**Supplementary material**

**Supplementary Table 1. Search strategies**

|  |  |
| --- | --- |
| **Database** | **Search strategy** |
| EMBASE (including Ovid MEDLINE, Old Ovid MEDLINE and Ovid in process and other non-indexed citation) | #1 economics OR costs OR economic evaluation OR cost effectiveness analysis OR cost-minimisation analysis OR cost utility analysis OR cost benefit analysis OR cost-consequence analysis OR pharmacoeconomic OR economic value of life OR health technology assessment OR technology assessment OR healthcare costs#2 Ghana#1AND #2  |
| PUBMED | ((((("Economics"[Mesh:noexp]) OR OR ("health care costs"[Mesh]) OR ("economic value of life"[MeSH Terms]) OR ("Economics, Hospital"[Mesh]) OR ("Economics, Medical"[Mesh]) OR ("Economics, Pharmaceutical"[Mesh:noexp]) OR (economic\*[Title/Abstract] OR cost[Title] OR costs[Title/Abstract] OR costly[Title/Abstract] OR costing[Title] OR price[Title/Abstract] OR prices[Title/Abstract] OR pricing[Title] OR pharmacoeconomic\*[Title/Abstract]) OR (value for money[Title/Abstract]) OR (expenditure\*[Title/Abstract] NOT energy[Title/Abstract]) OR (budget\*[Title/Abstract])) AND and AND ((ghana[Mesh:noexp]) OR (ghana[Title/Abstract]))) NOT (letter[Publication Type] OR editorial[Publication Type] OR comment[Publication Type] OR note[Publication Type] OR historical article[Publication Type])) NOT ((animals[mesh:noexp]) NOT ((animals[mesh:noexp]) AND and AND (humans[mesh])))) AND and English[lang] |
| Google scholar | #1 Cost effectiveness analysis in Ghana#2 Cost utility analysis in Ghana#3 Cost benefit analysis in Ghan |

**Supplementary Table 2. Characteristics of economic evaluation studies conducted in Ghana**

| Study | Perspective of analysis | Source of data | Time horizon | Type of economic evaluation  | Disease/Condition | Technology being evaluated | Type of model |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Binka, Mensah and Mills (1997) | Not specified | Clinical trial | 2 years | CEA | Malaria  | Permethrin impregnated mosquito net | Not specified |
| van Hulst et al. (2008) | Societal  | Local facility data and published literature | Lifetime  | CUA | HIV | HIV screening | Decision tree and Markov |
| van Hulst et al. (2009) | Health provider | Hospital data and published literature | < 1 year | CUA | HIV and all forms of hepatitis | Blood screening  | Markov  |
| Schillcutt et al. (2010) | Provider and patient | Program and published literature | Not specified | CUA | Hernia  | Surgical intervention | Not specified |
| Hu et al. (2010) | Health payer and societal | Local hospital data and published literature | Not specified | CEA | Abortions  | Treatment intervention | Markov  |
| Conteh et al. (2010) | Public provider and societal | Clinical trial | 18 months | CEA | Malaria | Antimalarials (malaria prophylaxis) | Not specified |
| Witternborn and Rein (2011) | Societal  | Published literature | Lifetime  | CUA | Glaucoma  | Glaucoma interventions | Validated glaucoma |
| Nonvignon et al. (2012) | Societal  | Clinical trial | 4 years | CUA | Malaria  | Antimalarials | Not specified |
| Abotsi et al. (2012) | Provider  | Ongoing program | 2 years | CEA | Malaria  | Antimalarials (malaria prophylaxis) | Not specified |
| Abbott et al. (2012) | Provider  | Clinical trial and published literature | 5 years | CUA | Childhood diarrhoea diseases | Rotavirus vaccine | Yes (but not specified) |
| Zelle et al. (2012) | Healthcare provider | Published literature and local data | 10 years | CUA | Breast cancer | Breast cancer control | Yes (but not specified) |
| Ansah et al. (2013) | Provider and societal | Clinical trial | 1 year | CEA | Malaria  | Rapid diagnostic test | Decision tree |
| Paintain et al. (2014) | Provider and societal | Before and after design | 1 year | CEA | Malaria  | Mosquito net | Basic economic |
| VanDeusen et al. (2015) | Not specified | Local hospital data and published literature | Lifetime  | CUA | HIV | Option B plus medicine | Decision tree and Markov |
| Dalaba et al. (2015) | Provider  | Before and after design | 1 year | CEA | Maternal health  | Medical intervention | Not specified |
| Pitt et al. (2015) | Public provider | Clinical trial | 1 year | CEA | Child health | Home visits | Decision tree |
| Nonvignon et al. (2016) | Provider and societal | Program and other published literature | < 1 year | CEA | Malaria | Antimalarials (malaria prophylaxis) | Not specified |
| Tawialh et al. (2016) | Health sector and societal | Clinical trials and survey for household cost | 2 years | CEA | Malaria | Rapid diagnostic test | Decision tree |
| Ferrer et al. (2017) | Societal  | Survey and published data | Not specified | CEA | Childhood malaria, diarrhoea and pneumonia | Treatment programs: ICCM and CHPS | Not specified |
| Goodman et al. (2017) | Not specified | Program and local data on wages | 5 years | CUA | Maternal and child health | Quality improvement program | Not specified |
| Gyedu et al. (2017) | Not specified | Program  | Not specified | CUA | Surgeries  | Outreach program | Not specified |
| Nonvignon et al. (2017) | Health system and societal | Published literature  | 5/20 years | CUA | Childhood diarrhoea | Rotavirus vaccine  | Decision analytic |
| Russel et al. (2017) | Not specified | Published literature | Lifetime  | CUA | Neonatal health | Group B streptococcus vaccine | Decision tree and Markov |
| Wilcox et al. (2017) | Provider  | Program and published literature | 3 years | CUA | Maternal and child health | Program: basic emergency obstetric and newborn care | Decision tree |
| Basu, Shankar and Yudnik (2017) | Societal  | Published literature | Lifetime  | CUA | Diabetes  | Diabetes treatment | Microsimulation  |
| Asamani 2018 | Health system | Clinical trial and other published literature | Lifetime  | CUA | Chronic heart failure | Drug: Entresto TM | Markov  |
| Pecenka et al. 2018 | Health system | Published | 5 years | CUA | Childhood Diarrhoea | Rotavirus vaccine | Cohort model |
| Renner et al. 2018 | Not specified | Published and local primary data | 5 years | CUA | Childhood cancers | Cancer treatments | Mode used but type not specified |
| Frempong et al. 2019 | Health system | Published  | 180 days | CUA | Typhoid fever | New hypothetical typhoid test | Decision tree |
| Anderson et al. 2019 | Health system | Published | 10 years | CUA | Childhood Diarrhoea | ETEC and Shigella vaccine | Mode used but type not specified |
| Willcox et al. 2019 | Program  | Program and published literature | 10 years | CUA | Maternal and child health | Mobile technology | Mode used but type not specified |

**Supplementary Table 2. Continued**

| Study  | Costs included | Discount rate | Sensitivity analysis | Number of authors | Outcome/effectiveness measure | Source of funding |
| --- | --- | --- | --- | --- | --- | --- |
| Binka, Mensah and Mills (1997) | Direct and indirect | 3% | Univariate and multivariate | 3 | Child deaths averted, discounted life years gained | International  |
| van Hulst et al. (2008) | Direct and indirect | 3% | Probabilistic and univariate | 11 | DALYs averted (age weighting for base case) | International |
| van Hulst et al. (2009) | Direct only | 3% | Univariate  | 9 | DALYs averted (age weighting for base case) | International |
| Schillcutt et al. (2010) | Direct and indirect | 3% | Probabilistic  | 3 | DALYs averted | International |
| Hu et al. (2010) | Direct only | 3% | Univariate and multivariate | 6 | Years of lives saved | International |
| Conteh et al. (2010) | Direct and indirect | 3% | Probabilistic  | 6 | Malaria episodes averted | International |
| Witternborn and Rein (2011) | Direct and indirect | 3% | Univariate  | 2 | DALYs gained | International |
| Nonvignon et al. (2012) | Direct and indirect | 3% | Univariate and multivariate | 7 | DALYs saved/gained, anaemia cases averted, number of deaths due to malaria averted | International |
| Abotsi et al. (2012) | Direct and indirect | 3% | Univariate  | 7 | Malaria cases averted, number of deaths due to malaria averted, DALYs saved\* | Self-funded |
| Abbott et al. (2012) | Direct only | 3% | Univariate and multivariate | 4 | DALYs averted | International |
| Zelle et al. (2012) | Direct and indirect | 3% | Univariate  | 9 | DALYs averted | International |
| Ansah et al. (2013) | Direct and indirect | 5% | Univariate and multivariate | 5 | Correctly treated fever | International |
| Paintain et al. (2014) | Direct and indirect | 3% | Univariate  | 15 | Additional number of persons using an LLIN, additional number of children under five years using an LLIN, additional number of all-cause under five deaths averted | International |
| VanDeusen et al. (2015) | Direct and indirect | 3% | Univariate  | 4 | QALYs gained, HIV infections averted among newborns | International |
| Dalaba et al. (2015) | Direct only | 3% | Univariate  | 9 | Detection of pregnancy complications, reduction in labour complications | International |
| Pitt et al. (2015) | Direct and indirect | 3% | Probabilistic and univariate  | 10 | Years of lives saved (discounted), neonatal mortality averted | International |
| Nonvignon et al. (2016) | Direct and indirect | 3% | Univariate  | 9 | Additional number of malaria cases and deaths averted | International |
| Tawiah et al (2016) | Direct and indirect cost | 5% | Probabilistic and univariate | 10 | Appropriate treatment of malaria with Artemeter Lumefantrine  | International |
| Ferrer et al. (2017) | Direct and indirect cost | 3% | Univariate | 12 | Appropriate diagnosis and treatment given | International |
| Goodman et al. (2017) | Direct and indirect cost | Not specified | Univariate | 8 | DALYs | International |
| Gyedu et al. (2017) | Direct and indirect cost | Not specified | None | 4 | DALYs | International and local |
| Nonvignon et al. (2017) | Direct and indirect cost | 3% | Univariate | 8 | DALYs | International |
| Russel et al. (2017) | Direct costs | 3% | Probabilistic and univariate | 8 | DALYs | International |
| Wilcox et al. (2017) | Direct costs | 3% | Probabilistic and univariate | 6 | DALYs | International |
| Basu, Shankar and Yudnik (2017) | Direct and indirect cost | 3% | Univariate | 3 | DALYs | Not specified |
| Asamani 2018 | Direct costs | 3.5% | Probabilistic and univariate | 1 | QALYs | Not specified |
| Pecenka et al. 2018 | Direct costs | Not specified | Threshold analysis | 7 | DALYs | International |
| Renner et al. 2018 | Direct costs | 3% | Univariate | 6 | DALYs | International |
| Frempong et al. 2019 | Direct costs | 3% | Probabilistic and headroom analysis | 4 | QALYs | International |
| Anderson et al. 2019 | Direct costs | 3% | Probabilistic and univariate | 8 | DALYS, diarheoal episodes, direct deaths, children stunted, stunted children dying from other infectious diseases | International |
| Willcox et al. 2019 | Direct costs | 3% | Probabilistic and univariate | 8 | DALYS | International |

Abbreviations: CEA, Cost effectiveness analysis; CHPS, community-based health planning and services; CUA, Cost utility analysis; DALY, Disability adjusted life years; ICCM, integrated community case management; LLIN, Long lasting insecticidal nets; QALYs, Quality adjusted life years; HIV, Human immunodeficiency virus.

**Supplementary Table 3. The Quality score of studies reviewed**

|  | Title | Abstract | Background and objectives | Target pop and subgroups  | Setting and location | Study perspective | Comparators | Time horizon | Discount rate | Choice of health outcomes | Measurement of effectiveness | Preference-based outcomes | Est resources and outcomes | Currency, price, and conversion | Choice of model | Assumptions | Analytical methods | Study parameters | IC and outcomes | Characterising uncertainty | Characterising heterogeneity | Discussion | Source of funding | Conflicts of interest | Number of criteria met |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Binka, Mensah and Mills (1997) | × | × | × |  | × |  | × | × | × | × | × |  | × | × |  |  | × | × | × | × |  | × | × | × | 16 |
| van Hulst et al. (2008) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | 23 |
| van Hulst et al. (2009) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × |  | × | × | × | 22 |
| Schillcutt et al. (2010) | × | × | × | × | × | × | × |  | × | × | × | × | × | × |  |  | × | × | × | × | × | × | × | × | 21 |
| Hu et al. (2010) | × | × | × | × | × | × | × |  | × | × | × |  | × | × | × | × | × | × | × | × |  | × | × |  | 20 |
| Conteh et al. (2010) | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  |  | × | × | × | × |  | × | × | × | 20 |
| Witternborn and Rein (2011) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × |  | × | × | × | 22 |
| Nonvignon et al. (2012) | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  |  | × | × |  | × |  | × | × |  | 19 |
| Abotsi et al. (2012) | × | × | × | × | × | × |  |  | × | × | × | × | × |  |  |  | × | × |  | × |  | × | × | × | 17 |
| Abbott et al. (2012) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  | 22 |
| Zelle et al. (2012) | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  | 22 |
| Ansah et al. (2013) | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | × | × | × | × | × |  | × | × |  | 21 |
| Paintain et al. (2014) | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  |  | × | × | × | × |  | × | × | × | 20 |
| VanDeusen et al. (2015) | × | × | × | × | × |  | × | × | × | × | × | × | × |  | × | × | × | × | × | × |  | × | × | × | 21 |
| Dalaba et al. (2015) | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  |  | × | × | × | × |  | × | × | × | 20 |
| Pitt et al. (2016) | × | × | × | × | × | × |  | × | × | × | × |  | × | × | × | × | × | × | × | × |  | × | × | × | 21 |
| Nonvignon et al. (2016) | × | × | × | × | × | × | × | × | × | × | × |  | × | × |  |  | × | × | × | × |  | × | × | × | 20 |
| Tawiah et al. (2016) | × | × | × | × | × | × | × | × | × | × | × |  | × |  | × | × | × | × | × | × |  | × | × | × | 21 |
| Ferrer et al. (2017) | × | × | × | × | × | × | × |  | × | × | × |  | × | × |  | × | × | × | × | × |  | × | × | × | 20 |
| Goodman et al. (2017) | × | × | × | × | × |  | × | × |  | × | × |  | × | × |  | × | × | × | × | × |  | × | × | × | 19 |
| Gyedu et al. (2017) | × | × | × | × | × |  | × |  |  | × | × |  | × | × |  |  | × | × |  |  |  | × | × | × | 14 |
| Nonvignon et al. (2017) | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | × | × | × | × | × |  | × | × | × | 22 |
| Russel et al. (2017) | × | × | × | × | × |  | × | × | × | × | × |  | × | × | × | × | × | × |  | × |  | × | × | × | 20 |
| Wilcox et al. (2017) | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | × | × | × |  | × |  | × | × | × | 21 |
| Basu, Shankar and Yudnik (2017) | × | × | × | × | × | × | × | × | × | × | × |  | × |  | × | × | × | × |  | × |  | × |  | × | 19 |
| Asamani 2018 | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | × | × | × | × | × |  | × |  |  | 20 |
| Pecenka et al. 2018 | × | × | × | × | × | × | × | × |  | × | × | × | × |  | × | × | × | × | × | × |  | × | × | × | 21 |
| Renner et al. 2018 | × | × | × | × | × |  |  | × | × | × | × | × | × |  | × | × | × | × |  | × |  | × | × | × | 19 |
| Frempong et al. 2019 | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | 23 |
| Anderson et al. 2019 | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | 23 |
| Willcox et al. 2019 | × | × | × | × | × | × |  | × | × | × | × | × | × | × | × | × | × | × | × | × |  | × | × | × | 22 |

Abbreviations: IC = incremental cost

Note: A (x) means studies satisfied the CHEERS checklist criterion