

Table 3: Surveillance and public health actions for national contingency invasive mosquito plan levels 0 to 4

Risk Level and description	Surveillance	Public Health Actions	Vector control
<p>Level 0</p> <p>No invasive mosquitoes detected in England.</p> <p>Imported human cases of mosquito borne disease only.</p>	<p>Active entomological surveillance</p> <ul style="list-style-type: none"> - On a risk-based approach – primarily at points of entry to England, main highway routes, climate-suitable urban areas and other at-risk locations. See https://www.gov.uk/guidance/information-on-invasive-mosquitoes. <i>UKHSA and LA</i> <p>Passive entomological surveillance</p> <ul style="list-style-type: none"> - Voluntary reporting from members of the public through UKHSA mosquito recording scheme (1). <i>UKHSA</i> - Local authority nuisance mosquito recording to UKHSA. <i>UKHSA and LA</i> <p>Disease surveillance</p> <ul style="list-style-type: none"> - Dengue virus and Chikungunya virus are notifiable organisms, <i>UKHSA</i> - Surveillance of travel associated infections, <i>UKHSA</i> - Testing of travellers who have returned from outside of the UK from endemic areas with compatible clinical syndromes, <i>UKHSA and NHS</i> - NHSBT screening programme of some donors based on travel history, <i>NHSBT</i> 	<p>Public communications to raise awareness of invasive mosquitoes, how to report them, and how to reduce potential habitats. <i>UKHSA</i></p> <p>Travel health information for those travelling overseas, including country-specific advice and mosquito bite avoidance advice. <i>NATHNaC</i></p> <p>Up-to-date guidelines regarding blood donation and overseas travel. <i>NHSBT</i></p> <p>Communications regarding VBDs <i>UKHSA</i></p>	<p>No targeted vector control.</p> <p>Local authorities to take up training in invasive mosquito surveillance, incident response, and principles of mosquito control provided by UKHSA. <i>LA</i></p> <p>Ensure ports of entry and high-risk sites are managed to reduce litter, in order to reduce habitats for invasive mosquitoes and reduce future costs of control in the event of detection. <i>LA and Port Health authorities</i></p> <p>Business owners in high-risk areas (for</p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
	<p>- Syndromic surveillance of insect bite related healthcare encounters <i>UKHSA</i></p> <p>Horizon scanning and review signals from changes in epidemiology, entomology or other factors which may affect the risk from mosquito-borne diseases to the UK. <i>UKHSA, HAIRS</i></p>		<p>example, service stations) to ensure litter is removed. <i>LA</i></p> <p>Each local authority should maintain and exercise a plan for how to manage invasive mosquitoes, with level of effort based upon the local risk of the mosquito establishing as informed by annual UKHSA updates. <i>LA</i></p> <p>Develop and maintain a preparedness plan for invasive mosquitoes based on potential local risk. <i>LRF</i></p> <p>Guidance available at Management of invasive species of mosquitoes - Urban Pests Book</p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
<p>Level 1</p> <p>Invasive mosquitoes detected in an area in England.</p> <p>Imported human cases only</p>	<p>Per level 0 plus:</p> <p>Enhanced entomological investigation into a new incursion, and monitoring efficacy of any vector control measures. <i>UKHSA and LA</i></p> <p>Continued surveillance at other key locations per Level 0, including sites of previous invasive mosquito detections. <i>UKHSA and LA</i></p> <p>Follow up of confirmed cases from that area to ensure they are travel-acquired, UKHSA</p>	<p>Per level 0 plus:</p> <p>UKHSA Health Protection Team-led multi-agency incident management team (IMT) to coordinate investigation into the introduction, risk assessment and control measures. <i>UKHSA, LA, DPH, ICB, NHS, Port Health</i></p> <p>Enhanced public communications prior to the summer season to raise awareness of invasive mosquitoes, promote use of the mosquito recording scheme, mosquito bite and source reduction advice. <i>UKHSA</i></p> <p>Develop bespoke advice on bite prevention measures to be provided</p>	<p>Targeted vector control intervention in 200-300m buffer zone of each detection. This may include source reduction (including litter removal and incineration), larviciding and public engagement. <i>LA with technical support from UKHSA.</i></p> <p>Guidance available at Management of invasive species of mosquitoes - Urban Pests Book</p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
		to confirmed imported cases, <i>UKHSA</i>	

Risk Level and description	Surveillance	Public Health Actions	Vector control
<p>Level 2</p> <p>Invasive mosquitoes established in an area of England and imported human cases only</p> <p>(Actions proportional to the period of seasonal activity of the mosquito).</p>	<p>Entomological surveillance, <i>UKHSA and LA</i></p> <ul style="list-style-type: none"> - Map of surveillance to accurately assess the distribution of invasive mosquitoes, and estimate abundance and density. <i>UKHSA and LA</i> - Entomological surveillance around areas where invasive mosquitoes are established to inform control strategy. <i>LA with support from UKHSA</i> - Employ available models to guide at risk areas and entomological responses. <i>UKHSA</i> - Review impact of vector control measures taken on vector abundance and density. <i>UKHSA</i> 	<p>Initiate local response through IMT and local resilience forum. <i>UKHSA HPT and LA</i></p> <p><i>UKHSA</i> initiate national incident response and convene technical group. <i>UKHSA</i></p> <p>Notify cross-government departments of the increased risk and share any relevant advice or guidance. <i>UKHSA</i></p> <p>National bite avoidance advice to people with mosquito-borne diseases, people with imported fever, and people returning from highly endemic areas to</p>	<p>Vector control (source reduction and larviciding) to reduce nuisance biting and risk of mosquito borne disease transmission from an imported case. If the invasive mosquitoes are not controlled by these measures and risk is assessed as high, IMT to consider intensive vector control measures for example, adulticiding around imported cases</p> <p><i>LA with technical support from UKHSA</i></p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
	<ul style="list-style-type: none"> - Routine publication of invasive species distribution maps. <i>UKHSA</i> <p>Disease surveillance</p> <ul style="list-style-type: none"> - Enhanced surveillance of all mosquito-borne diseases through national surveillance programme to determine if imported or locally acquired. <i>UKHSA</i> - Map imported human cases on to map of invasive mosquito distribution through integrated system. <i>UKHSA</i> - Prepare seroprevalence study protocol for roll out if locally acquired cases are subsequently detected. <i>UKHSA</i> - Consider focused seroprevalence studies targeting specific groups if funding available, <i>UKHSA and NHSBT</i> <p>Modelling of disease transmission potential using the extrinsic incubation period (EIP) <i>UKHSA</i></p>	<p>areas where mosquito is established. <i>UKHSA, NHS</i></p> <p>National public communications on risk and risk reduction (mosquito control, bite avoidance), with targeted efforts on the areas where the mosquitoes have become established. Communications to be enhanced relating to specific incidents or events. <i>UKHSA and LA.</i></p> <p>Identify any high risk groups or settings, <i>LA and UKHSA.</i></p> <p>Targeted pre-travel advice for residents of a level 2 area who are visiting a dengue endemic area. <i>UKHSA</i></p> <p>Communications to clinicians to ensure an appropriate level of awareness among health care professionals i.e. targeted</p>	<p>See guidance at Level 0 for maintaining litter free points of entry and at-risk areas around surveillance locations to a) reduce suitability for establishment and b) reduce incident cost</p> <p>Guidance available at Management of invasive species of mosquitoes - Urban Pests Book</p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
		<p>local engagement of clinicians, availability of national guidelines for clinical management and briefing note. <i>UKHSA</i></p> <p>Diagnostic and clinical guidance provided to NHS. <i>UKHSA</i></p> <p>UKHSA would work with NHS to provide guidance and support re clinical assessment of cases of imported fever and fever of unknown origin (i.e. lower threshold for testing). <i>NHS and UKHSA</i></p> <p>Scope out roll-out of dengue (and other VBD) testing to NHS laboratories. <i>NHS and UKHSA</i></p> <p>Alert to NHSBT. <i>UKHSA</i></p>	

Risk Level and description	Surveillance	Public Health Actions	Vector control
<p>Level 3</p> <p>At least one case of confirmed locally acquired mosquito-borne infection in 1 or more foci in a limited region</p>	<p>Entomological investigation where local cases are suspected or confirmed</p> <ul style="list-style-type: none"> - Enhanced mosquito surveillance in areas identified as higher risk, local to, or visited by, the locally acquired case. <i>LA with support from UKHSA.</i> - Identify mosquito breeding sites. <i>LA with support from UKHSA</i> - Use of modelling to guide response. <i>UKHSA.</i> <p>Disease surveillance</p> <ul style="list-style-type: none"> - Enhanced surveillance of all <i>Aedes</i> borne diseases through national surveillance programme. <i>UKHSA</i> - Routine mapping of imported and locally acquired cases onto invasive mosquito map. <i>UKHSA</i> 	<p>Initiate local response through IMT and local resilience forum. <i>HPT and LA</i></p> <p>UKHSA to initiate national incident response; likely to convene a national IMT, and technical group. <i>UKHSA</i></p> <p>Ensure cross government partners are kept informed of the risk. <i>UKHSA</i></p> <p>Epidemiological investigation which may include first few cases enhanced surveillance protocol, and active case finding. <i>UKHSA</i></p> <p>Community engagement Public communications on risk reduction and bite avoidance,</p>	<p>Per level 2</p> <p>AND</p> <p>Targeted vector control around imported and locally acquired cases where the IMT considers there is a risk of onwards transmission. <i>LA</i></p> <p>Guidance available at Management of invasive species of mosquitoes - Urban Pests Book</p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
	<ul style="list-style-type: none"> - Consider roll out VBD seroprevalence study protocol if funding available. <i>UKHSA</i> 	<p>especially if unwell. <i>UKHSA and LA</i></p> <p>Communications to be enhanced relating to specific incidents or events (for example, first locally acquired human case of a specific mosquito-borne disease). <i>UKHSA and LA</i></p> <p>Warn and inform notification to local populations, providing risk communication materials and advice on reducing mosquito breeding sites. <i>UKHSA and LA</i></p> <p>Information to employers and public on invasive mosquito source control. <i>UKHSA and LA</i></p> <p>Employers to inform employees where there is an occupational risk. <i>Employers</i></p>	

Risk Level and description	Surveillance	Public Health Actions	Vector control
		<p> Diagnostics and clinical management: Urgent public health alert to NHS on presence of mosquito borne infection in UK, including diagnostic and clinical guidance. <i>UKHSA</i> </p> <p> Assess laboratory capacity/testing capacity to establish widespread testing. <i>UKHSA and NHS</i> </p> <p> Standard measures to prevent transmission through infected blood and tissue products and implement any additional measures as advised by SACTTI. <i>NHSBT</i> </p> <p> Consider clinical studies including outcomes and therapeutics. <i>UKHSA and NHS</i> </p> <p> Discuss with JCVI potential role for vaccinations (see </p>	

Risk Level and description	Surveillance	Public Health Actions	Vector control
		annex). <i>UKHSA, NHS, DHSC and JCVI</i>	
<p>Level 4</p> <p>Invasive mosquitoes are widely established in England, AND geographically spread locally transmitted cases and outbreaks of an exotic mosquito-borne infection.</p>	<p>Per level 3</p> <p>AND</p> <p>Expand entomological surveillance over a wider geographical area as informed by modelling. <i>LA with support from UKHSA</i></p> <p>Consideration of mosquito testing for <i>Aedes</i>-borne arboviruses. <i>UKHSA</i></p> <p>Recommendation on syndromic testing to NHS. <i>UKHSA</i></p>	<p>Per level 3</p> <p>AND</p> <p>Expand over a wider geographical area</p> <p>Regular communications to be issued, with enhanced communications implemented for specific incidents and outbreaks. <i>UKHSA</i></p> <p>Consideration should be given to an advertising awareness-raising campaign. <i>UKHSA</i></p> <p>Cross-government coordination of response. <i>UKHSA or Cabinet Office</i></p>	<p>Per level 3</p> <p>AND</p> <p>Expand mosquito control activities over a wider geographical area. <i>LAs, and IMT. LA can request activation of LRF response structures if multi-agency co-ordination is required.</i></p> <p>Consider bespoke interventions (for example, local adulticiding around imported cases) in high transmission risk areas (lots of travellers, lots of invasive mosquitoes). <i>IMT</i></p>

Risk Level and description	Surveillance	Public Health Actions	Vector control
		<p>Support arrangements for co-ordination across multiple Local Resilience Forums. <i>MHCLG</i></p> <p>Use modelling to predict and understand outbreak hotspots. <i>UKHSA</i></p> <p>Screening of blood and tissue products by NHSBT and possibly wider UK blood services as directed by SACTTI/SABTO and aligned with regulatory frameworks. <i>NHSBT</i></p>	<p>Guidance available at Management of invasive species of mosquitoes - Urban Pests Book</p>