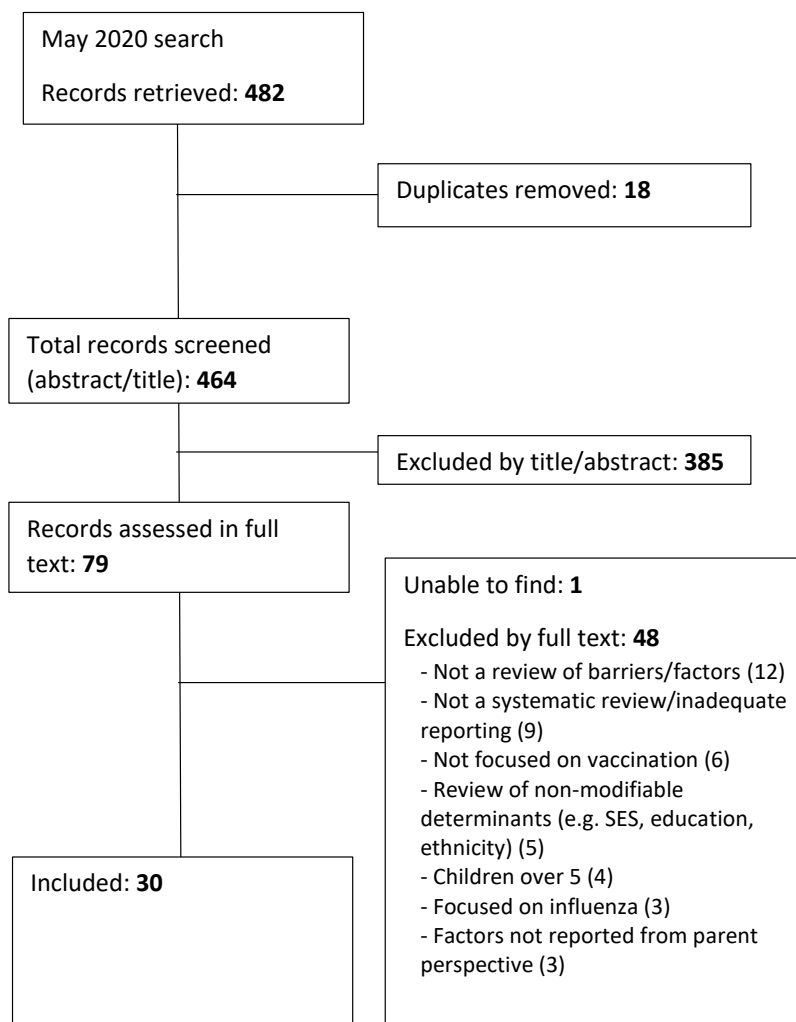


Supplemental materials

Epistemonikos search strategy

advanced_title_en:(((barrier* OR facilitat* OR factor* OR understand* OR reason*) AND (vacc* OR immunis* OR immuniz*))) OR advanced_abstract_en:(((barrier* OR facilitat* OR factor* OR understand* OR reason*) AND (vacc* OR immunis* OR immuniz*) AND (parent* OR child* OR infant* OR newborn*))) [Filters: protocol=no, classification=systematic-review]

PRISMA diagram

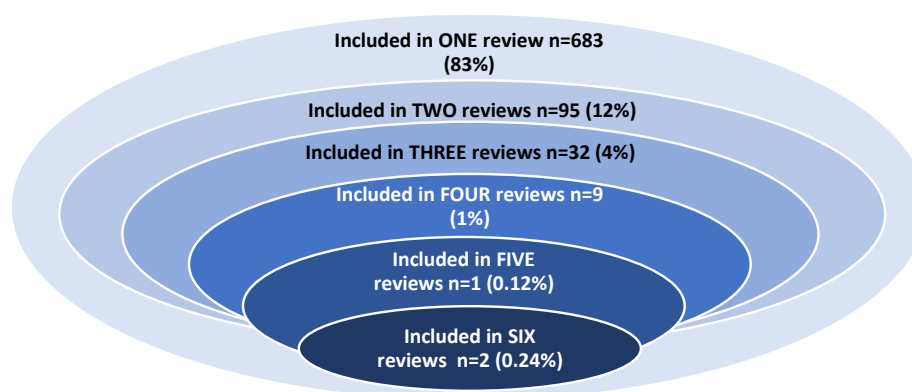


Excluded studies and reasons

| | |
|----------------------------|---|
| 1. Abahussin 2016 | Not a review of barriers/factors (review of strategies) |
| 2. Ames 2017 | Not a review of barriers/factors (review of parent views about communication and its impact on decisions) |
| 3. Arat 2019 | Review of non-modifiable determinants (SES and healthcare systems) |
| 4. Atkinson 1994 | Not a systematic review |
| 5. Bish 2011 | Focused on seasonal influenza vaccination, barriers to childhood vaccination not clear |
| 6. Bocquier 2017 | Review of non-modifiable determinants (SES) |
| 7. Bright 2017 | Not a review of barriers/factors (review of strategies) |
| 8. Bright 2018 | Children over 5 |
| 9. Cook 2013 | Not focused on vaccination |
| 10. CooperRobbins 2011 | Children over 5 |
| 11. ElisabettaPegurri 2005 | Not a review of barriers/factors (review of strategies) |
| 12. Flores 1998 | Not focused on vaccination |
| 13. Forshaw 2017 | Review of non-modifiable determinants (maternal education) |
| 14. Gidengil 2019 | Includes children over 5 |
| 15. Grabenstein 2013 | Not a systematic review |
| 16. Guzman-Holst 2020 | Includes children over 5 |
| 17. Hill 2019 | Factors not reported from parent perspective |
| 18. Hinton 2012 | Not a systematic review |
| 19. Huang 2018a | Review of non-modifiable determinants (ethnicity) |
| 20. Huang 2018b | Not focused on vaccination |
| 21. Hutchins 1993 | Not a systematic review |
| 22. Jarrett 2015 | Not a review of barriers/factors (review of strategies) |
| 23. Kang 2017 | Children over 5 |
| 24. Kaufman 2018 | Not a review of barriers/factors (review of strategies) |
| 25. Larson 2014 | Not a systematic review |
| 26. Lipstein 2012 | Not focused on vaccination |
| 27. Lukusa 2018 | Not a review of barriers/factors (review of strategies) |
| 28. Magwood 2018 | Not focused on vaccination |
| 29. Mathew 2012 | Review of non-modifiable determinants (gender, birth order, residential area, migrants, maternal education, religion etc) |
| 30. Mureed 2015 | Not a review of barriers/factors (review of strategies) |
| 31. Niederhauser 2010 | Not a systematic review |
| 32. Oliver-Williams 2017 | Not a review of barriers/factors (review of strategies) |
| 33. Perman 2017 | Children over 5 |
| 34. Pulver 2016 | Not a systematic review |
| 35. Quansah 2016 | Review of non-modifiable determinants (gender, birth order, residential area, migrants, maternal education, religion etc) |
| 36. Roberts 2002 | Source of barriers not identified in review |
| 37. Rosso 2020 | Not a review of barriers/factors (review of studies of knowledge/attitudes) |
| 38. Ruiz 2016 | <i>Dissertation, unclear if an SR and cannot find</i> |
| 39. Sadaf 2013 | Not a review of barriers/factors (review of strategies) |
| 40. Schmid 2017 | Focused on seasonal influenza vaccination, barriers to childhood vaccination not clear |

| | |
|-------------------|--|
| 41. Shaikh 2018 | Not a systematic review (inadequate reporting of included studies) |
| 42. Simone 2012 | Factors not reported from parent perspective |
| 43. Singh 2018 | Not a systematic review (inadequate reporting of included studies and search) |
| 44. Sridhar 2014 | Not a review of barriers/factors (review of prevalence of missed opportunities) |
| 45. Storr 2018 | Not a systematic review (inadequate reporting of included studies and search) |
| 46. Wang 2018 | Focused on seasonal influenza vaccination, barriers to childhood vaccination not clear |
| 47. Wardle 2016 | Factors not reported from parent perspective |
| 48. Williams 2014 | Not a systematic review |
| 49. Wiysonge 2012 | Not a review of barriers/factors (review of professional practice interventions) |

Number of times individual primary studies (N=822) were included in reviews



Tabular presentation of ROBIS ratings

| | 1: STUDY ELIGIBILITY CRITERIA | 2: IDENTIFICATION AND SELECTION OF STUDIES | 3: DATA COLLECTION AND STUDY APPRAISAL | 4: SYNTHESIS AND FINDINGS |
|--------------------|--|---|---|--------------------------------------|
| Adamu_2019 | ✓ | ✓ | ? | ✓ |
| Allan_2014 | X | X | ? | X |
| Apte_2018 | ✓ | X | ✓ | X |
| Brown_2010 | X | X | ? | X |
| CobosMunoz_2015 | X | ? | ? | X |
| Connors_2012 | ? | ✓ | ? | X |
| Crescitelli_2020 | X | X | ✓ | X |
| CrockerBuque_2017 | X | ✓ | X | X |
| Falagas_2008 | X | X | X | X |
| Forster_2016a | X | ✓ | ? | X |
| Forster_2017 | X | ✓ | ? | X |
| Fournet_2018 | X | ✓ | X | X |
| Hermann_2019 | X | ✓ | ✓ | ✓ |
| Karthigesu_2018 | X | X | X | X |
| Kurup_2017 | X | X | X | X |
| Malerba_2015 | X | ✓ | X | X |
| Merten_2015 | X | X | ✓ | X |
| Mills_2005a | X | ✓ | ✓ | X |
| Mills_2005b | X | ✓ | ✓ | X |
| Phillips_2017 | X | X | ? | ✓ |
| QuadriSheriff_2012 | X | X | X | X |
| Rainey_2011 | X | X | ✓ | X |
| Smith_2017 | X | ✓ | ? | X |
| Tabacchi_2016 | X | X | X | X |
| Tauil_2016 | X | X | ? | X |
| Thorpe_2016 | ✓ | X | X | X |
| Wallace_2014 | X | ✓ | X | X |
| Walton_2017 | X | X | X | X |
| Wilder-Smith_2019 | X | X | X | X |
| Wilson_2018 | X | X | ✓ | X |
| | ✓ | Low risk | | |
| | X | High risk | | |
| | ? | Unclear risk | | |

Summary of included reviews

| Author (year published) | Vaccine/s of interest | No. of primary studies included | Methodology of included primary studies | Countries of primary studies | Country income levels of primary studies | Review authors reported appraising primary study quality | Access | Clinic or health system | Concerns & beliefs | Health perception & experience | Knowledge & info | Social or family influence |
|-------------------------|--|---------------------------------|--|--|--|--|--------|-------------------------|--------------------|--------------------------------|------------------|----------------------------|
| Adamu (2019) | Childhood vaccines for <23 months of age | 20 | Quantitative | Benin, Congo, Egypt, Eswatini, Ethiopia, Ghana, Kenya, Malawi, Nigeria, Republic of the Niger, South Sudan, South Africa, Zimbabwe | LIC | yes | x | x | x | x | x | x |
| Allan (2015) | MMR | 14 | Qualitative | UK | HIC | yes | | | x | x | x | x |
| Apte (2018) | Rotavirus vaccine | 15 | Quantitative | Belgium, Brazil, Canada, China, El Salvador, India, UK, USA | Mixed | yes | x | x | | x | x | x |
| Brown (2010) | Combination vaccines (majority MMR) | 31 | Mixed (quantitative n=13; quantitative cohort n=6; qualitative n=12) | Australia, Ireland, Italy, Sweden, UK, USA | HIC | Yes | x | x | x | x | x | x |
| Cobus-Munoz (2015) | Routine childhood vaccines (some studies specifically focused on polio or measles) | 44 | Mixed (quantitative n=20, qualitative n=19, mixed methods n=5) | Studies conducted in 19 countries (Asia 23, Africa 16, South America 4, Oceania 1) | LMIC | Yes | x | x | x | x | x | x |
| Connors (2012) | Routine childhood vaccines | 45 | Study designs not described | USA | HIC | No | x | x | | x | | |
| Crescitelli (2020) | Routine childhood vaccines | 27 | Qualitative | Australia, Burkina Faso, Canada, Netherlands, Spain, Sweden, UK, USA, Venezuela | Mixed | Yes | | | x | x | x | |

| Author (year published) | Vaccine/s of interest | No. of primary studies included | Methodology of included primary studies | Countries of primary studies | Country income levels of primary studies | Review authors reported appraising primary study quality | Access | Clinic or health system | Concerns & beliefs | Health perception & experience | Knowledge & info | Social or family influence |
|-------------------------|--|---------------------------------|--|--|--|--|--------|-------------------------|--------------------|--------------------------------|------------------|----------------------------|
| Crocker-Buque (2017) | Routine childhood vaccines | 63 | Mixed (cross-sectional surveys n=42, qualitative study n=1, ecological study n=1, intervention evaluations n=20) | Brazil, Burkina Faso, Central African Republic, China, Democratic Republic of the Congo, Ethiopia, India, Iran, Kenya, Nigeria, Pakistan, Zambia | LMIC | No | x | | | | x | |
| Falagas (2008) | Routine childhood vaccines (some specifically focused on HBV/ HAV/ Hib) | 39 | Mixed (analytical statistical n=27, quantitative n=6, mixed methods n=6) | Australia, Canada, Italy, Netherlands, Russia, Turkey, UK, USA | HIC | No | x | x | x | x | x | x |
| Forster (2016) | UK routine childhood vaccines | 34 | Qualitative | UK | HIC | Yes | | | x | | | x |
| Forster (2017) | UK routine childhood vaccines | 8 | Qualitative | UK | HIC | Yes | | | x | | | x |
| Fournet (2018) | Not specified | 13 | Mixed | Europe | HIC | No | x | | x | x | x | x |
| Hermann (2019) | Routine childhood vaccines (defined as recommended immunisation schedule from the study setting) | 12 | Mixed (quantitative n=11, qualitative n=1) | Australia, UK, USA | HIC | Yes | x | x | | | x | |
| Karthigesu (2018) | Childhood vaccines (incl measles and | 6 | Study designs not described | Canada, Lebanon, Pakistan, UK, USA | HIC | No | | | | | | x |

| Author (year published) | Vaccine/s of interest | No. of primary studies included | Methodology of included primary studies | Countries of primary studies | Country income levels of primary studies | Review authors reported appraising primary study quality | Access | Clinic or health system | Concerns & beliefs | Health perception & experience | Knowledge & info | Social or family influence |
|-------------------------|--|---------------------------------|--|--|--|--|--------|-------------------------|--------------------|--------------------------------|------------------|----------------------------|
| | BCG, excl influenza and HPV) | | | | | | | | | | | |
| Kurup (2017) | Childhood vaccines for children aged ≤6yrs | 20 | Mixed (quantitative n=10, qualitative n=10) | Brazil, Canada, Hong Kong, Iran, New Zealand, Norway, Poland, Taiwan, Spain, Sweden, UK, USA | HIC | yes | x | | x | x | x | x |
| Malerbra (2015) | Pneumococcal and meningococcal (only data relating to children < 5 yrs were extracted) | 3 | Quantitative | Belgium, Poland | HIC | No | x | x | | x | | |
| Merten (2015) | Childhood vaccines | 25 | Qualitative | Bangladesh, Bolivia, Cameroon, China, Ethiopia, Gabon, Haiti, India, Kenya, Mozambique, Nigeria, Senegal, South Africa, Togo, Turkey, Uganda | LMIC | Yes | x | x | x | x | x | x |
| Mills (2005a) | Childhood vaccines | 15 | Qualitative | Australia, Canada, Ireland, New Zealand, UK, USA | HIC | Yes | x | x | x | x | x | x |
| Mills (2005b) | Childhood vaccines | 29 | Mixed (survey n=19, structured interview n=7, telephone questionnaire n=3) | Australia, Belgium, New Zealand, UK, USA | HIC | Yes | x | x | x | x | x | x |
| Phillips (2017) | Childhood vaccines (including BCG, yellow fever, HPV) | 78 | Mixed (study designs not reported but review mentions | NR for all studies. Includes developing/ LMIC | LMIC | Yes | x | x | | x | x | x |

| Author (year published) | Vaccine/s of interest | No. of primary studies included | Methodology of included primary studies | Countries of primary studies | Country income levels of primary studies | Review authors reported appraising primary study quality | Access | Clinic or health system | Concerns & beliefs | Health perception & experience | Knowledge & info | Social or family influence |
|-------------------------|---|---------------------------------|--|--|--|--|--------|-------------------------|--------------------|--------------------------------|------------------|----------------------------|
| | | | included quant, qual, intervention studies and systematic reviews) | | | | | | | | | |
| Quadri-Sheriff (2012) | Childhood vaccines (some studies focus on MMR, all routine vaccines, HPV, Varicella, Influenza, catch-up vaccination) | 29 | Mixed (quantitative n=12, qualitative n=17) | Australia, Europe, Hong Kong, New Zealand, USA | HIC | No | | | | | | x |
| Rainey (2011) | Routine childhood vaccines (focus on routine vaccination generally or on one or more EPI vaccines) | 203 | Mixed (n=153 cross-sectional studies or secondary analysis of cross-sectional surveys; n=22 intervention studies; n=10 anthropological investigations or focus groups; n=8 systematic reviews) | Afghanistan, Angola, Argentina, Australia, Bangladesh, Benin, Botswana, Brazil, Burkina Faso, Cambodia, Cameroun, Chad, Chile, China, Columbia, Congo, Costa Rica, Ecuador | Mixed | Yes | x | x | x | x | x | x |
| Smith (2017) | Routine childhood vaccines (defined as recommended immunisation schedule from the study setting) | 64 ^o | Quantitative | Australia, Canada, France, Hong Kong, Iraq, Israel, Japan, Korea, Netherlands, Sweden, UK, USA | HIC | Yes | x | x | x | x | x | x |

| Author (year published) | Vaccine/s of interest | No. of primary studies included | Methodology of included primary studies | Countries of primary studies | Country income levels of primary studies | Review authors reported appraising primary study quality | Access | Clinic or health system | Concerns & beliefs | Health perception & experience | Knowledge & info | Social or family influence |
|-------------------------|--|---------------------------------|---|--|--|--|--------|-------------------------|--------------------|--------------------------------|------------------|----------------------------|
| Tabacchi (2016) | MMR | 45 | Mixed (questionnaires n=28; qualitative n=17) | Belgium, France, Germany, Greece, Ireland, Italy, the Netherlands, Spain, Sweden, UK | HIC | Yes | | | | x | x | x |
| Tauil (2016) | Childhood vaccines (schedules with at least 3 DTP, 3 polio, 1 measles) | 23 | Quantitative | Argentina, Australia, Belgium, Brazil, Burkina Faso, Canada, China, India, Kenya, Mozambique, Philippines, Uganda, USA | Mixed | No | x | x | | x | x | |
| Thorpe (2016) | Routine childhood vaccines (excluding HPV) | 12 | Quantitative | Bangladesh, India, Kenya, Nepal, Nigeria | LMIC | No | | | x | | | |
| Wallace (2014) | Childhood vaccinations (focus on multiple injections delivered simultaneously) | 44 | Mixed (qualitative n=37; quantitative n=8) | Australia, Belgium, Canada, Germany, The Netherlands, Rwanda, Ukraine, UK, USA | HIC | No | | | x | | | |
| Walton (2017) | Routine childhood vaccines (including HPV) | 32 | Quantitative | Australia, Italy, Sweden, UK, USA | HIC | No | x | x | | x | x | |
| Wilder-Smith (2020) | MMR | 20 | Mixed (qualitative n=11; quantitative n=9) | France, Germany, Italy, the Netherlands, Sweden, Switzerland, UK | HIC | Yes | x | x | x | x | x | x |
| Wilson (2018) | Routine childhood vaccines | 5 | Qualitative | Australia, Canada, England, Hong Kong, The Netherlands, | HIC | Yes | x | x | x | x | x | x |

Footnote: ϕ 64 studies were reported in 68 citations.