The Republic of Korea, which was malaria-free from 1979 to 1993, currently has a national goal to eliminate malaria by 2015.

Overview

The Republic of Korea is a country partner of the Asia Pacific Malaria Elimination Network (APMEN) and is categorized in the elimination phase by the World Health Organization (WHO). This densely populated country was declared free of Plasmodium vivax malaria in 1979 by WHO. However, malaria reemerged in 1993 and cases rapidly increased to 4,142 by 2000 before declining. Plasmodium vivax is the only endemic malaria parasite active in the Republic of Korea, and has an unstable (border) transmission pattern from May through October. Anopheles sinensis was previously thought to be the primary vector in the Republic of Korea. More recent data identifies two other species, An. pullus and An. kleini, that, along with An. lesteri in some locations, are the primary vectors, with An. sinensis playing a secondary role in transmission.

Malaria Transmission Limits

*2010 statistics

Reported cases of malaria (P. vivax only)

Deaths from malaria

% of population at risk (total population: 48.1 million)

Annual parasite incidence (cases/1,000 total population/year)

% Slide positivity rate

N/A: Data not available

P. vivax malaria risk is classified into no risk, unstable risk of <0.1 case per 1,000 population (API) and stable risk of ≥0.1 case per 1,000 population (API). Risk was defined using health management information system data and the transmission limits were further refined using temperature and aridity data. Data from the international travel and health guidelines (ITHG) were used to identify zero risk in certain cities, islands and other administrative areas.
Phylaxis was initiated among Korean soldiers deployed in malaria high-risk areas bordering the DPRK. The program expanded annually from 37,000 doses to approximately 200,000 doses today. This program reduced the proportion of military cases out of the total number of annual cases to approximately 20 percent by 2007. Conversely, the number of adult civilian cases began increasing in 1999, and since 2002 accounted for more than 50 percent of the number of malaria cases reported annually.

Over the last decade, there was a 68 percent decrease in the number of annual cases due to effective chemoprophylaxis for soldiers and the advent of a web-based surveillance and epidemic detection and response system, in addition to improved reporting and diagnosis. Currently, strategies are being implemented to increase vector surveillance, identify P. vivax malaria susceptibility for each of the species of potential vectors, monitor malaria high-risk areas for disease and vector population trends that have an impact on transmission and disease, educate at-risk populations on malaria prevention, and strengthen coordination both within the national malaria program and in the neighboring DPRK.

**Progress Toward Elimination**

*P. vivax* malaria has been endemic on the Korean peninsula for centuries, with a history of unstable transmission. Formal control efforts did not begin until the second half of the twentieth century following the Korean War (1950–1953). The Korean War led to a sharp rise in cases; more than 15,000 Korean soldiers and more than 6,000 American soldiers were reported to have contracted malaria in Korea during this time.

In 1959 the Republic of Korea, with assistance from WHO, established the National Malaria Eradication Service, and for the next two decades cases declined as a result of combined efforts utilizing indoor DDT residual spraying, chloroquine treatment for blood-stage parasites, primaquine treatment for liver-stage parasites, and socioeconomic development. By 1979, the Republic of Korea was declared malaria-free by WHO. From that time, locally transmitted malaria was not reported for 14 years.

In 1993, a Korean soldier stationed in the DMZ who had never traveled outside the area was diagnosed with *P. vivax* malaria. It is unclear how transmission in the Republic of Korea was reintroduced; however, the number of cases increased...
exponentially over the next seven years, primarily in soldiers stationed in the DMZ-bordering provinces of Gangwon and Gyeonggi.\textsuperscript{7, 9} However, beginning in 1997, cases began to extend to the east and south, mainly due to military veterans returning to their hometowns and to civilians visiting high-risk areas within the Republic of Korea.\textsuperscript{20, 21} The government responded by launching the current national malaria control program, which focuses on early case detection and treatment, chemophrophylaxis for soldiers, vector control, and financial support to the DPRK for malaria control efforts.\textsuperscript{7}

This new program, combined with increased malaria control in the DPRK, led to an 80 percent decrease in the number of \textit{P. vivax} malaria cases between 2000 and 2004.\textsuperscript{2}

From that time, cases began to increase again in all populations, rising from 826 cases in 2004 to 2,192 cases in 2007.\textsuperscript{2} The epidemiology of malaria infections also changed: by 2007 over 60 percent of cases were in the civilian population, and local transmission was beginning to occur in previously non-endemic areas.\textsuperscript{7, 22, 23} Reasons for the sudden increase are unclear, although likely causes include increased urbanization in areas directly adjacent to rice fields and unusually warm autumn weather, which may have led to increased late season mosquito populations, resulting in extended transmission seasons.\textsuperscript{12, 24}

Since 2007, there has been an overall decrease in malaria cases. Much progress has been made in reducing the average case detection time—from 23 days in 1995 to fewer than 6 days in 2007.\textsuperscript{7, 21} Mass chemophrophylaxis along the DMZ continues to be successful in dramatically reducing malaria among soldiers, although efficacy of prophylaxis has been hampered by poor compliance. A study from 2005–2007 found that less than 25 percent of soldiers took their prophylactic medications on a regular basis. This finding may help explain hydroxychloroquine-resistant \textit{P. vivax},\textsuperscript{13} which has been identified in the Republic of Korea and signifies the first cases of this type of resistance in temperate Asia.\textsuperscript{24, 25}

The Republic of Korea is continuing its malaria elimination efforts through an improved case detection and outbreak surveillance system, increased fund allocation for malaria activities, consistent screening of malaria high-risk populations, and continued aid to the DPRK for malaria control.

### Eligibility for External Funding\textsuperscript{14–16}

<table>
<thead>
<tr>
<th>Fund/Initiative</th>
<th>Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Global Fund to Fight AIDS, Tuberculosis and Malaria</td>
<td>No</td>
</tr>
<tr>
<td>U.S. Government’s President’s Malaria Initiative</td>
<td>No</td>
</tr>
<tr>
<td>World Bank International Development Association</td>
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### Economic Indicators\textsuperscript{17}

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
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<tbody>
<tr>
<td>GNI per capita (US$)</td>
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<tr>
<td>Country income classification</td>
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<tr>
<td>Total health expenditure per capita (US$)</td>
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<tr>
<td>Total expenditure on health as % of GDP</td>
<td>6</td>
</tr>
<tr>
<td>Private health expenditure as % total health expenditure</td>
<td>46</td>
</tr>
</tbody>
</table>

### Challenges to Eliminating Malaria

**Cross-border collaboration**

Since 2001, the Republic of Korea has provided aid to the DPRK in the form of bed nets, antimalarial drugs, laboratory equipment, and insecticides.\textsuperscript{4, 7} Yet collaboration between the two countries has been marred by a long history of political tension. The highest foci of transmission in each country is adjacent to the DMZ border, therefore increased monitoring of vector populations and malaria infection rates, in addition to mutual cooperation, is crucial for malaria elimination in both countries.

### Conclusion

The Republic of Korea has successfully responded to the \textit{P. vivax} malaria resurgence, and is continually scaling up its efforts to eliminate malaria. However, the need for increased cross-border collaboration with the DPRK and the difficulty in controlling and treating \textit{P. vivax} relapses and latent malaria are obstacles that the Republic of Korea must overcome to achieve national elimination by 2015.
Sources

4. Han-Sung L. Malaria Elimination Program in Republic of Korea. Korean Centers for Disease Control and Prevention ROK. Asia Pacific Malaria Elimination Network (APMEN) Inaugural Meeting Presentation; Brisbane; 2009.
Transmission Limits Map Sources


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About This Briefing

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The Malaria Elimination Initiative at the Global Health Group of the University of California, San Francisco (www.globalhealthsciences.ucsf.edu/global-health-group) convenes the Malaria Elimination Group (www.malariaeliminationgroup.org), and supports countries actively pursuing elimination at the endemic margins of the disease. Funding for the Malaria Elimination Initiative is provided by the Bill & Melinda Gates Foundation and Exxon Mobil Corporation.

The Malaria Atlas Project (MAP) provided the malaria transmission maps. MAP is committed to disseminating information on malaria risk, in partnership with malaria endemic countries, to guide malaria control and elimination globally. Find MAP online at: www.map.ox.ac.uk.

Additional support was provided by the Asia Pacific Malaria Elimination Network (APMEN). Find APMEN online at: www.apmen.org.