Table 3. Summary of malaria vector control tools (VCTs), excluding ITNs and IRS, with at least one Phase III evaluation, stratified by outcome

VCT or study reference	Outcome	Study design	Number of participants (N studies)	Measure of effect	Relative effect (95% CI)*	Quality of evidence (GRADE)†	Risk of bias (EPOC) ‡	Comments
VCTs with a recent systematic review§								
Larval source management (LSM)								
Biological control with larvivorous fish								
Reference: Walshe 2013 **Study type:** Cochrane review (AMSTAR score 91%)	Malaria incidence; EIR; density of adult mosquitoes	--	0 studies	--	--	--	--	No studies eligible
Participants: All age groups in malaria-endemic settings **Countries:** Kenya, Korea, India, Indonesia, Sri Lanka, Sudan	Density of mosquito larvae	Quasi-experimental	9 studies	Not pooled	--	Very low	--	Variable effects reported
Larval source management, excluding biological control with larvivorous fish								
Reference: Tusting 2013 **Study type:** Cochrane review (AMSTAR score 100%) **Participants:** All age groups in malaria-endemic settings **Countries:** Eritrea, The Gambia, Greece, Kenya, India, Mali, Philippines, Sri Lanka, Tanzania	Malaria incidence	Cluster-RCT	20124 (2 studies)	Rate ratio	0.26 (0.22, 0.31)	Moderate	--	95% CI may be falsely narrow because studies did not adjust for cluster design
		CBA	98233 (3 studies)	Rate ratio	0.51 (0.18, 1.44)	Very low	--	--
	Parasite prevalence	Cluster-RCT	2963 (1 study)	Risk ratio	0.11 (0.05, 0.22)	Moderate	--	95% CI may be falsely narrow because studies did not adjust for cluster design
		CBA	8041 (5 studies)	Risk ratio	0.32 (0.19, 0.55)	Moderate	--	--
	EIR	Cluster-RCT	1 study	Percent reduction	84.6 (year 2 data); not estimable (year 1 data)	--	--	95% CI not available
		CBA	3 studies	Percent reduction	21.3 (-42.3, 56.4) to 73.0 (22.0, 90.7)	--	--	--
	HBR	Cluster-RCT	1 study	Percent reduction	45.8 (year 2) to 49.0 (year 1)	--	--	95% CI not available
		CBA	2 studies	Percent reduction	31.3 (-59.2, 70.4) to 73.1 (20.3, 90.9)	--	--	--
Mosquito-proofed housing								
Screened versus unscreened housing								
Reference: Tusting 2015 **Study type:** Systematic review (AMSTAR score 91%) **Participants:** All age groups in malaria-endemic settings **Countries**: Benin, Equatorial Guinea, Ethiopia, The Gambia, Ghana, Kenya, Nigeria, Peru, Sao Tome & Principe, Sudan, Tanzania, USA	Clinical malaria	Case–control	1 study	Crude odds ratio	1.16 (0.82, 1.64)	Not assessed	--	--
		Cohort	3 studies	Adjusted rate ratio	0.56 (0.46, 0.67)	Not assessed	--	--
	Malaria infection	RCT	1 study	Adjusted odds ratio	0.95 (0.63, 1.43)	Not assessed	--	--
		Case-control, cross-sectional, cohort	2 studies	Adjusted odds ratio	0.93 (0.82, 1.05)	Not assessed	--	--
	Anaemia in children aged 0-11 years	RCT	1 study	Adjusted odds ratio	0.52 (0.34, 0.80)	Not assessed	--	--
		Case-control	1 study	Adjusted odds ratio	0.56 (0.24, 1.27)	Not assessed	--	--
	EIR	RCT	1 study	Abundance ratio	0.34 (0.21, 0.54) (year 1); 0.31 (0.16, 0.59) (year 2)	Not assessed	--	--
	HBR	RCT	1 study	Ratio of means	0.46 (0.34, 0.63)	Not assessed	--	--

		Phase II	2 studies	Rate ratio	0.50 (0.38, 0.67) to 0.61 (0.44, 0.83)	Not assessed	--	--
		Cohort; cross-sectional	3 studies	--	--	Not assessed	--	Variable associations reported
Modern versus traditional housing								
Reference: Tusting 2015 **Study type:** Systematic review (AMSTAR score 91%) **Participants:** All age groups in malaria-endemic settings **Countries:** East Timor, Egypt, Ethiopia, Greece, Malawi, Mexico, Sri Lanka, Tanzania, Thailand, Uganda, Yemen	Clinical malaria	Case–control	357 (1 study)	Adjusted odds ratio	0.35 (0.20, 0.62)	Very low	--	--
		Cohort	2237 (3 studies)	Adjusted rate ratio	0.55 (0.36, 0.84)	Very low	--	--
	Malaria infection	Case-control; cross-sectional; cohort	3949 (5 studies)	Adjusted odds ratio	0.53 (0.42, 0.67)	Very low	--	--
	HBR	Cohort	2 studies	Adjusted odds ratio	0.48 (0.37, 0.64) to 0.57 (0.37, 0.87)	Not assessed	--	--
Topical repellents								
Reference: Wilson 2014 **Study type:** Systematic review (AMSTAR score: 64%) **Participants:** All age groups in malaria-endemic settings **Countries**: Bolivia, Ecuador, Ethiopia, Ghana, India, Lao People's Democratic Republic (PDR), Pakistan, Peru, Tanzania, Thailand	*P. falciparum* malaria or infection	RCT; CBA	7 studies	Crude risk ratio	0.82 (0.62, 1.08)	Not assessed	Low/unclear	--
	P. vivax malaria or infection	RCT; CBA	6 studies	Crude risk ratio	0.80 (0.47, 1.37)	Not assessed	Low/unclear	--
Other VCTs with a Phase III evaluation[¶]								
Insecticide-treated clothing and blankets								
Reference: Macintyre 2003 **Study type:** Phase III **Participants:** All age groups **Country**: Kenya	Malaria incidence (aged >5 years)	RCT	375	Crude rate ratio	0.19 (0.05, 0.77)	--	Moderate	--
	Malaria incidence (aged ≤5 years)	RCT	97	Crude rate ratio	1.87 (0.31, 11.30)	--	Moderate	--
Reference: Rowland 1999 **Study type:** Phase III **Participants:** All age groups; refugees **Country:** Pakistan	*P. falciparum* incidence	RCT	825	Adjusted odds ratio	0.51 (0.30, 0.86)	--	Low	--
	P. vivax incidence	RCT	825	Adjusted odds ratio	0.70 (0.43, 1.13)	--	Low	--
Insecticide-treated hammocks								
Reference: Magris 2007 **Study type:** Phase III **Participants:** All age groups **Country:** Venezuela	Malaria incidence	RCT	924	Adjusted rate ratio	0.44 (0.41, 0.48)	--	Low	--
	Malaria prevalence (aged ≤6 months)	RCT	924	Adjusted risk ratio	0.17 (0.00, 0.53)	--	Low	--
Reference: Thang 2009 **Study type:** Phase III **Participants:** All age groups **Country:** Vietnam	Malaria incidence	RCT	18646	--	--	--	Low	See footnote[l]
	Malaria prevalence	RCT	18646	--	--	--	Low	
Insecticide-treated livestock								
Reference: Rowland 2001 **Study type**: Phase III **Participants**: All age groups; refugees **Country:** Pakistan	Malaria incidence (*P. falciparum*)	Cross-over	56329	Adjusted rate ratio	0.44 (0.22, 0.86)	--	Moderate	--
	Malaria incidence (*P. vivax*)	Cross-over	56329	Adjusted rate ratio	0.69 (0.50, 0.95)	--	Moderate	--

	Malaria prevalence (*P. falciparum*)	Cross-over	56329	Adjusted rate ratio	0.46 (0.31, 0.70)	--	Moderate	--
	Malaria prevalence (*P. vivax*)	Cross-over	56329	Adjusted rate ratio	0.60 (0.33, 1.08)	--	Moderate	--
	Density of adult *An. stephensi*	Cross-over	15 sentinel rooms/village	Density ratio	0.53 (0.32, 0.88)	--	Moderate	--
	Density of adult *An. subpictus*	Cross-over	15 sentinel rooms/village	Density ratio	0.67 (0.25, 1.85)	--	Moderate	--
Spatial repellents								
Reference: Hill 2014 **Study type:** Phase III **Participants:** All age groups **Country:** China	Malaria prevalence (*P. falciparum*)	RCT	7413	Adjusted odds ratio	0.23 (0.11, 0.50)	--	Moderate	--
	Malaria prevalence (*P. vivax*)	RCT	7413	Adjusted odds ratio	0.20 (0.09, 0.44)	--	Moderate	--
	HBR	RCT	Four sentinel houses per arm	Percent reduction	88%	--	Moderate	95% CI not reported
Reference: Lawrance 2004 **Study type:** Systematic review (AMSTAR score: 18%) **Participants:** Not reported **Countries:** Not reported	Biting or feeding inhibition; mosquito mortality, knockdown	Laboratory, Phase II	15 studies	No meta-analysis reported	--	Not assessed	--	No included studies measured the effect of mosquito coils on the incidence of clinical malaria. Mosquito coils inhibited nuisance biting in 13 of 15 included studies (though the effect was not always significant).
Reference: Ogoma 2012 **Study type**: Systematic review (AMSTAR score: 18%) **Participants:** n/a **Countries:** Not reported	Adult mosquito mortality; knock-down time post-exposure; deterrence; human feeding	Laboratory, Phase II	17 studies	No meta-analysis reported	--	Not assessed	--	There was evidence that coils and emanators increased mosquito mortality and deterrence and reduced human feeding.
Reference: Syafruddin 2014 **Study type:** Phase III **Participants:** Men aged 18-60 years **Country:** Indonesia	Incidence of new malaria infections	RCT	170	Relative risk	0.48 (0.31, 0.75)		Low	--
	HBR	RCT	Five sentinel houses	Percent reduction	32.9%		Low	95% CI not reported
Zooprophylaxis								
Reference: Donnelly 2015 **Study type**: Systematic review (AMSTAR score: 18%) **Participants:** All age groups **Countries:** Bolivia, Burkina Faso, Ethiopia, The Gambia, Ghana, Guinea Bissau, Kenya, Mozambique, Pakistan, Lao PDR, Zambia	Malaria prevalence, human blood index, HBR	Not reported	20 studies	n/a	No meta-analysis	n/a		Variable effects reported

*CI: Confidence interval

†GRADE: GRADE Working Group[53] grades of evidence for each outcome, as evaluated by the authors of the cited review. Grades range from high quality (further research is very unlikely to change our confidence in the estimate of effect) to moderate quality (further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate), low quality (further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate) and very low quality (we are very uncertain about the estimate).

‡EPOC risk of bias scores[15] for Phase III studies, as evaluated by the authors of the present review.

§For VCTs with a systematic review with an AMSTAR score of ≥50%, individual Phase III studies are not presented.

[¶]For VCTs without a systematic review with an AMSTAR score of ≥50%, both systematic reviews and individual Phase III studies are presented.
[|]After 24 months' follow up, malaria incidence decreased in both control (IRR 0.48; 95% CI 0.28, 0.82) and intervention (IRR 0.23, 95% CI 0.14, 0.38) arms, compared to the baseline, and infection prevalence decreased in both control (OR 0.26, 95% CI 0.20, 0.35) and intervention (OR 0.15, 95% CI 0.09, 0.26) arms. Malaria incidence and infection prevalence in the intervention group decreased significantly more in the intervention arm than in the control.