Appendix C – Summary statistics of datasets and p-value plots

Meta-analysis of selected cancers in petroleum refinery workers (after Schnatter et al., 2018^)

Note: Base study=base study 1st author name in Schnatter et al. (2018); RR=relative risk; LCL=lower confidence limit; UCL=upper confidence limit; bold, italicized p-value <0.05; p-values were calculated using the method of Altman, D. G., & Bland, J. M. (2011). How to obtain the p-value from a confidence interval. *British Medical Journal*, *343*, d2304. https://doi.org/10.1136/bmj.d2304. A p-value calculated as ≤0.0001 was recorded as 0.0001.

Chronic myeloid leukemia risk for petroleum refinery workers:

Base study	**RR**	**LCL**	**UCL**	**p-value**
Collingwood 1996	0.53	0.07	3.74	0.54263
Divine 1999a	1.05	0.60	1.85	0.87478
Gun 2006b	1.09	0.45	2.61	0.85800
Huebner 2004	1.68	0.88	3.23	0.11778
Lewis 2000a	1.08	0.35	3.35	0.90196
Rushton 1993a	0.89	0.50	1.61	0.70923
Satin 1996	0.85	0.38	1.88	0.70346
Satin 2002	0.45	0.14	1.39	0.17355
Tsai 2007	0.66	0.21	2.05	0.48425
Wong 2001a	1.31	0.55	3.15	0.55549
Wong 2001b	1.96	0.49	7.84	0.34689
Wongsrichanalia 1989	0.44	0.06	3.12	0.42318

Median RR = 0.97 (~1); range of the RR IQR (Interquartile Range) = 0.63−1.15

Mesothelioma risk for petroleum refinery workers (based on mesothelioma subgroup analysis using Schnatter et al. (2018) 'Best Methods' dataset):

Base study	**RR**	**LCL**	**UCL**	**p-value**
Devine 1999a	2.97	2.21	3.99	***0.0001***
Gamble 2000	2.43	1.35	4.39	***0.00321***
Gun 2006a	3.77	2.14	6.64	***0.0001***
Honda 1995	2.00	1.04	3.84	***0.03720***
Hornstra 1993	5.51	3.38	8.99	***0.0001***
Huebner 2009	2.44	1.83	3.24	***0.0001***
Kaplan 1986	2.41	1.26	4.64	***0.00817***
Lewis 2000a	8.68	5.77	13.06	***0.0001***
Tsai 2003	2.16	0.70	6.69	0.18215
Tsai 2007	2.50	1.63	3.83	***0.0001***

Median RR = 2.47 (>2); range of the RR IQR = 2.42−3.57

^ Schnatter, A. R., Chen, M., DeVilbiss, E. A., Lewis, R. J., & Gallagher, E. M. (2018). Systematic review and meta-analysis of selected cancers in petroleum refinery workers. *Journal of Occupational and Environmental Medicine*, *60(7)*, e329−e342. https://doi.org/10.1097/JOM.0000000000001336

Meta-analysis of elderly long-term exercise training−mortality & morbidity risk (after de Souto Barreto et al., 2019*)

Note: Base study=base study 1st author name in de Souto Barreto et al. (2019); RR=relative risk; LCL=lower confidence limit; UCL=upper confidence limit; bold, italicized p-value <0.05; p-values were calculated using the method of Altman, D. G., & Bland, J. M. (2011). How to obtain the p-value from a confidence interval. *British Medical Journal*, *343*, d2304. https://doi.org/10.1136/bmj.d2304. A p-value calculated as ≤0.0001 was recorded as 0.0001.

Outcome	No.	Base Study ID (n=69)	RR	LCL	UCL	*p-value*
Mortality	1	Belardinelli et al. 2012	0.38	0.13	1.15	0.08153
	2	Barnett et al. 2003	0.14	0.01	2.63	0.16736
	3	O’Connor et al. 2009	0.96	0.80	1.16	0.67980
	4	Campbell et al. 1997	0.50	0.09	2.70	0.43245
	5	El−Khoury et al. 2015	0.84	0.26	2.72	0.78350
	6	Galvão et al. 2014	3.00	0.13	71.92	0.50544
	7	Gianoudis et al. 2014	1.00	0.06	15.72	1.00000
	8	Hewitt et al. 2018	1.02	0.52	2.03	0.95866
	9	Karinkanta et al. 2007	0.33	0.01	7.93	0.52568
	10	Kemmler et al. 2010	0.33	0.01	8.10	0.52704
	11	King et al. 2002	0.32	0.01	7.68	0.51168
	12	Kovács et al. 2013	0.40	0.14	1.17	0.09039
	13	Lam et al. 2012	0.64	0.06	7.05	0.72673
	14	Lam et al. 2015	0.30	0.03	2.82	0.30309
	15	Lord et al. 2003	4.84	0.55	42.33	0.15519
	16	Merom et al. 2015	1.36	0.22	8.23	0.75225
	17	Pahor et al. 2006	0.99	0.14	6.97	0.99276
	18	Pahor et al. 2014/Gill et al. 2016	1.14	0.76	1.71	0.53739
	19	Patil et al. 2015	0.11	0.01	2.04	0.10355
	20	Pitkälä et al. 2013	0.25	0.06	1.14	0.06455
	21	Prescott et al. 2008	0.42	0.08	2.12	0.30363
	22	Rejeski et al. 2017	0.34	0.01	8.16	0.53914
	23	Rolland et al. 2007	0.88	0.34	2.28	0.80441
	24	Sherrington et al. 2014	1.10	0.46	2.63	0.84135
	25	Underwood et al. 2013	1.06	0.84	1.35	0.64301
	26	Van Uffelen et al. 2008	0.36	0.01	8.72	0.56573
	27	von Stengel et al. 2011	0.34	0.01	8.15	0.53907
	28	Voukelatos et al. 2015	9.09	0.49	167.75	0.13843
	29	Wolf et al. 2003	0.97	0.14	6.86	0.97786
Hospitalization	30	Belardinelli et al. 2012	0.30	0.15	0.62	***0.00092***
	31	O’Connor et al. 2009	0.97	0.91	1.03	0.34039
	32	Hambrecht et al. 2004	0.16	0.02	1.31	0.08551
	33	Hewitt et al. 2018	0.64	0.27	1.50	0.31209
	34	Kovács et al. 2013	2.00	0.19	21.21	0.57619
	35	Messier et al. 2013	8.54	0.46	157.06	0.14992
	36	Mustata et al. 2011	0.33	0.02	7.32	0.47075

(continued)

Outcome	No.	Base Study ID (n=69)	RR	LCL	UCL	*p-value*
Hospitalization	37	Pahor et al. 2006	0.99	0.68	1.44	0.96195
	38	Pahor et al. 2014/Gill et al. 2016	1.10	0.99	1.22	0.07332
	39	Pitkala et al. 2013	0.78	0.55	1.12	0.17166
	40	Rejeski et al. 2017	3.04	0.13	73.46	0.50161
	41	Rolland et al. 2007	1.82	0.95	3.49	0.07083
Injurious falls	42	Barnett et al. 2003	0.77	0.48	1.21	0.27108
	43	Campbell et al. 1997	0.67	0.45	1.00	***0.04892***
	44	El−Khoury et al. 2015	0.90	0.78	1.05	0.16541
	45	Hewitt et al. 2018	0.58	0.42	0.81	***0.00120***
	46	MacRae et al. 1994	0.16	0.01	2.92	0.20731
	47	Pahor et al. 2014/Gill et al. 2016	0.89	0.66	1.20	0.45350
	48	Patil et al. 2015	0.51	0.31	0.84	***0.00810***
	49	Pitkälä et al. 2013	0.65	0.39	1.09	0.10016
	50	Reinsch et al. 1992	1.46	0.37	5.81	0.60232
Fractures	51	Belardinelli et al. 2012	0.19	0.01	3.89	0.27847
	52	O'Connor et al. 2009	0.60	0.32	1.11	0.10725
	53	El−Khoury et al. 2015	0.88	0.60	1.25	0.50488
	54	Gianoudis et al. 2014	3.00	0.12	72.57	0.51161
	55	Hewitt et al. 2018	0.80	0.20	3.11	0.76275
	56	Karinkanta et al. 2007	1.00	0.15	6.73	1.00000
	57	Kemmler et al. 2010	0.49	0.19	1.25	0.13795
	58	Kovács et al. 2013	3.00	0.13	71.56	0.50509
	59	Lam et al. 2012	1.27	0.06	28.95	0.88844
	60	Pahor et al. 2014/Gil et al. 2016	0.87	0.63	1.19	0.39774
	61	Patil et al. 2015	0.66	0.28	1.59	0.35403
	62	Pitkälä et al. 2013	1.00	0.26	3.84	1.00000
	63	Reinsch et al. 1992	0.45	0.04	4.78	0.52344
	64	Rolland et al. 2007	2.50	0.50	12.44	0.26692
	65	Sherrington et al. 2014	0.92	0.46	1.85	0.82585
	66	Underwood et al. 2013	1.05	0.63	1.74	0.86094
	67	Villareal et al. 2011	0.52	0.05	5.39	0.59601
	68	von Stengel et al. 2011	0.58	0.18	1.87	0.36778
	69	Wolf et al. 2003	0.78	0.17	3.67	0.76405

Median RR = 0.80 (<1); range of the RR IQR = 0.42−1.05

* de Souto Barreto, P., Rolland, Y., Vellas, B., & Maltais, M. (2019). Association of long-term exercise training with risk of falls, fractures, hospitalizations, and mortality in older adults: a systematic review and meta-analysis. *JAMA Internal Medicine*, *179(3)*, 394–405. https://doi.org/10.1001/jamainternmed.2018.5406

Meta-analysis of smoking−lung squamous cell carcinoma risk (after Lee et al., 2012º)

Note: Base study=base study 1st author name in Lee et al. (2012); RR=relative risk; LCL=lower confidence limit; UCL=upper confidence limit; p-value calculated after Altman (2011); bold, italicized p-value <0.05; p-values were calculated using the method of Altman, D. G., & Bland, J. M. (2011). How to obtain the p-value from a confidence interval. *British Medical Journal*, *343*, d2304. https://doi.org/10.1136/bmj.d2304. A p-value calculated as ≤0.0001 was recorded as 0.0001.

Place	No.	Base Study ID (n=102)	RR	LCL	UCL	*p-value*
USA	1	1948 WYNDE4 m	12.79	6.19	26.14	***0.0001***
	2	1948 WYNDE4 f	2.82	2.55	13.31	***0.01380***
	3	1949 BRESLO c	3.69	2.06	6.62	***0.0001***
	4	1952 HAMMON m	16.88	6.29	45.29	***0.0001***
	5	1955 HAENSZ f	3.00	1.90	4.73	***0.0001***
	6	1957 BYERS1 m	8.29	5.29	13.00	***0.0001***
	7	1960 LOMBA2 f	4.24	2.40	7.50	***0.0001***
	8	1962 WYNDE2 m	19.72	6.21	62.59	***0.0001***
	9	1964 OSANN2 f	35.10	4.80	256.00	***0.00048***
	10	1966 WYNDE3 m	18.29	5.71	58.56	***0.0001***
	11	1966 WYNDE3 f	6.79	2.45	18.82	***0.00025***
	12	1968 HINDS f	16.13	7.66	33.97	***0.0001***
	13	1969 STAYNE m	3.47	2.17	5.56	***0.0001***
	14	1969 WYNDE6 m	18.59	12.74	27.13	***0.0001***
	15	1969 WYNDE6 f	32.37	17.66	59.35	***0.0001***
	16	1975 COMSTO m	8.07	1.91	34.02	***0.00452***
	17	1975 COMSTO f	46.20	2.74	778.83	***0.00784***
	18	1976 BUFFLE m	14.03	4.73	41.61	***0.0001***
	19	1976 BUFFLE f	13.04	3.99	42.66	***0.0001***
	20	1979 CORREA c	28.30	18.60	43.20	***0.0001***
	21	1979 SIEMIA m	22.70	6.90	75.20	***0.0001***
	22	1980 DORGAN m	18.90	7.00	51.30	***0.0001***
	23	1980 DORGAN f	11.10	7.20	17.10	***0.0001***
	24	1981 JAIN m	18.00	5.50	111.00	***0.00018***
	25	1981 JAIN f	25.50	7.93	156.00	***0.0001***
	26	1981 WU f	24.29	3.40	173.76	***0.00153***
	27	1983 BAND m	37.45	17.60	79.58	***0.0001***
	28	1984 BROWN2 m	11.10	9.50	12.90	***0.0001***
	29	1984 BROWN2 f	20.10	16.40	24.80	***0.0001***
	30	1984 OSANN m	36.10	17.80	73.30	***0.0001***
	31	1984 OSANN f	26.40	14.50	48.10	***0.0001***
	32	1984 SCHWAR m1	32.81	4.48	240.23	***0.0001***
	33	1984 SCHWAR m2	1.81	0.50	6.78	0.37881
	34	1984 SCHWAR f1	43.23	2.60	718.15	***0.00862***
	35	1984 SCHWAR f2	62.61	3.64	1076.10	***0.00441***
	36	1985 KHUDER m	7.82	3.87	15.77	***0.0001***
	37	1986 ANDERS f	25.57	10.29	63.56	***0.0001***
	38	1989 HEGMAN c	30.80	12.48	76.03	***0.0001***

(continued)

Place	No.	Base Study ID (n=102)	RR	LCL	UCL	*p-value*
Europe	39	1947 ORMOS m	10.14	2.41	42.79	***0.00165***
	40	1948 DOLL m	13.17	4.12	42.10	***0.0001***
	41	1948 DOLL f	2.13	1.06	4.27	***0.03311***
	42	1948 KREYBE m	10.87	3.47	34.04	***0.0001***
	43	1948 KREYBE f	2.29	0.89	5.88	0.08506
	44	1954 STASZE m	57.77	3.58	933.17	***0.00430***
	45	1954 STASZE f	32.45	1.32	800.04	***0.03297***
	46	1959 TIZZAN c	2.70	1.99	3.67	***0.0001***
	47	1964 ENGELA m	6.45	1.97	21.11	***0.00211***
	48	1966 TOKARS c	6.80	1.20	38.70	***0.03026***
	49	1971 NOU m	27.17	6.60	11.85	***0.0001***
	50	1971 NOU f	7.09	1.35	37.19	***0.02043***
	51	1972 DAMBER m	11.80	6.40	23.00	***0.0001***
	52	1975 ABRAHA m	92.66	5.77	1488.21	***0.00143***
	53	1975 ABRAHA f	5.35	2.22	12.90	***0.00021***
	54	1976 LUBIN2 m	16.66	12.69	21.86	***0.0001***
	55	1976 LUBIN2 f	5.78	4.34	7.71	***0.0001***
	56	1977 ALDERS m	14.70	3.40	63.64	***0.00035***
	57	1977 ALDERS f	6.09	2.68	13.82	***0.0001***
	58	1979 BARBON m	14.52	6.35	33.20	***0.0001***
	59	1979 DOSEME m	3.60	2.60	5.00	***0.0001***
	60	1980 JEDRYC m	12.84	5.58	29.55	***0.0001***
	61	1983 SVENSS f	12.62	3.97	40.14	***0.0001***
	62	1985 BECHER f	10.69	2.43	47.00	***0.00177***
	63	1987 KATSOU f	6.11	2.69	13.87	***0.0001***
	64	1988 JAHN m	23.03	7.29	72.81	***0.0001***
Asia	65	1961 ISHIMA c	21.00	3.38	868.40	***0.03122***
	66	1964 JUSSAW m	25.43	13.87	46.63	***0.0001***
	67	1965 MATSUD m	39.01	5.44	279.84	***0.00029***
	68	1976 CHAN m	15.22	3.61	64.12	***0.00023***
	69	1976 CHAN f	6.44	3.44	12.06	***0.0001***
	70	1976 LAMWK2 m	6.89	2.65	17.90	***0.0001***
	71	1976 LAMWK2 f	6.49	3.27	12.88	***0.0001***
	72	1976 TSUGAN m	14.55	0.75	283.37	0.07657
	73	1978 ZHOU m	3.14	1.90	5.18	***0.0001***
	74	1978 ZHOU f	3.81	1.50	9.68	***0.00496***
	75	1981 KOO f	4.15	2.46	6.98	***0.0001***
	76	1981 LAMWK f	10.54	4.19	26.52	***0.0001***
	77	1981 XU3 m	5.90	1.69	20.57	***0.00540***
	78	1981 XU3 f	25.67	4.99	131.94	***0.00012***
	79	1982 ZHENG m	16.82	6.05	46.71	***0.0001***
	80	1982 ZHENG f	5.45	3.11	9.54	***0.0001***
	81	1983 LAMTH f	8.10	4.16	15.77	***0.0001***

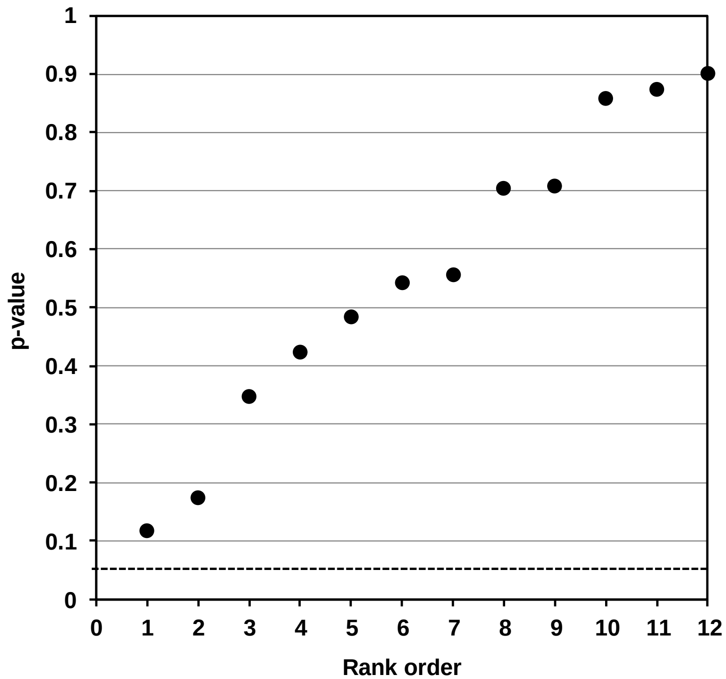
(continued)

Place	No.	Base Study ID (n=102)	RR	LCL	UCL	***p-value***
Asia	82	1984 GAO m	8.40	4.70	15.00	***0.0001***
	83	1984 GAO f	7.20	4.60	11.10	***0.0001***
	84	1984 LUBIN m	6.33	2.29	17.45	***0.00040***
	85	1985 CHOI m	5.45	2.34	12.67	***0.0001***
	86	1985 CHOI f	6.94	2.68	17.96	***0.0001***
	87	1985 WUWILL f	4.20	3.00	5.90	***0.0001***
	88	1986 SOBUE m	17.88	7.82	40.87	***0.0001***
	89	1986 SOBUE f	8.74	5.09	15.02	***0.0001***
	90	1988 WAKAI m	8.61	2.08	35.72	***0.00305***
	91	1988 WAKAI f	25.23	6.87	92.66	***0.0001***
	92	1990 FAN c	11.68	5.04	27.04	***0.0001***
	93	1990 GER c	3.19	1.08	9.42	***0.03547***
	94	1990 LUO c	10.90	2.50	47.90	***0.00157***
	95	1991 KIHARA c	26.97	10.84	67.08	***0.0001***
	96	1997 SEOW f	17.50	6.95	44.09	***0.0001***
Other	97	1978 JOLY m	31.21	7.69	126.68	***0.0001***
	98	1978 JOLY f	18.56	7.74	44.51	***0.0001***
	99	1987 PEZZOT m	62.74	3.86	1019.50	***0.00367***
	100	1991 SUZUK2 c	31.00	4.20	227.00	***0.00078***
	101	1993 DESTE2 m	13.20	4.70	37.10	***0.0001***
	102	1994 MATOS m	8.08	2.58	25.50	***0.00038***

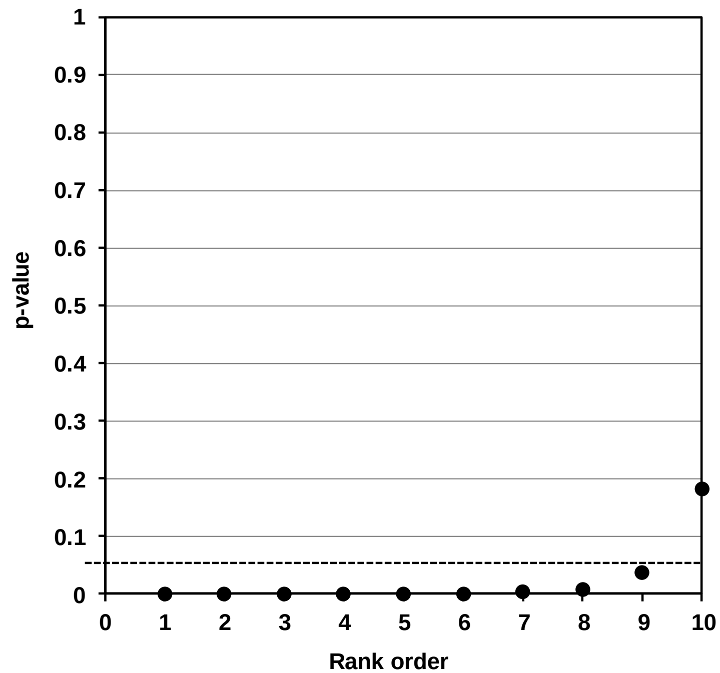
Median RR = 12.8 (>2); range of the RR IQR = 6.6‒24

º Lee, P. N., Forey, B. A., & Coombs, K. J. (2012). Systematic review with meta-analysis of the epidemiological evidence in the 1900s relating smoking to lung cancer. *BMC Cancer*, *12*, 385. https://doi.org/10.1186/1471-2407-12-385

Appendix C Fig. C−1. p-value plots for meta-analysis of small observational datasets representing: (i) plausible true null hypothesis for a petroleum refinery worker−chronic myeloid leukemia causal relationship (n=12) after Schnatter et al. (2018) and (ii) plausible true alternative hypothesis for a petroleum refinery worker−mesothelioma causal relationship (n=10) after Schnatter et al. (2018).

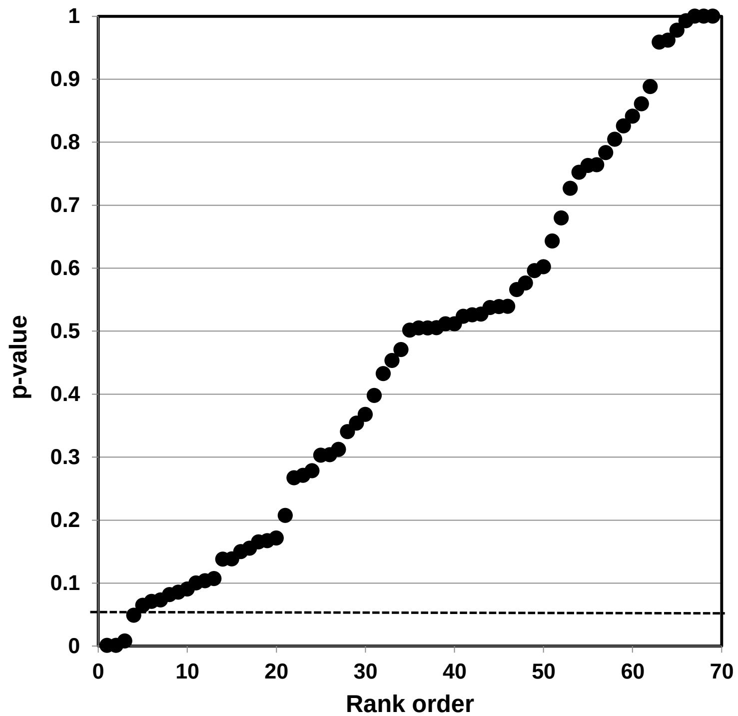


(i)

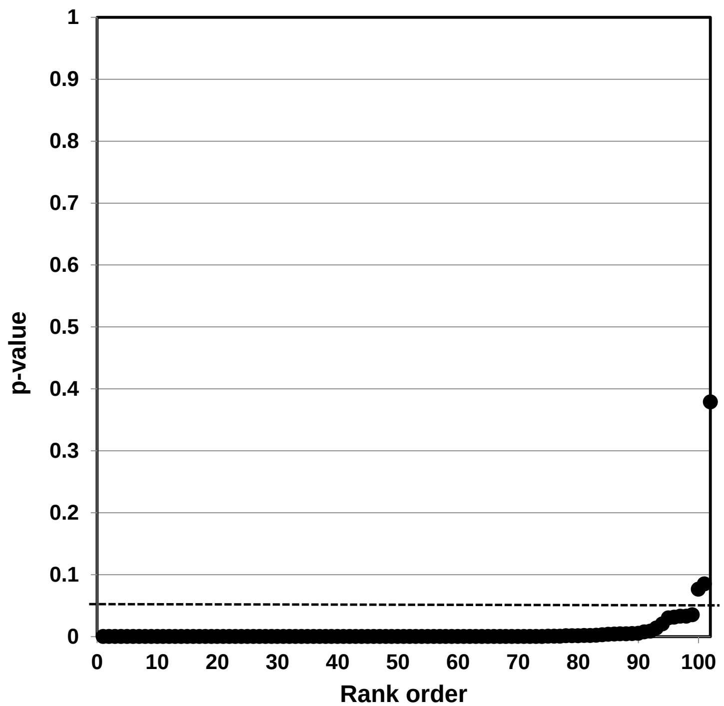


(ii)

Appendix C Fig. C−2. p-value plots for meta-analysis of large observational datasets representing: (i) plausible true null hypothesis for an elderly long-term exercise training−mortality & morbidity causal relationship (n=69) after de Souto Barreto et al. (2019) and (ii) plausible true alternative hypothesis for a smoking−lung squamous cell carcinoma causal relationship (n=102) after Lee et al. (2012).



(i)



(ii)

Explanation of Figs C3−1 and C3−2

Figure C3−1 presents a set of p-value plots for small meta-analysis datasets (i.e., n<15 base papers) showing plausible true null and true alternative hypothesis representing selected cancers in petroleum refinery workers after Schnatter et al. (2018):

- Fig C3−1 (i); left image – presents p-values as a sloped line from left to right at approximately 45-degrees representing a plausible true null hypothesis for a chronic myeloid leukemia causal relationship in petroleum refinery workers (n=12) after Schnatter et al. (2018).
- Fig C3−1 (ii); right image – presents a majority of p-values below the .05 line representing a plausible true alternative hypothesis for a mesothelioma causal relationship in petroleum refinery workers (n=10) after Schnatter et al. (2018).

Figure C3−2 presents a set of p-value plots for large meta-analysis datasets (i.e., n>65 base papers) showing plausible true null and true alternative hypothesis:

- Fig C3−2 (i); left image – presents p-values as a sloped line from left to right at approximately 45-degrees representing a plausible true null hypothesis for an elderly long-term exercise training−mortality & morbidity causal relationship (n=69) after de Souto Barreto et al. (2019).
- Fig C3−2 (ii); left image – presents a majority of p-values below the .05 line representing a plausible true alternative hypothesis for a smoking−lung squamous cell carcinoma causal relationship (n=102) after Lee et al. (2012).