Reassessing the Evidence for Universal School-age Bacillus Calmette Guerin (BCG) Vaccination in England and Wales

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# What is already known on this subject

* Targeted Bacillus Calmette Guerin (BCG) vaccination against TB is recommended in low incidence countries over universal vaccination.
* The impact of replacing universal BCG vaccination in England and Wales with a targeted programme in 2005 was assessed under the assumption of static declines in TB rates.
* The BCG Guerin vaccine was shown to be effective in the UK born in England, regardless of the age at which it was given. School-age vaccination maybe more beneficial in this population than in other settings.

# What this study adds

* Using notification data from England and Wales from 1973 to 2015, we estimate that the ending the BCG schools’ scheme likely resulted in more additional cases than was predicted.
* The inclusion of parameter uncertainty, and measurement error, allowed the uncertainty in the final estimates to be presented. Previously published estimates may have been spuriously precise.
* This study highlights the need for a more detailed evaluation of the 2005 change in BCG policy. In particular, the impact of including the introduction of targeted neonatal vaccination and capturing the long term, indirect, effects needs further study.

# Abstract

## Background

In 2005, England and Wales switched from universal BCG vaccination against tuberculosis (TB) disease for school-age children to targeted vaccination of neonates. We assessed the quantitative evidence that informed this policy change.

## Methods

We recreated a previous approach for estimating the impact of ending the BCG schools’ scheme in England and Wales, updating the model with parameter uncertainty. We investigated scenarios considered by the UK’s Joint Committee on Vaccination and Immunisation, and explored new approaches using notification data. We estimated the number of vaccines needed to prevent a single notification, and the average annual additional notifications caused by ending the BCG schools’ scheme.

## Results

We found a 1.9% annual decrease in TB incidence rates best matched notification data. We estimate that 1600 (2.5-97.5% Quantiles (Q): 1300 - 2100) vaccines would have been required to prevent a single notification in 2004. If the scheme had ended in 2001, 302 (2.5-97.5% Q: 238 - 369) additional annual notifications would have occurred compared to if the scheme had continued. If the scheme ended in 2016, 120 (2.5-97.5% Q: 88 - 155) additional annual notifications would have occurred.

## Conclusions

Our estimates of the impact of ending the BCG schools’ scheme were highly sensitive to the annual decrease in incidence rates. The impact of ending the BCG schools’ scheme was found to be greater than previously thought when parameter values were updated and notification data were used. Our results highlight the importance of including uncertainty when forecasting