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Where do web surveys work?

A meta-analysis of response rate experiments across countries

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Background I

- Cross-cultural research questions and thus cross-national datasets become increasingly important in globalized world

- Large international surveys do still stick to traditional survey modes, however face-to-face surveys are cost-intensive and inflexible -> increasing number of offline recruited internet panels around the world and international attempts for web-based cross-cultural data collections (e.g., CRONOS Panel, OPPA)

- Major challenges in web-based data collection: Nonresponse bias and coverage

- Nonresponse rate is not equal with nonresponse bias. Nonetheless, those two concepts are strongly related and moderated by survey design features such as the survey population (Groves & Peytcheva 2008)

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Background II

- Existing meta-analytical research that aimed at explaining web response rates with survey design factors could not explain large parts of response rate heterogeneity (Manfreda et al., 2008; Shih & Fan, 2008; Daikeler et al., 2018)

  - *Found on average 12%-points lower web response rates compared to traditional survey modes*

  - *Significant survey design factors (Daikeler et al., 2018):*
    - *survey prenotifications - are less effective in web modes*
    - *sample recruitment strategy - web surveys work in panels or pre-recruited lists better as for one time recruited subjects*
    - *solicitation mode - web surveys work better with an email solicitation compared to mail or telephone*
    - *target population - web surveys work better for students or members than for business association or the general population*
    - *number of contact attempts - more contact attempts work better in other modes than the web*

  - *Explained effect size heterogeneity ≤ 8%*

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Background III

- Cross-cultural differences affect response behavior (e.g., Johnson et al. 2005; Smith & Fischer,2008; Stark et al. 2018)

At least three aspects why online survey response rates might differ across countries:

- Social and economic factors (e.g., Rammstedt et al. 2017; Stark et al. 2018)
  - Education
  - GDP
  - Annual population growth
  - Mean population age
- Technological factors (e.g., Mohorko, et al. 2013)
  - Internet Coverage
  - Cellphone Coverage
  - Internet users
- Country-specific survey climate (e.g., Babier et al. 2016; Beullens et al., 2018)
  - Frequency of surveys
  - Country-specific response behavior

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Research Gap

To our knowledge no previous study attempted to examine web response and refusal behavior from a cross-cultural perspective

Our research goals are to…

I. Examine whether there are cross-cultural differences in web response rates?

II. Explain those cross-cultural differences with country-based indicators such as social and economic factors, technological factors and the country-specific survey climate

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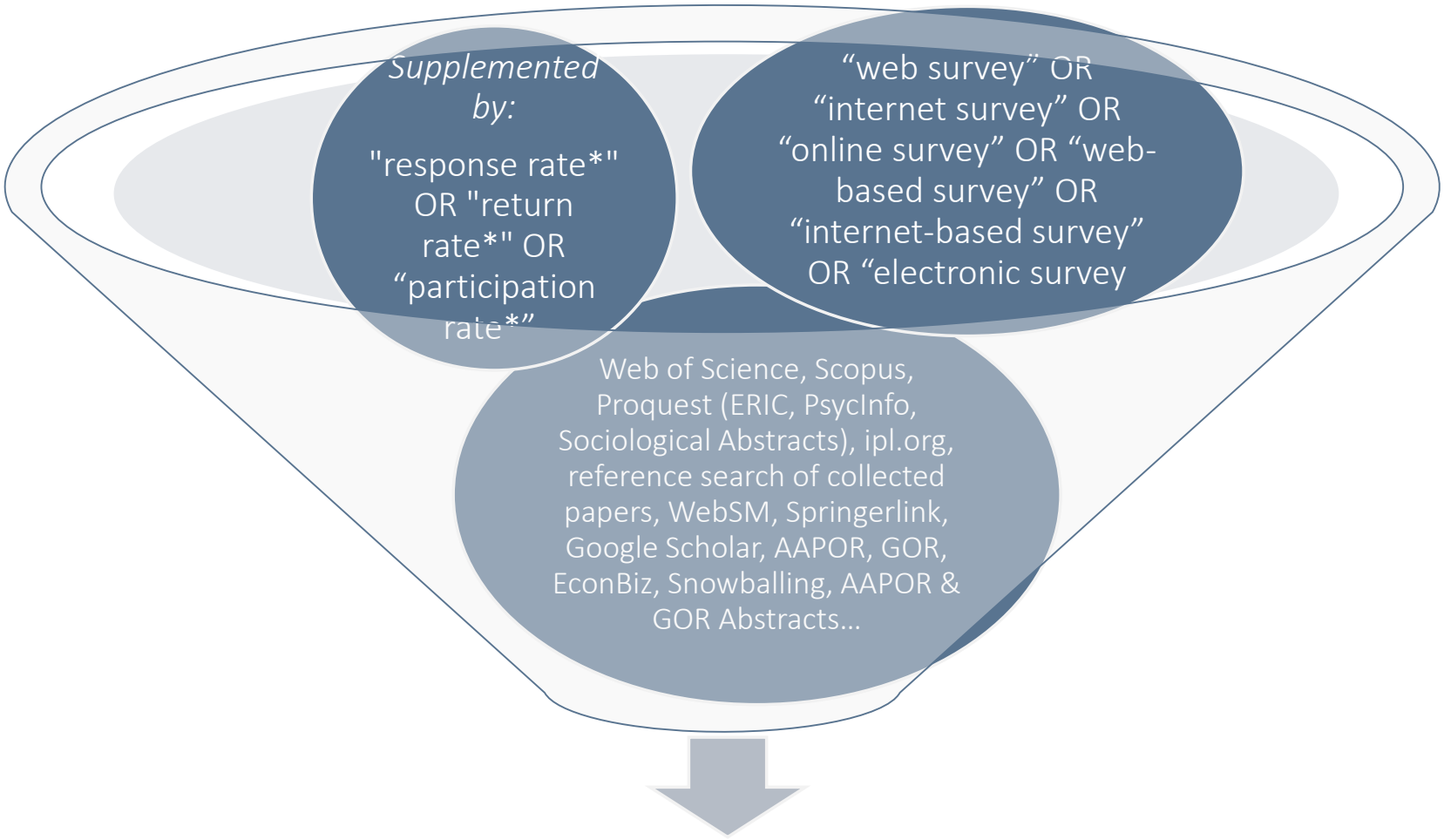
Literature Search



110 studies nested 64 manuscripts nested in 7 countries

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Inclusion & Exclusion Criteria

Web-based survey

- Questionnaire on the web

Other survey mode comparison

- email, mail, telephone, fax, face to face, other

Response rates

- should be available or calculable
- survey country must be reported

A split sample random experimental design

- respondents from the same population

No mode switching

- remain in the mode they were randomly assigned

The survey design

- should be the same for the compared modes (e.g., same questions)

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Methods

Data Generation Model

Inference goal: generalizing beyond the studies included – **Random Effects Model (metafor – Viechtbauer, 2010)** *(no multilevel model possible due to too less variance on country-level)*

Two Effect Sizes (Dependent Variable) and Metric *(AAPOR 2000, Callegaro & DiSogra 2008)*

1. Web response rate (AAPOR RR5)

$$d = \frac{number\ of\ web\ mode\ respondents}{number\ of\ invited\ and\ eligible\ subjects}$$

2. Response Rate Difference Web and other Mode

$$d = \frac{number\ of\ web\ mode\ respondents}{number\ of\ web\ mode\ invited\ and\ eligible\ subjects} - \frac{number\ of\ comp.mode\ respondents}{number\ of\ comp.mode\ invited\ and\ eligible\ subjects}$$

Seven countries included

Australia, Germany, The Netherlands, Slovenia, Sweden, United Kingdom, United States

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Moderators

Independent Variables (Moderators)

Factor	Variable	Source	Description
Social and economic factors	Education	world bank	Education index
	GDP	OECD	Gross domestic product (GDP) at market prices is the expenditure on final goods and services minus imports by year and country.
	Annual population growth	world bank	annual population growth in a country by year and country
	Population ages 65 and over	OECD	The elderly population is defined as the share of people aged 65 and over. and the working age (15-64 years) population by year and country.
Technological factors	Internet coverage	world bank	Individuals using the Internet (% of population) by year and country
	Cellphone coverage	world bank	Mobile cellular subscriptions by year and country
	Internet users in %	world value survey	using the internet (daily, weekly, monthly, less than monthly, never) by year and country
Country-specific survey climate	Web response rate	calculated	study-level of current paper
	Other mode response rate	calculated	study-level of current paper
	Country-level aggregated Web response rate	calculated	country- level aggregated value of current paper
	Country-level aggregated other mode response rate	calculated	country- level aggregated value of current paper
	ISSP response rate	ISSP database	response rate by year and country to the last ISSP round

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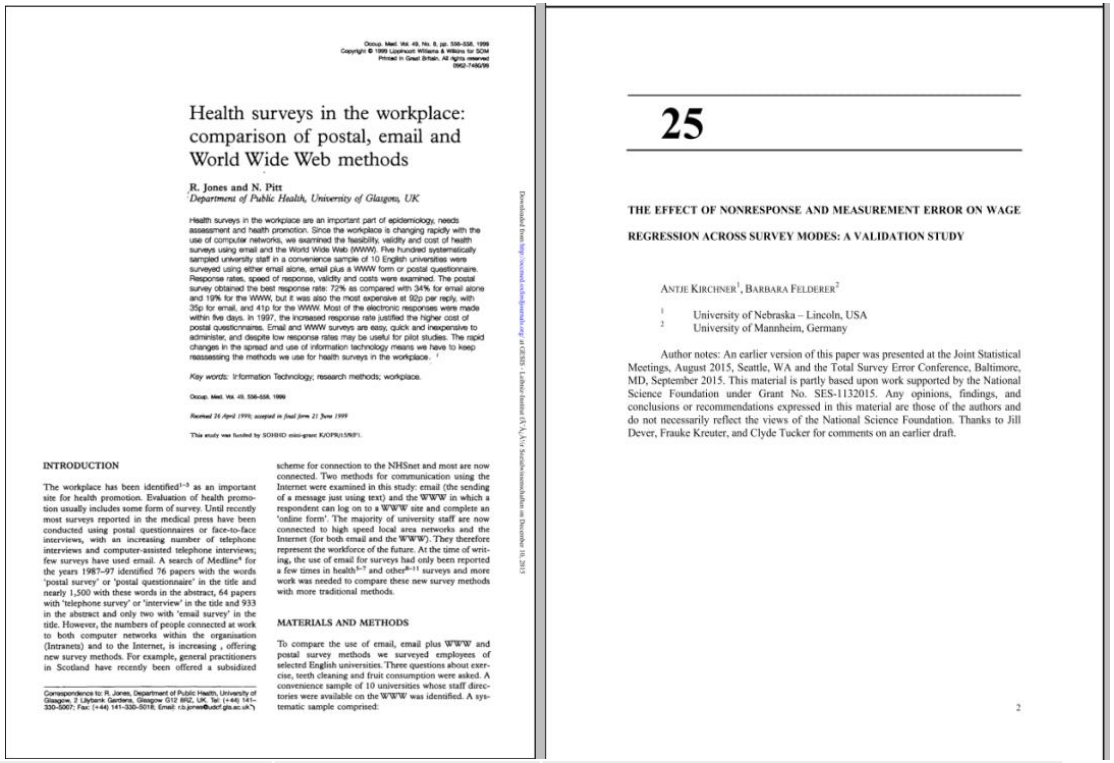
Examples

Jones, R. and Pitt, N. (1997)



Health surveys in the workplace: comparison of postal, email and World Wide Web methods

R. Jones and N. Pitt
Department of Public Health, University of Glasgow, UK

Health surveys in the workplace are an important part of epidemiology, needs assessment and health promotion. Since the workplace is changing rapidly with the use of computer networks, we examined the feasibility, validity and cost of health surveys using email and the World Wide Web (WWW). Five hundred systematically sampled university staff in a convenience sample of 10 English universities were surveyed using either email alone, email plus a WWW form or postal questionnaire. Response rates, speed of response, validity and costs were examined. The postal survey obtained the best response rate: 72% as compared with 34% for email alone and 19% for the WWW, but it was also the most expensive at 92p per reply, with 35p for email, and 41p for the WWW. Most of the electronic responses were made within five days. In 1997, the increased response rate justified the higher cost of postal questionnaires. Email and WWW surveys are easy, quick and inexpensive to administer, and despite low response rates may be useful for pilot studies. The rapid changes in the spread and use of information technology means we have to keep reassessing the methods we use for health surveys in the workplace.

Key words: Information Technology; research methods; workplace.

INTRODUCTION

The workplace has been identified as an important site for health promotion. Evaluation of health promotion usually includes some form of survey. Until recently most surveys reported in the medical press have been conducted using postal questionnaires or face-to-face interviews, with an increasing number of telephone interviews and computer-assisted telephone interviews; few surveys have used email. A search of Medline for the years 1987–97 identified 76 papers with the words 'postal survey' or 'postal questionnaire' in the title and nearly 1,500 with these words in the abstract, 64 papers with 'telephone survey' or 'interview' in the title and 933 in the abstract and only two with 'email survey' in the title. However, the numbers of people connected at work to both computer networks within the organisation (Intranets) and to the Internet, is increasing , offering new survey methods. For example, general practitioners in Scotland have recently been offered a subsidized scheme for connection to the NHSnet and most are now connected. Two methods for communication using the Internet were examined in this study: email (the sending of a message just using text) and the WWW in which a respondent can log on to a WWW site and complete an 'online form'. The majority of university staff are now connected to high speed local area networks and the Internet (for both email and the WWW). They therefore represent the workforce of the future. At the time of writing, the use of email for surveys had only been reported a few times in health and other surveys and more work was needed to compare these new survey methods with more traditional methods.

MATERIALS AND METHODS

To compare the use of email, email plus WWW and postal survey methods we surveyed employees of selected English universities. Three questions about exercise, teeth cleaning and fruit consumption were asked. A convenience sample of 10 universities whose staff directories were available on the WWW was identified. A systematic sample comprised:

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THE EFFECT OF NONRESPONSE AND MEASUREMENT ERROR ON WAGE REGRESSION ACROSS SURVEY MODES: A VALIDATION STUDY

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[2] University of Mannheim, Germany

Author notes: An earlier version of this paper was presented at the Joint Statistical Meetings, August 2015, Seattle, WA and the Total Survey Error Conference, Baltimore, MD, September 2015. This material is partly based upon work supported by the National Science Foundation under Grant No. SES-1132015. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation. Thanks to Jill Dever, Frauke Kreuter, and Clyde Tucker for comments on an earlier draft.

Kirchner & Felderer (2016)

Comparison Mode	Mail	Telephone
Response Rates	Web: 19%, Mail: 72%	Web: 9%, Telephone: 19%
Response Rate Difference	-53%	-10 %
Country	UK	Germany

Effect Size 1

Effect Size 2

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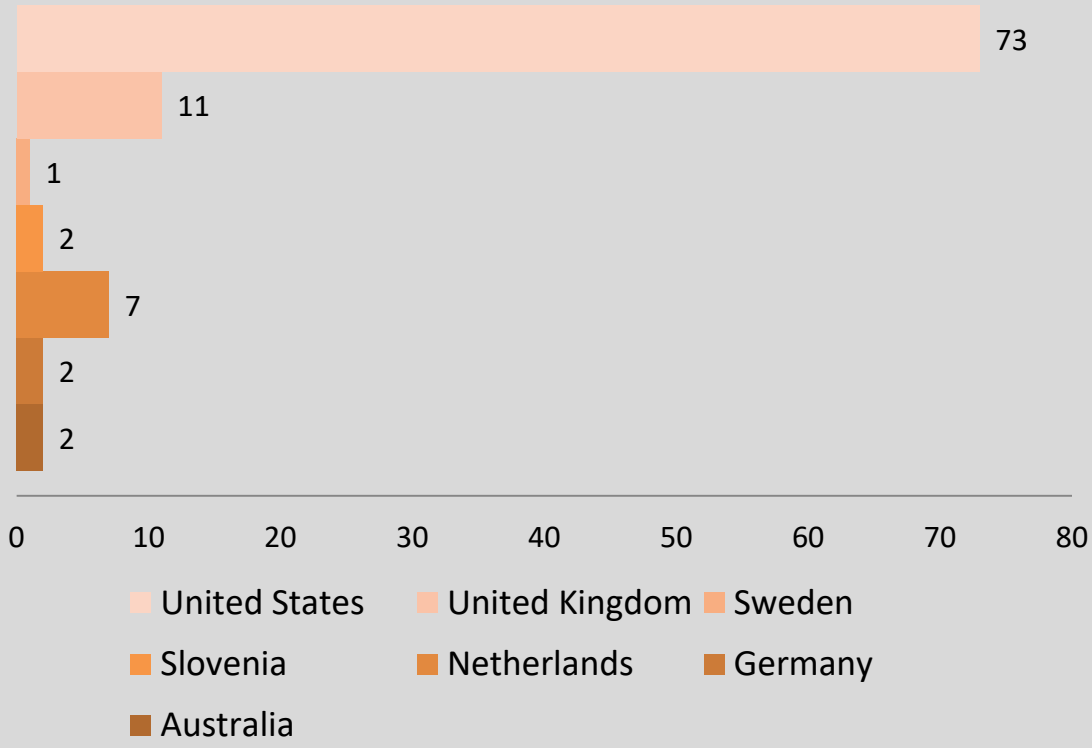
Results:
Descriptives



Experiments by country in %
More than 70% of the studies are US studies, followed by United Kingdom (11%) and the Netherlands (7%)

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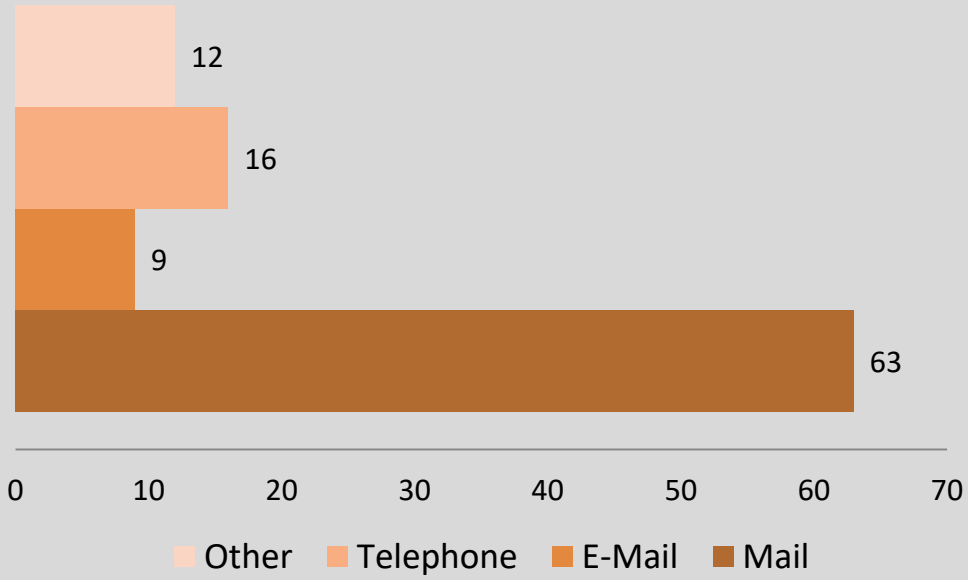
Results:

Descriptives & Sensitivity



Web comparison mode in %

Web surveys are mostly compared to mail surveys (63%).

Sensitivity Analysis

Based on the strong presence of US studies and mode comparisons with mail, we conducted three sensitivity analyses:

- Two random samples with a selection of US studies
- Mail comparisons only

All analyses succeed in replicating the subsequent findings

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Results:

Are there cross-cultural differences in web response rates?

	Mean web response rate: 36%	Mean other mode response rate: 48%	Mean response rate difference: 12%
Heterogenous effect size?	yes	yes	yes
Country	Significant **	Significant***	Significant **
Amount of heterogeneity explained by cntry	7%	20%	6%
Mode	-	Significant ***	not significant
Country*Mode	-	significant	not significant

***≤ 0.001; **≤ 0.05; *≤ 0.1

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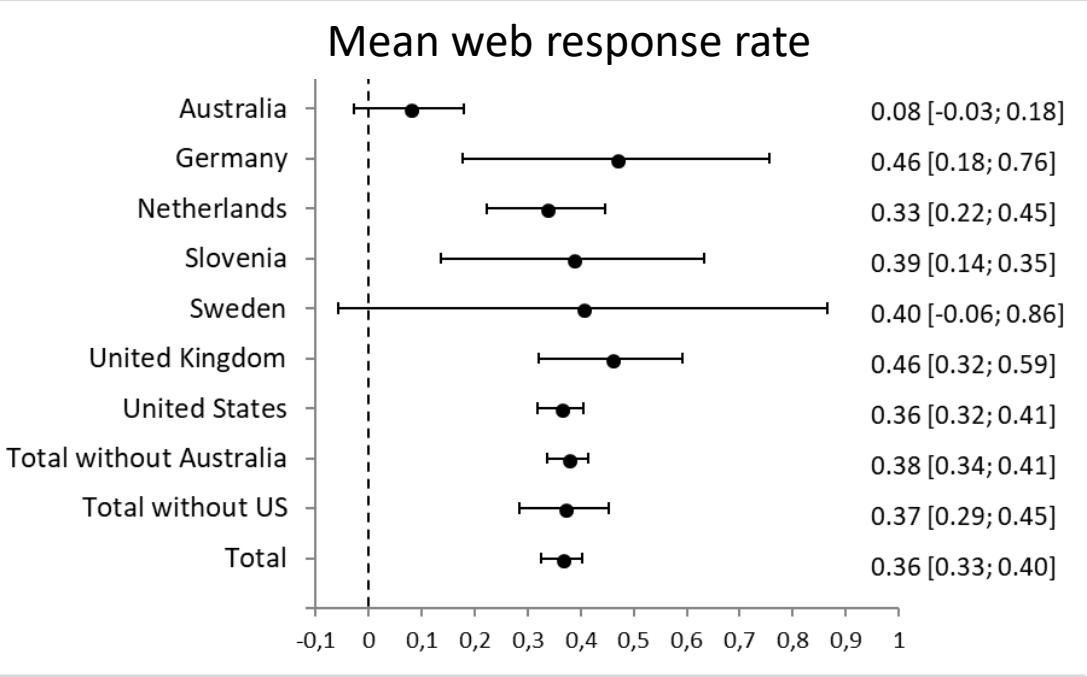
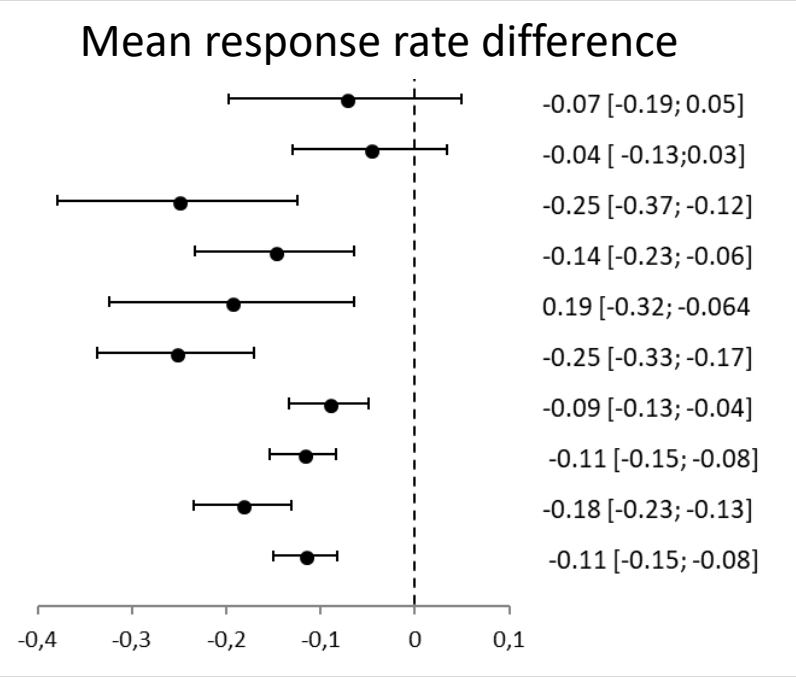
Results:

Are there cross-cultural differences in web response rates?





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Results:

Do social and economic factors influence the success of web surveys?

Effect Size	Education	GDP	Annual population growth	Population ages 65 and over
Web Response Rate	n.s.	n.s.	**+ sig.**	n.s.
Response Rate Difference Web vs. Other Mode	n.s.	n.s.	**+ sig.**	**- sig.**

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Results:

Do technological factors influence in the success of web surveys?

Effect Size	Internet coverage	Cellphone coverage	Internet users
Web Response Rate	**+ sig.**	**+ sig.**	n.s.
Response Rate Difference Web vs. Other Mode	**- sig.**	**+ sig.**	n.s.

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Results:

Does the survey climate influence the success of web surveys?

Effect Size	Web response rate	Other mode response rate	Country-level aggregated Web response rate	Country-level aggregated other mode response rate	Issp response rate
Web Response Rate	.	**+ sig.**	**+ sig.**	**+ sig.**	n.s.
Response Rate Difference Web vs. Other Mode	**+ sig.**	**- sig.**	n.s.	**- sig.**	**+ sig.**

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Take Home Messages

I. Are there cross-cultural differences in web response rates?

- Yes, the specific country has a significant influence on the success of a web survey. However, it can only explain less than 10% of the heterogeneity at country level.

II. Do social and economic factors influence the success of web surveys?

- The higher the population growth and the lower the proportion of older people in a country the better do web surveys work.

II. Do technological factors influence the success of web surveys?

- Internet and cellphone coverage show significant effects. The higher the Internet coverage, the higher is the web response rate and the smaller is the response rate difference. The higher the cellphone coverage, the better do web surveys work but the larger is the response rate difference.

II. Does the country-specific survey climate influence the success of a web survey?

- Yes, the higher the country-specific response rates, the better do web surveys work.

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Limitations & Outlook

Limitations

- ~73% of all studies conducted in the US -> need further evidence from other countries (more statistical power & better understanding moderating factors)

- All countries have a similar cultural background

- Searched English speaking literature only -> language bias problem

- Great degree of heterogeneity remains still unexplained

Conclusion

- In summary, web surveys are particularly useful in countries with a younger, technology-oriented population that is generally open to surveys

- Our findings may help researchers who plan national and cross-national data collections to evaluate a web surveys response rate in comparison to other survey modes before the data collection

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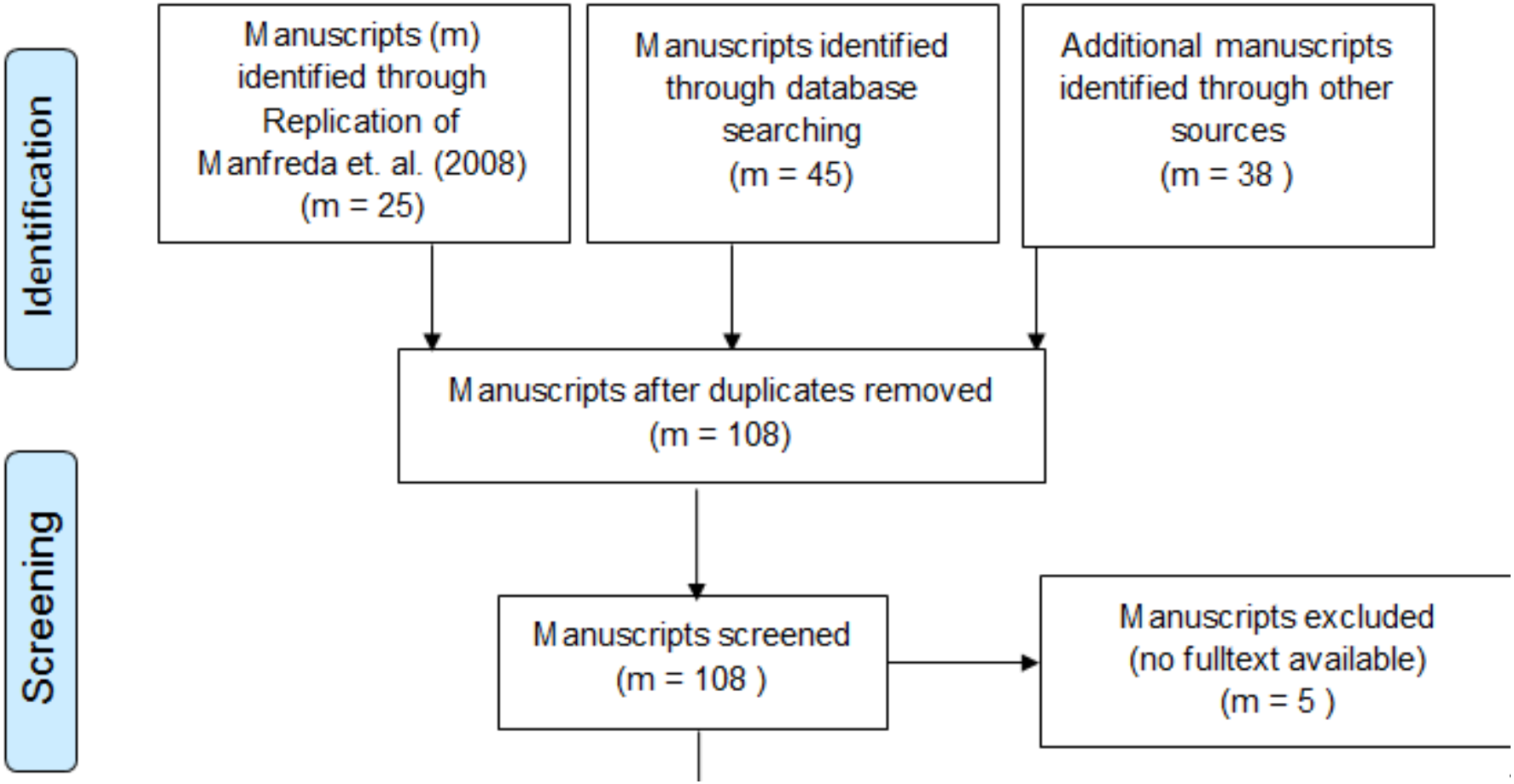
Prisma Flow Diagram (I)



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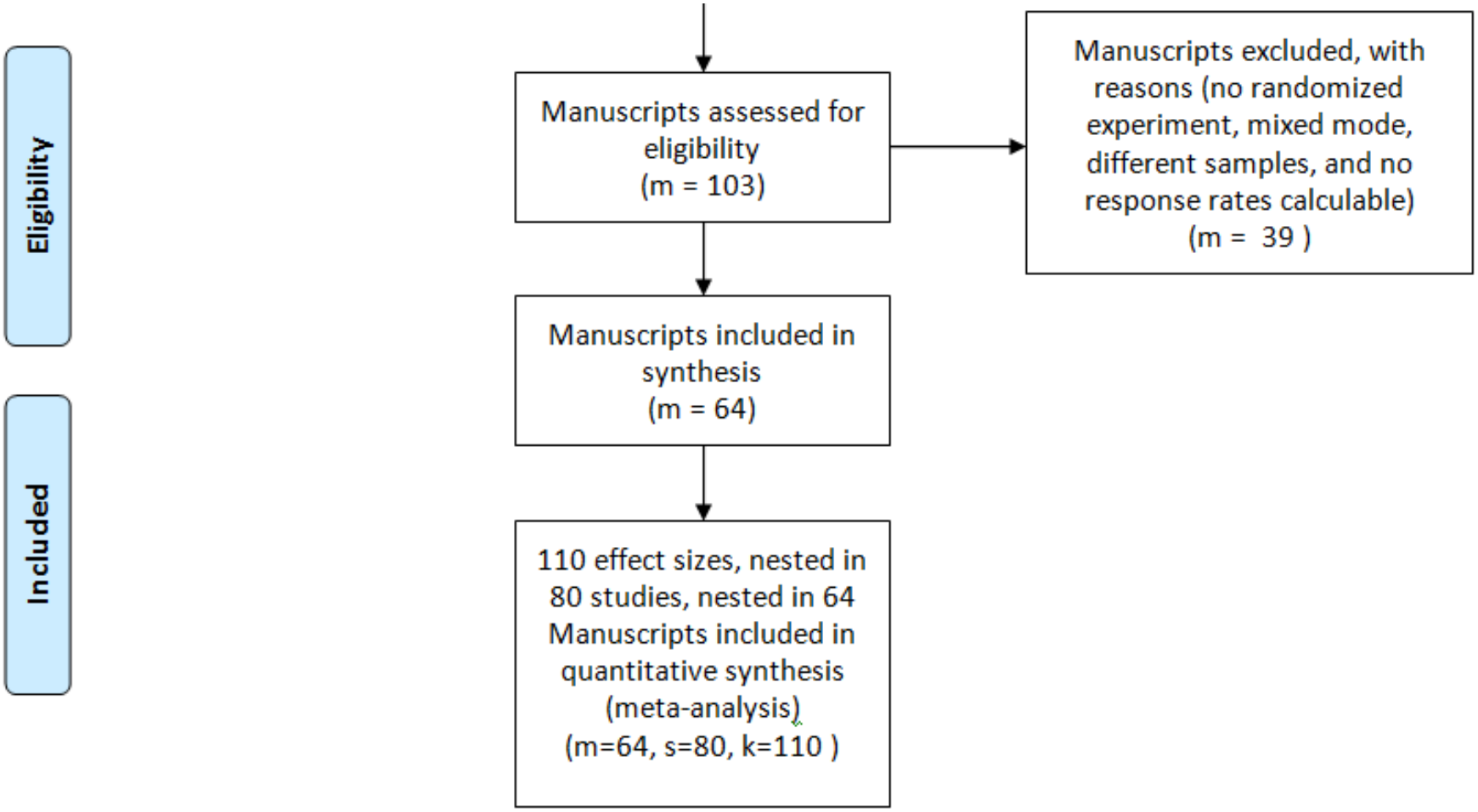
Prisma Flow Diagram (II)



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List of studies per country

Author(s)	Year	Web Mode: Response Rate in % (No. of eligible units contacted, No. of responses)	Other Mode: Response Rate in % (No. of eligible units contacted, No. of responses)	Country
Sinclair et al.	2012	1,4; (7000/101)	6,65; (4000/266)	Australia
Sinclair et al.	2012	2,9; (10000/289)	9,3; (5500/511)	Australia
Sinclair et al.	2012	2,9; (10000/289)	27,3; (1000/273)	Australia
Allum et. al.	2014	85,4; (945/807)	97,1; (509/494)	England
Auspurg et. al.	2013	58,5; (1072/627)	64,7; (543/351)	England
Baghal & Lynn	2015	56,3; (1432/807)	92,6; (716/663)	England
Blom et al.	2015	64,6; (1126/727)	95,3; (554/528)	England
de Leeuw et al.	2012	47; (349/164)	73; (282/206)	England
de Leeuw et al.	2012	47; (349/164)	96,1; (314/217)	England
Denscobe	2009	60; (460/276)	60; (460/276)	England
Jones & Pitt	1997	18,5; (200/37)	34; (200/68)	England
Park & Humphrey	2014	55; (1000/550)	55; (1000/550)	England

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List of studies per country cntnd.

Jones & Pitt	**1997**	**18,5; (200/37)**	**72; (100/72)**	**England**
Kirchner & Felderer	2016	19,4; (12400/2400)	19,4; (12400/2400)	Germany
Roberts et. al.	2016	70,5; (600/423)	70,5; (600/423)	Germany
Roberts et. al.	2016	65,4; (500/327)	65,4; (500/327)	Germany
Pötschke	2002	37,1; (380/141)	50,7; (402/204)	Germany
Boschmann et al.	2012	44,7; (293/131)	44,7; (293/131)	Slovenia
Lozar Manfreda et al.	2000	77; (200/154)	89; (200/178)	Slovenia
Vehovar et al.	1999	26; (300/78)	51,9; (747/388)	Slovenia
Vehovar et al.	1999	26; (300/78)	39,2; (222/87)	Slovenia
Vehovar et. al	1999	26; (300/78)	21,6; (76/24)	Slovenia
Woo et al.	2015	26,4; (500/132)	85,6; (500/428)	South Corea
Bech & Kristensen	2009	16,9; (4900/829)	42,5; (5000/2123)	Sweden
de Leeuw et al.	2012	19,7; (6134/1207)	60,4; (2000/1207)	The Netherlands
Klausch et al.	2012	28,7; (2200/631)	49,8; (2199/1095)	The Netherlands

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List of studies per country cntnd.

Klausch et al.	**2012**	**28,7; (2200/631)**	**64,8; (2182/1413)**	**The Netherlands**
Klausch et al.	2012	28,7; (2200/631)	67,5; (2200/1485)	The Netherlands
Zuidgeest, M. et. al.	2011	60,5; (400/242)	64; (400/256)	The Netherlands
Al-Subaihi, AA	2008	34,6; (26/9)	100; (26/26)	UAE
Andrew et al.	2015	64,3; (2345/1509)	63,1; (2366/1494)	USA
Bason	2000	15,5; (742/115)	23,9; (674/161)	USA
Bason	2000	15,5; (742/115)	27,8; (735/204)	USA
Bason	2000	15,5; (742/115)	17,4; (736/128)	USA
Bates	2000	55,7; (1571/875)	44,2; (1569/694)	USA
Beach & Musa	2012	67,9; (627/426)	63,9; (627/401)	USA
Beach & Musa	2012	52,9; (627/332)	41,9; (627/263)	USA
Beach et al.	2008	60,4; (1966/1188)	55,4; (1967/1090)	USA
Borkan	2009	21; (1000/210)	44,2; (500/221)	USA
Boyle etr. Al.	2016	23,49; (2179/512)	17,1; (2755/472)	USA
Burnett	2016	87,1; (225/196)	76; (225/171)	USA

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List of studies per country cntnd.

Chat et al.	**2002**	**82,1; (3627/2979)**	**62,9; (477/300)**	**USA**
Chisolm	1997	24; (300/72)	30; (300/90)	USA
Clark et al.	2011	43,5; (104/45)	51,9; (101/52)	USA
Clark et al.	2011	47,2; (104/49)	49,2; (101/48)	USA
Cobanoglu et al.	2000	44,2; (95/42)	26,3; (99/26)	USA
Cobanoglu et al.	2000	44,2; (95/42)	17; (100/17)	USA
Converse et. al.	2008	41,7; (750/313)	41,7; (750/313)	USA
Crawford et al.	2001	63; (3500/2205)	52; (3500/1820)	USA
Croteau et al.	2010	26,2; (359/94)	39,2; (338/134)	USA
Eckford & Barnett	2016	55,5; (1225/680)	10,9; (1225/133)	USA
Edwards et al.	2014	33,2; (559/185)	53,1; (557/296)	USA
Edwards et al.	2014	27,5; (573/157)	47,1; (552/259,9)	USA
Edwards et al.	2014	23,3; (553/129)	45,5; (561/255)	USA
Edwards et al.	2014	38,7; (574/222)	57,9; (565/327)	USA

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List of studies per country cntnd.

Elder & Incalcatera	**1999**	**37,4; (690/258)**	**54,3; (693/376)**	**USA**
Ellis & Rexrode	2012	14,5; (2601/377)	25; (8678/2170)	USA
Fisher & Herrick	2013	11,5; (1649/189)	31,9; (1834/585)	USA
Foster & Gaugham	2008	46; (100/46)	46; (100/46)	USA
Fraze et. al.	2002	43,2; (95/41)	60; (95/57)	USA
Fraze et. al.	2002	43,2; (95/41)	27,4; (95/26)	USA
Fricker et al.	2003	51,6; (1058/546)	97,4; (544/530)	USA
Grandjean et al.	2009	9,5; (1126/107)	10,8; (1273/138)	USA
Grandjean et al.	2009	9,5; (1126/107)	17,1; (904/155)	USA
Greene et al.	2008	75,2; (501/377)	67,2; (250/168)	USA
Greenlaw & Brown-Welty	2009	52,4; (1281/672)	42; (1280/538)	USA
Hardigan et al.	2012	11; (2000/220)	24,8; (2000/495)	USA
Hayslett & Wildemuth	1999	28; (100/28)	51; (100/51)	USA
Hayslett & Wildemuth	1999	39; (100/39)	51; (100/51)	USA

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List of studies per country cntnd.

Hsu & McFall	**2015**	**87,2; (624/544)**	**77,2; (189/146)**	**USA**
Israel	2009	64,5; (200/129)	64,5; (200/129)	USA
Israel	2012	39,8; (646/257)	67; (646/432,82)	USA
Isreal & Lamm	2012	48,1; (310/149)	58,4; (344/201)	USA
Jacob	2011	40,2; (532/214)	59,6; (339/202)	USA
Jacob & Jacob	2012	53,5; (288/154)	53,5; (288/154)	USA
Kaplowitz et al.	2001	29,7; (4327/1285)	31,5; (2594/817)	USA
Kaplowitz et al.	2001	28,6; (4178/1195)	31,5; (2594/817)	USA
Kennedy	2012	42,2; (2609/1102)	23,8; (390/93)	USA
Kerwin et al.	2004	37,6; (359/135)	27,7; (195/54)	USA
Kiernan	2005	70,1; (137/96)	61,3; (137/84)	USA
Knapp & Kirk	1999	15,9; (359/57)	48,5; (359/174)	USA
Knapp & Kirk	1999	15,9; (359/57)	33,7; (359/121)	USA
Kongsved et.al.	2007	76,4; (276/211)	76,4; (276/211)	USA

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List of studies per country cntnd.

Kwak & Radler	**1999**	**27,4; (987/270)**	**41,9; (990/415)**	**USA**
Lesser & Newton	1999	18,9; (159/30)	59,4; (389/231)	USA
Lesser & Newton	1999	21,9; (233/51)	59,4; (389/231)	USA
Lesser & Newton	1999	18,9; (159/30)	39,3; (163/64)	USA
Lesser & Newton	1999	21,9; (233/51)	39,3; (163/64)	USA
Lesser & Newton	1999	18,9; (159/30)	53; (151/80)	USA
Lesser & Newton	1999	21,9; (233/51)	53; (151/80)	USA
McMorris & Petrie	2009	82,5; (189/156)	82,5; (189/156)	USA
Messer	2012	32,7; (700/228)	58,5; (600/351)	USA
Messer	2012	32,7; (920/346)	37,6; (920/346)	USA
Messer	2012	12,6; (470/59)	46,2; (600/277)	USA
Messer	2012	28; (510/142)	50; (510/255)	USA
Messer et al.	2012	38,5; (600/231)	59,375; (800/475)	USA
Messer et al.	2012	23,3; (3200/747)	46,2; (2200/1017)	USA

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List of studies per country cntnd.

Messer et al.	**2012**	**30; (2100/630)**	**57,8; (1800/1040)**	**USA**
Millar et al.	2011	42,3; (676/285)	51,2; (681/349)	USA
Murphy et al.	2012	30; (400/120)	38; (400/152)	USA
Newsome et. al.	2009	75; (10000/7500)	75; (10000/7500)	USA
Redline & Zukerberg	2015	24; (4477/1075)	24; (4477/1075)	USA
Rodriguez, H. et. al	2006	18,4; (250/46)	50,4; (115/58)	USA
Rodriguez, H. et. al	2006	18,4; (250/46)	34,5; (200/69)	USA
Sax et. al	2001	11,1; (737/82)	10; (1478/152)	USA
Shannon & Bradshaw	2002	22,2; (189/42)	22,2; (189/42)	USA
Smyth et al.	2010	41; (566/232)	70,6; (367/259)	USA
Szoc et al.	2013	64; (25123/16079)	64; (25123/16079)	USA
Turner et al.	2010	8; (5000/400)	16; (10000/1600)	USA
Weible & Wallace	1997	34,4; (151/52)	35,7; (196/70)	USA
Weible & Wallace	1997	34,4; (151/52)	30,8; (162/50)	USA

List of studies per country cntnd.

Weible & Wallace	**1997**	**34,4; (151/52)**	**29,8; (161/48)**	**USA**
Wolfe et al. .	2008	44; (375/165)	81; (375/303,75)	USA
Wygant & Lindorf	1998	49,5; (1270/629)	31,5; (1299/410)	USA