Malaria vector insecticide resistance monitoring and status in the Asia-Pacific

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GMP Entomology and Vector Control
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WHO data collation and management

- Countries should have **national databases** to compile and manage vector surveillance information
- WHO requests that data are reported **annually**: country → region → global
- WHO insecticide resistance database is used for status updates and assessments to inform guidance development
- Completeness of reporting is therefore essential
- Reporting usually June/July but for 2018 there have been delays due to DHIS-2 preparation
WHO data collation and management

- National databases
  - WHO regional database
  - WHO global IR database
  - WHO data collation and management

- Scientific publications eg. MAP
- Unpublished reports eg. PMI
- Research results eg. IIR project
Data use - examples

• Global report on insecticide resistance in malaria vectors: 2010-2016 (and subsequent updates)

• Regional reports and status updates

• Malaria Threats Map

• Additional investigations: spatial and temporal trends; gaps analyses; identifying areas appropriate for pyrethroid-PBO net deployment
2018 data collations

• Excel forms plus DHIS-2 links (and instructions) will be sent soon by regional/country offices

• Countries are requested to:
  1) verify data
  2) add any new data

• Requested for: 21 September 2018
Monitoring and resistance status: APMEN countries
Data reported: South-East Asia

Country status for reporting of resistance data to WHO from 2015 to 2018, by insecticide class

a) Pyrethroids

b) Carbamates

Last year reporting
- Red: Before 2015 or never
- Orange: 2015
- Yellow: 2016
- Green: 2017
- Dark green: 2018
- Grey: Not endemic

Numbers indicate total years of data reported to WHO (2015-2018)

c) Organophosphates

d) Organochlorines
Data reported: Western Pacific

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Data reported: 2010-2016, APMEN countries

a) Total data by investigation type, APMEN countries (n=2762)

- Biochemical assay
- Molecular assay
- Intensity concentration bioassay
- Other bioassay
- Discriminating concentration bioassay

b) Total data by year, APMEN countries (n=2762)

- 2010: 300 reports
- 2011: 350 reports
- 2012: 300 reports
- 2013: 500 reports
- 2014: 500 reports
- 2015: 400 reports
- 2016: 300 reports

Majority of data were for discriminating concentration bioassays, with decreases in the amount of data reported for 2015-2016.
c) Total data by vector species, APMEN countries (n=2762)

Diversity of vector species in the region, with data for An. culicifacies and An. sinensis most commonly reported.
### Resistance status: 2010-2016, APMEN countries

PY = pyrethroids; OC = organochlorines; C = carbamates; OP = organophosphates
R = resistance confirmed; S = resistance not confirmed (susceptible or possible resistance)

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<thead>
<tr>
<th>Country</th>
<th>Resistance status</th>
<th>Species exhibiting resistance</th>
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<td>PY</td>
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Pyrethroid and DDT resistance confirmed in most countries in numerous vectors, with limited testing of carbamates and OPs
Resistance to all four insecticide classes is prevalent when considering all APMEN countries (but largely driven by India).
Pyrethroid resistance frequency varied widely between APMEN countries.
Resistance frequency for other insecticides was high, and varied widely across APMEN countries.
Resistance mechanisms

- Very few data on resistance mechanisms reported (China, India, PNG, Republic of Korea)
- But data are required to guide deployment of some tools
  - evidence of P450s needed for pyrethroid-PBO nets
    → but no data from synergist-insecticide bioassays
- Data requirements should be clearly articulated in national insecticide resistance monitoring and management plans

Resistance monitoring will need to be strengthened to guide deployment of new tools
Resistance monitoring & management plans are needed. These must leverage available interventions proactively & appropriately.

Some progress has been made. Further effort is required.

Data source: WHO (2017e)
Outlook

- Wide diversity in vector species in APMEN countries
- Confirmed resistance to pyrethroids in most countries, with varying frequencies
- Confirmed resistance to 3 other classes in many countries
- Complete extent of resistance unknown because:
  - many countries do not carry out routine monitoring
  - countries collect data but no timely reporting or sharing
  - no data yet for new insecticides (e.g. neonicotinoids - IRS product PQ-listed 2017)
- Impact of insecticide resistance on effectiveness of vector-control tools remains poorly-understood

But... the potential that increasing resistance may reduce the efficacy of insecticidal interventions remains concerning
Thank you