).mp. (800895)

7 (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$).mp. (1407803)

8 or/1-7 (10197473)

9 adolescent/ or exp child/ or exp infant/ (6808859)

10 (child$ or adolescen$ or teenage$ or prenatal$ or postnatal$ or birth or infant$ or infancy or paediatric$ or pediatric$).mp. (8470518)

11 in utero.mp. (63096)

12 or/9-11 (8665640)

13 8 and 12 (1094086)

14 exp multiple birth offspring/ or exp twins/ (66598)

15 exp Pregnancy, Multiple/ (36156)

16 (twin$ adj2 pregnancy).mp. (19817)

17 multiple birth$.mp. (6016)

18 (twin birth$ or quadruplets or quintuplets or triplets or twins).mp. (106152)

19 Diseases in twins/ (39230)

20 twin membership.mp. (16)

21 or/14-20 (130591)

22 13 and 21 (4401)

23 exp risk/ (3612294)

24 risk$1.mp. (6428018)

25 cancer susceptibility/ (40464)

26 (cancer$ adj3 susceptib$).mp. (62905)

27 or/23-26 (6510822)

28 22 and 27 (1423)

29 limit 28 to yr="2016 -Current" (284)

30 remove duplicates from 29 (241)

31 limit 30 to english language (237)

32 limit 31 to abstracts (229)

**October 2016**

Database: Embase <1974 to 2016 October 06>, Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

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1 exp Neoplasms/ (6778963)

2 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$).mp. (7573593)

3 exp Leukemia/ (490324)

4 exp Sarcoma/ (299642)

5 exp Lymphoma/ (421887)

6 (sarcoma$ or lymphoma$).mp. (702603)

7 (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$).mp. (1247921)

8 or/1-7 (8624704)

9 adolescent/ or exp child/ or exp infant/ (6332463)

10 (child$ or adolescen$ or teenage$ or prenatal$ or postnatal$ or birth or infant$ or infancy or paediatric$ or pediatric$).mp. (7550573)

11 in utero.mp. (53840)

12 or/9-11 (7759976)

13 8 and 12 (962301)

14 exp multiple birth offspring/ or exp twins/ (86716)

15 exp Pregnancy, Multiple/ (32731)

16 (twin$ adj2 pregnancy).mp. (16546)

17 multiple birth$.mp. (5207)

18 twin birth$.mp. (1864)

19 or/14-18 (96485)

20 13 and 19 (3325)

21 exp risk/ (3284696)

22 risk$1.mp. (4964541)

23 cancer susceptibility/ (30709)

24 (cancer$ adj3 susceptib$).mp. (48023)

25 or/21-24 (5031341)

26 20 and 25 (1070)

27 exp \*Neoplasms/ or exp \*Leukemia/ or exp \*Sarcoma/ or exp \*Lymphoma/ (5500123)

28 (neoplasm$ or cancer$ or malignan$ or tumor$ or tumour$ or (sarcoma$ or lymphoma$) or (leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).ti. (3503760)

29 or/27-28 (6108242)

30 26 and 29 (593)

31 (child$ or adolescen$ or teenage$ or infant$ or infancy or paediatric$ or pediatric$).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fs, nm, kf, px, rx, an, eu, pm, ui] (6984935)

32 offspring.mp. (124160)

33 9 or 31 or 32 (7328585)

34 30 and 33 (453)

35 exp \*Pregnancy, Multiple/ (17251)

36 ((twin$ adj2 pregnancy) or multiple birth$ or twin birth$).ti. (5411)

37 14 or 35 or 36 (90050)

38 34 and 37 (384)

39 exp \*risk/ (395474)

40 \*cancer susceptibility/ (5305)

41 (risk$1 or (cancer$ adj3 susceptib$)).ti. (875502)

42 or/39-41 (970888)

43 38 and 42 (105)

44 remove duplicates from 43 (85)

45 exp \*multiple birth offspring/ or exp \*twins/ (44671)

46 (multiple birth offspring or quadruplets or quintuplets or triplets or twins).tw. (65659)

47 or/45-46 (82773)

48 44 and 47 (52)

49 (risk$ adj3 (cancer$ or malignan$ or tumor$ or tumour$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).ti. (80510)

50 (multiple birth offspring or quadruplets or quintuplets or triplets or twins).ti. (27442)

51 36 or 50 (32669)

52 49 and 51 (76)

53 remove duplicates from 52 (37)

54 48 or 53 (81)

55 limit 54 to abstracts (72)

56 limit 55 to english language (70)

57 from 56 keep 6-8,11,15,18,22-23,25-27,29-30,33-34,37,39-41,43,46,48-49,51-53,57,61,64,66-70 (34)

58 56 not 57 (36)

59 from 58 keep 3,9-11,13,17,24,26,31,33 (10)

60 58 not 59 (26)

61 \*Diseases in Twins/ (26363)

62 twin membership.tw. (16)

63 or/61-62 (26374)

64 et.fs. (4524945)

65 ep.fs. (2324998)

66 or/64-65 (6368741)

67 63 and 66 (4540)

68 29 and 67 (333)

69 25 and 68 (154)

70 twin study.ti. (3067)

71 69 not 70 (149)

72 twin$.ti. or twin membership.tw. (56225)

73 71 and 72 (124)

74 remove duplicates from 73 (92)

75 limit 74 to abstracts (77)

76 limit 75 to english language (74)

77 from 76 keep 1-5,7-8,10-12,15,18,21,23-25,27,29-33,36,44,46-47,51-52,58,66,68,72 (32)

78 76 not 77 (42)

79 60 or 78 (57)

80 from 79 keep 43,46 (2)

81 79 not 80 (55)

82 (childhood adj2 (cancer$ or malignan$ or tumor$ or tumour$ or leukaemia$ or leukemia$ or sarcoma$ or lymphoma$)).ti. (20837)

83 50 and 82 (36)

84 remove duplicates from 83 (20)

85 from 84 keep 1,9,18 (3)

86 84 not 85 (17)

87 limit 86 to abstracts (10)

88 limit 87 to english language (10)

89 81 or 88 (60)

90 from 89 keep 6 (1)

91 89 not 90 (59)