female sex worker; thus, the bacteria could have derived from her pharynx. *N. gonorrhoeae* strain H041 was previously isolated from the pharynx of a female sex worker (*1*). To prevent the emergence and spread of ceftriaxone-resistant *N. gonorrhoeae*, pharyngeal gonorrhea must be treated. It is uncertain whether a 1-g dose of ceftriaxone would be effective against pharyngeal gonorrhea caused by strains with decreased susceptibility to ceftriaxone, and this regimen might facilitate the selection of such strains from oral cephalosporin-resistant strains in the pharynx. The emergence of *N. gonorrhoeae* GU140106 in Japan suggests that new strategies (not just increased ceftriaxone doses), including combination treatment with ceftriaxone and another class of antimicrobial drugs and multiple dose regimens of ceftriaxone, might be required to treat pharyngeal gonorrhea.

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Measles Outbreak among Adults, Northeastern China, 2014

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To the Editor: In 2005, the World Health Organization (WHO) proposed to eliminate measles in the Western Pacific Region by 2012, and in 2006, China began a 6-year measles elimination campaign. The strategy included a routine 2-dose measles-containing vaccine (MCV) for children 8 months and 18–23 months of age, supplemented by nationwide vaccination activities in 2010 for children born during 1996–2010 (*1*). As a result, China's measles incidence rate has dropped sharply since 2008 and reached its lowest level (0.46 cases/100,000 population) in 2012 (*2*). However, the rate has risen again since 2012; in 2014, incidence was 3.88 cases/100,000 population (*3*). Shenyang, a hub city in northeastern China, experienced a massive measles outbreak in 2014, and we analyzed the causes and characteristics of this outbreak.

Shenyang Center of Disease Control reported 2,058 confirmed measles cases (1,447 laboratory diagnosed, 611 clinically diagnosed) in 2014 (25.02 cases/100,000 population), much higher than that reported in Shenyang in 2013 (2.33/100,000). Most cases occurred in children 0–1 years of age (487 cases; 1,145.77/100,000), followed by persons 25–30 (227 cases; 28.57/100,000), 30–35 (203 cases; 32.42/100,000), and 35–40 (203 cases; 35.02/100,000) years of age. Among all 2,058 confirmed cases, 438 patients were hospitalized because of measles complications; no deaths were reported.

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Within Shenyang, Kangping district had the highest confirmed measles incidence rate (80.59 cases/100,000 persons), followed by Tiexi (38.08/100,000) and Faku (32.2/100,000) districts. The remaining confirmed cases occurred in other districts.

Of the 1,207 adults with confirmed measles, migrant workers (640 cases) and farmers (234 cases) accounted for 72.4% of total cases. All confirmed measles-infected adults were surveyed by questionnaire; 93.0% did not recall receiving MCV or had no history of MCV. All 44 measles virus samples genotyped were genotype H1a.

The most notable characteristic of this outbreak was that adults accounted for more than half of reported cases (Figure). Shenyang conducted citywide supplementary vaccination activities in 2009 directed toward children born during 1995–2009, and among these cohorts (now 5–19 years of age), the incidence rate was lower in this outbreak, proving the efficiency of the supplementary vaccination activities. However, for patients >20 years of age, who were not included in the supplementary vaccination activities, the efficacy of their previous 2-dose vaccines also should have offered protection. Thus, other potential risk factors must exist.

One risk factor is the limited vaccine coverage. China started the measles vaccine plan in the 1960s, but from 1960 until the 1980s, local vaccination coverage was poor for suburban populations. In recent years, the national reported coverage of both 1-dose and 2-dose MCV have increased from <85% to >98.5% for 2-year-olds (*2*,*4*). However, a door-to-door measles questionnaire survey during an outbreak in Henan province in 2013 reported vaccine coverage of only 80%–90% (*5*). The reason may be that, currently, China calculates vaccine coverage using the number of vaccinated children as the numerator and the number of clinic-registered children as the denominator. This method excludes those who did not register at a community clinic (e.g., because the family breached the 1-child policy and therefore refused registration or because of lack of medical insurance) and thus resulted in higher reported coverage rates. Unvaccinated persons who missed supplementary vaccination activities also possibly became susceptible to measles.

The second characteristic was the higher incidence rates in the suburban than urban districts (Figure). In fact, the 3 districts (Kangping, Tiexi, Faku) reporting the highest incidence rates were all suburban and industrial districts. The underlying reason was the aggregation of migrant workers in these districts. Shenyang is a hub city in northeastern China where workers from the surrounding rural regions come for job opportunities. These labor workers gather at suburban and industrial districts, and ≈20% of them lack proper vaccination because of limited healthcare access during childhood. Eventually, the aggregation of these susceptible persons caused the adult epidemic in this outbreak.

Although measles incidence in China has decreased sharply since 2010, multiregion epidemics have again been reported, especially among adults, in recent years. The underlying reasons for the Shenyang outbreak in 2014 are limited vaccine coverage and aggregation of susceptible persons. This adult-centered epidemic should serve as a reminder that preventing measles in adults might play an increasing role in future measles elimination efforts.

World Health Assembly and global vaccination partners endorsed the Global Vaccine Action Plan in 2012, and WHO now aims to eliminate measles in 5 of the 6 WHO regions by 2020 (*6*,*7*); the United States first achieved this goal in 2000. However, multiple measles outbreaks were reported in recent years in countries where elimination has been achieved, such as the United States (*8*) and Australia (*9*), mainly because of transmission resulting from international travel and low vaccine coverage in some populations (*10*). China is the most populous country in the world, and eliminating measles in China would help prevent future global transmission events.

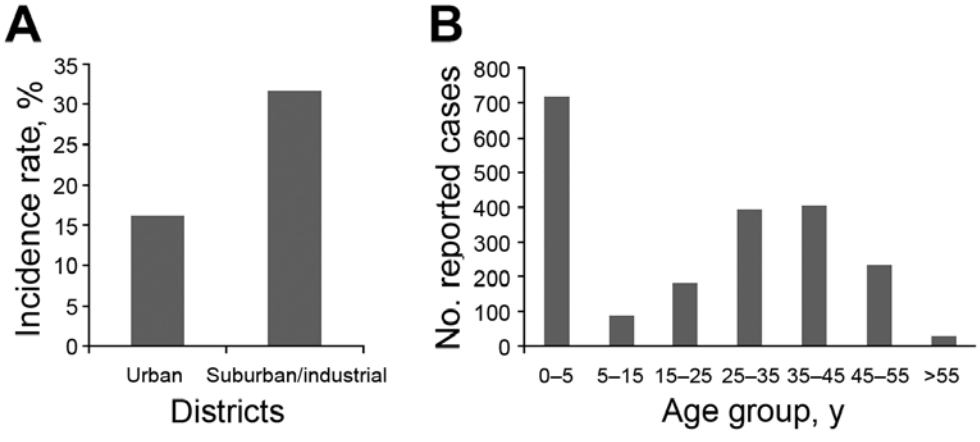

Figure. Geographic (A) and age (B) distributions of measles patients, Shenyang, China, 2014.

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Objective Determination of End of MERS Outbreak, South Korea, 2015

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To the Editor: After not finding any additional cases of Middle East respiratory syndrome (MERS) for several weeks in South Korea, in July 2015, the South Korean government and the World Health Organization (WHO) discussed the appropriate time to declare the end of the outbreak in July 2015 (*1*). This declaration would enable allocation of human resources to healthcare facilities to return to normal and would help restore international travel to the country. A widely acknowledged criteria of WHO to determine the end of an epidemic has been twice the length of the incubation period since the most recently diagnosed case (*2*). For MERS, the longest incubation period is 14 days. Thus, adopting 28 days as the waiting period, and counting days from diagnosis of the most recent case on July 4, 2015, the earliest date the South Korean government could have declared the end of outbreak was August 2 if it adhered to WHO criteria (*1*). However, to emphasize safety to the nation and to international travelers at an earlier time, the South Korean government originally decided to announce the end of the MERS outbreak on July 27, the date the last quarantined MERS patient was released from movement restriction. Because we are concerned about the validity of strict adherence to the WHO criteria, we objectively calculated the probability of observing additional cases at a given time and compared that probability with the WHO criteria.

To clearly define the end of the outbreak, we excluded reintroduction of imported cases and cases of MERS coronavirus infection resulting from a zoonotic reservoir. We defined the end of the outbreak as the end of continued chains of transmission. The probability of observing additional cases was derived by using the serial interval; that is, the time from illness onset in the primary case-patient to illness onset in a secondary case-patient, and the transmissibility of MERS (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/22/1/15-1383-Techapp1.pdf). Both of these epidemiologic variables were estimated by using case data in South Korea (*3*,*4*). As practiced in the determination of the length of quarantine (*5*), the end of outbreak can be declared if that probability is <5%, a threshold value.