Invasive Meningococcal Disease
- prevention through vaccination

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Public Health England
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**Vaccines against MenB**

- MenC and MenACWY conjugate vaccines target the polysaccharide capsules – no cross-protection
- MenB polysaccharide is a polysialic acid - identical to that found on surface of human foetal neuronal cells.
- Consequently;
  - (i) Poorly immunogenic.
  - (ii) Potential to induce an autoimmune response
- Use subcapsular antigens, which:
  - (i) are Surface-exposed
  - (ii) are Conserved
  - (iii) induce Bactericidal activity
Combining antigens that target different steps of meningococcal pathogenesis is likely to help optimize MenB vaccine effectiveness

Predicted meningococcal strain coverage in Europe

Figure 1: Percentages of isolates predicted by the meningococcal antigen typing system to be covered, and number of antigens, overall and by country.
19. JCVI concluded that, on the basis of the available evidence, routine infant or toddler immunisation using Bexsero® is highly unlikely to be cost effective at any vaccine price based on the accepted threshold for cost effectiveness used in the UK and could not be recommended.

20. JCVI noted that its assessment had been challenging given that Bexsero® had been authorised in the absence of key data to support an assessment of effectiveness and cost effectiveness.
Invasive meningococcal disease laboratory-confirmed cases
England and Wales

- Other
- Y
- W
- C
- B
Laboratory confirmed cases of invasive meningococcal disease capsular group B (MenB) in England, calendar years 2009-2014
Cost-effectiveness for any new vaccine

Population Factors
- Vaccine acceptance
- Vaccine coverage
- Herd protection
- Replacement disease

Vaccine Factors
- Number of doses
- Reactogenicity
- Effectiveness
- Strain coverage
- Cross-protection

Disease Factors
- Incidence
- Age distribution
- Disease severity
- Long-term sequelae
- Case fatality ratios
Long term trends in notified meningococcal disease, England and Wales

- Cerebrospinal fever
- Meningococcal infection
- Meningococcal meningitis
- Meningococcal meningitis and septicaemia

Years:
- 1912
- 1917
- 1922
- 1927
- 1932
- 1937
- 1942
- 1947
- 1952
- 1957
- 1962
- 1967
- 1972
- 1977
- 1982
- 1987
- 1992
- 1997
- 2002
- 2007

Number of notifications:
- 0
- 1000
- 2000
- 3000
- 4000
- 5000
- 6000
- 7000
- 8000
- 9000
- 10000
- 11000
- 12000
- 13000
- 14000

Public Health England
Could you please tell me how serious the consequences of children getting each disease would be?

- Meningitis: 83% Very serious
- Septicaemia (blood poisoning): 78%
- Pneumonia: 71%
- Polio: 69%
- Tetanus: 52%
- Diptheria: 52%
- Whooping cough: 47%
- Rubella/ German measles: 44%
- Measles (Not German): 38%
- Mumps: 36%
- Hib: 36%
- Rotavirus: 25%
- Flu: 22%
- Diarrhoea and vomiting: 18%
- Chicken pox: 17%
- Ear infection: 14%

2010
% Very serious
91%
81%
68%
63%
40%
44%
28%
41%
29%
28%
30%
n/a
8%
12%
11%
6%
Multiple iterations of the Health Economic Model

- Hospitalised IMD cases and fatalities, recorded in the national hospital administrative database (HES), extrapolated from England to the UK (~3x higher than lab-confirmed cases)
- Average of past 7 years (assuming the next 7 years will mirror the previous 7 years)
- QAF adjustment for QALY loss – 3x
- Additional costs: short-term QALY loss, litigation costs, etc
- Optimised parameters: strain coverage of 88%, VE 95%, high vaccine coverage
- Reduced 2 dose priming schedule
Proportion of children with bactericidal antibody (GMT) to specific strains at different schedules

<table>
<thead>
<tr>
<th>Study</th>
<th>Schedule</th>
<th>44/76 fHBP</th>
<th>5/99 NadA</th>
<th>NZ 98/254 OMV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findlow (≥1:4 hSBA)</td>
<td>2, 4, 6 m</td>
<td>95% (30)</td>
<td>95% (126)</td>
<td>85% (19)</td>
</tr>
<tr>
<td></td>
<td>After third dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2, 4 m</td>
<td>87% (28)</td>
<td>100% (104)</td>
<td>74% (6.6)</td>
</tr>
<tr>
<td></td>
<td>After second dose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gossger (≥1:5 hSBA)</td>
<td>2, 3, 4 m</td>
<td>99.3% (82)</td>
<td>100% (323)</td>
<td>81% (11)</td>
</tr>
<tr>
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</tbody>
</table>
Predicted strain coverage in the UK using hSBA
Infant immunisation at 2 + 4 and 12/13 months could be cost-effective if Bexsero® can be obtained at a low price

Adolescent immunisation with Bexsero® not recommended because of uncertainties regarding duration of protection and impact on carriage
Negotiations to procure at cost-effective price were concluded in late March 2015

MenB vaccine given with routine immunisation appointments from 1st September 2015

Routine cohort: infants born on or after the 1 July 2015
  Schedule: 2, 4 and 12 months (2+1)

Catch-up cohort: infants born from 1 May to 30 June 2015
  Schedule: 3, 4 and 12 months (2+1)
  Schedule: 4 and 12 months (1+1)
Laboratory confirmed IMD by group and age (2010-2014)
MenB cases/deaths, England 2014/15
IMD in <2 year-olds
England & Wales (2006/07-2010/11)
National enhanced surveillance of vaccination programmes targeting invasive meningococcal disease in England

Public Health England Immunisation Department and Meningococcal Reference Unit

https://www.gov.uk/search?q=meningococcal+enhanced+surveillance
**NATIONAL EPIDEMIOLOGICAL SURVEILLANCE - CONFIRMED INVASIVE MENINGOCOCCAL DISEASE**

**Public Health England Immunisation, Hepatitis and Blood Safety Department,**
61 Collindale Avenue, London NW9 5EQ.
Tel: 020 8327 7828 or 6658 Secure Fax: 020 8327 7404 Email: meningoc@phe.gov.uk

**PLEASE COMPLETE IN BLOCK CAPITAL LETTERS**

**Patient Details**

Surname: __________________ Forename: __________________ D.O.B.: (DD/MM/YYYY): ___/___/____ Gender: □ Male □ Female

NHS number: ______________ HPZone reference number: __________ PHE reference: __________ Onset date: ___/___/____

**PART A: Ethnicity – please tick below**

□ White British □ White other □ Black-Caribbean □ Black African □ Indian □ Pakistani □ Bangladeshi □ Chinese

□ Mixed □ Other ____________________________ Please specify

**PART B: Vaccination History. This covers Men B, Men C and MenACWY vaccination.**

Please complete details for all vaccines below as fully as possible.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Did this case receive any doses of each vaccine before disease onset?</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; dose</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; dose</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>MenB Vaccination</td>
<td>Yes □ No □ NK □</td>
<td>Not eligible □</td>
<td>Bexsero®</td>
<td>Bexsero®</td>
</tr>
<tr>
<td>MenC Vaccination</td>
<td>Yes □ No □ NK □</td>
<td>Not eligible □</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MenC/Hib Vaccination</td>
<td>Yes □ No □ NK □</td>
<td>Not eligible □</td>
<td>Menitorix®</td>
<td></td>
</tr>
<tr>
<td>MenACWY Vaccination</td>
<td>Yes □ No □ NK □</td>
<td>Not eligible □</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*All high risk groups (complement deficiency or asplenia) should be offered MenB and MenACWY vaccination.*

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1. Men B vaccine (Bexsero®) included in the routine infant programme since 1/9/2015 and any baby born from 1/5/2015 should have been offered the vaccine at 2-4 months.
2. Men C vaccine (Menitoff® or MeniQuide® or Nisvax®) included in the routine infant programme, since 9/11/2000. Catch-up vaccination means all those born from 1/9/1981 should have been offered at least one dose of MenC vaccine. MenC vaccine was offered to teenagers aged 13/14 years and Fresher June 2013 - May 2015.
3. A single dose of Menitorix® vaccine (combined MenC-Haemophilus influenzae type B [Hib]) has been offered at 12-13 months of age from 1/9/2006 (DOB 1/8/2005).
4. Men ACWY vaccine (Menacyw® or Menpoly®) replaced MenC vaccine for teenagers and fresher doses given from 1/9/2015; catch-up vaccination is also being offered for those aged 14-18 years (DOB 1/9/2006 and aged 14+/ years).
PART C: Clinical presentation

1) What was the clinical presentation?
- Meningitis
- Septicaemia
- Both meningitis & septicaemia
- Septic arthritis
- Epiglottitis
- Pneumonia
- Other
- Unknown

Comments: ........................................

PART D: Risk factors

2) At the time of onset did the patient have any known risk factors for meningococcal disease?
- Yes
- No
- Unknown

2.1) If yes, what were their risk factor/s?
- Acute/ splenic dysfunction
- Complement deficiency
- Malignancy/ Immune Deficiency
- Immunosuppressive drug
  (Including complement inhibitors, e.g. eculizumab)

Comments: ........................................

PART E: Co-morbidities and pregnancy

3) At the time of meningococcal disease, did the patient have any co-morbidities?
- Yes
- No
- Unknown

3.1) If yes, what were their co-morbidities?
- Chronic heart disease
- Congenital or chromosomal abnormality
- Chronic lung disease
- CNS disease (CSF leak, VP shunt etc)
- Chronic renal disease
- Chronic gastrointestinal disease
- Metabolic disease
- Other

Comments: ........................................

4) Was the patient pregnant at the time?
- Yes
- No
- Unknown

PART F: Outcome

5) Was the patient admitted to ITU?
- Yes
- No
- Unknown

6) Is the patient currently alive?
- Yes
- No
- Unknown

6.1) If patient died, Date of death

  ........................................

PART G: Travel History

7) Was the patient born in the UK?
- Yes
- No
- Unknown

7.1) If no, when did they arrive in the UK

  ........................................

7.2) Country of birth:

  ........................................

8) Has the patient recently travelled abroad (returning in the last 28 days)?
- Yes
- No
- Unknown

8.1) If yes, where did they travel?

  ........................................

8.2) When did they return?

  ........................................

PART H: Is the case working at or attending any of these situations?
- child minder
- nursery
- school
- university
- care/nursing home
- barracks
- other...

PART I: Please provide any further comment

........................................

Thank you for your time and assistance. Please return by post, secure fax, email (both as detailed overleaf) or upload to HP2one.
IMD Surveillance, England

- Public Health England (PHE) conducts enhanced IMD surveillance
- PHE Meningococcal Reference Unit (MRU)
  - Confirmation & characterisation of invasive isolates
  - Free national PCR-testing service (20,000 samples, 6% positive)

- High case ascertainment (>95% of cases captured)

- All confirmed cases followed up by PHE Imms
  - Vaccine history
  - Risk factors
  - Clinical course
  - Outcome
Cases: summary

• 01 September 2015 - 30 June 2016 (10 months)

• 55 lab-confirmed IMD cases in vaccine-eligible infants
  • born on or after 01 May 2015,
  • diagnosed on or after 01 September 2015
  • aged ≥10 weeks at diagnosis

• Capsular group distribution
  • 37 (67%) MenB
  • 11 (20%) MenW
  • 5 (9%) MenY
  • 2 (4%) ungrouped
Vaccine Coverage, Dose 1

Coverage (%) vs Age (days)

- May
- June
- July
- Aug
- Sep
- Oct
- Nov
- Dec
Vaccine Coverage, Dose 2
## Vaccine Effectiveness

<table>
<thead>
<tr>
<th>Doses</th>
<th>Cases vaccinated / total</th>
<th>Average matched coverage</th>
<th>VE (95 %CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2+0</td>
<td>9/13 (69%)</td>
<td>92.9%</td>
<td>82.9% (24.1% to 95.2%)</td>
</tr>
</tbody>
</table>

Assuming 88% of MenB strains covered by 4CMenB, then VE against vaccine-preventable strains ~94%
## Vaccine Effectiveness

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<td>9/13 (69%)</td>
<td>92.9%</td>
<td>82.9% (24.1% to 95.2%)</td>
</tr>
<tr>
<td>1+0</td>
<td>20/28 (71%)</td>
<td>76.2%</td>
<td>22.0% (-105% to 67.1%)</td>
</tr>
</tbody>
</table>
**Vaccine Impact: pre-vaccine years**

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Group</th>
<th>Cases (Sep15-June 16)</th>
<th>Equivalent cohorts (2011/12-2014/15) mean per year</th>
<th>IRR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compare to past 4 years</strong></td>
<td>Catch-up (Born 1st May -30th June 2015)</td>
<td>9</td>
<td>25</td>
<td>0.36 (0.18-0.72), p=0.004</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Routine (Born on or after 1st July 2015 aged ≥18w)</td>
<td>18</td>
<td>34</td>
<td>0.53 (0.33-0.87), p=0.012</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Routine (Born on or after 1st July 2015 aged 10-17w)</td>
<td>10</td>
<td>15</td>
<td>0.66 (0.34-1.28), p=0.216</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>All combined</strong></td>
<td><strong>37</strong></td>
<td><strong>74</strong></td>
<td><strong>0.50 (0.36-0.71), p&lt;0.001</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONTROLS (&lt;10 weeks old or born before 01 May 2015 and aged &lt;5 years)</td>
<td>173</td>
<td>201</td>
<td>0.86 (0.73-1.01), p=0.073</td>
<td></td>
</tr>
</tbody>
</table>
Trends in ineligible children

Cases

Age=1

Age=2

Age=3

Age=4

2011/12 2012/13 2013/14 2014/15 2015/16

2011/12 2012/13 2013/14 2014/15 2015/16

2011/12 2012/13 2013/14 2014/15 2015/16

2011/12 2012/13 2013/14 2014/15 2015/16
Vaccine-eligible Cohorts

Number of Cases

2011/12 2012/13 2013/14 2014/15 2015/16
Vaccine Safety

• So far, more than 1 million doses given to children

• Concerns before vaccine introduction
  • Kawasaki Disease – very rare in <6m, no evidence of increase
  • Seizures – no evidence of increase in any kind of seizure
  • Less likely to have subsequent vaccination – no evidence (97-98% return for their subsequent vaccines)

• Primary Care consultations for fever
  • 2-fold increase in infants attending GP for fever post-vaccination with Bexsero

• Secondary care consultations for fever
  • 3-4 fold increase in infants attending the ED for fever post-vaccination

• Hospitalisations for fever
  • Around half the infants attending the ED have septic screens +/- antibiotics
  • ? Did the parents give prophylactic paracetamol as recommended?
Summary

• 4CMenB was introduced into the UK infant immunisation programme on 01 September 2015

• Preliminary analysis indicates a significant reduction in MenB disease in vaccine-eligible infants, irrespective of
  • Vaccine coverage in the population
  • Number of vaccines doses received by the infants
  • MATS coverage of the MenB strains causing IMD cases
  • Vaccine effectiveness against invasive MenB disease

• VE for 2-dose infant priming schedule was 83%, equivalent to 94% VE against the 88% predicted MenB strain coverage

• On-going surveillance is essential to continue to monitor impact

• On 01 May 2016, the first cohort of infants became eligible for the 12 month booster

• No safety concerns so far …
Controlling the increase in group W meningococcal disease in the UK

Dr Shamez Ladhani
Paediatric Infectious Diseases Consultant
Public Health England
Email: shamez.ladhani@phe.gov.uk
Laboratory confirmed cases of invasive meningococcal disease in England and Wales.

Number of Cases

- MenC vaccine for 0-24 year-olds
Invasive Meningococcal Disease
England & Wales, 2008-14
MenW cases in England, 2005/06-2014/15
MenW cases by age group
England, 2010/11-2014/15

MenW Cases (England)

Number of Cases

Age Group

<1y 1-4y 5-9y 10-14y 15-19y 20-24y 25-44y 45-64y ≥65y

2010/2011
2011/2012
2012/2013
2013/2014
2014/2015*

60
Phenotypic characterisation of Invasive meningococcal serogroup W isolates: England and Wales 2000/1 to 2013/14
Hi-res comparison of available genomes

- MRF Meningococcus Genome Library (all invasive isolates from 2010/11)
- All W:cc11 genomes on MGL/Pubmlst *Neisseria* database (n=83; Feb 2014)
- Genome comparator tool (1546 genes; PubMLST *Neisseria* database)
- Distance matrix visualised using SplitsTree v4.12.8

→ Single strain responsible for UK increase
→ Distinct from Hajj and Sth Africa strains?

UK Hajj pilgrim (2000)

England & Wales (n=71; Jun 2010 – July 2013)
- England & Wales (n=1; 2000)
- Ireland (n=2; 2013)
- South Africa (n=8; 2003-2011)
- Burkina Faso (n=1; 2002)
The UK MenW Outbreak

2008/9 academic year
190 students, 6 residential halls,
from 5 weeks into first term
→ No W:cc11
Outbreak progression

- 2009/10 (n=5)

5 (t_{-6.5 months})
1 (t_0)
4 (t_{-6 months})
2 (t_{-1 month})
3 (t_{-5 months})
Outbreak progression

Cases 1&2

Cases 3&4

Case 5

- 2009/10 (n=5)

- 1 (t_0)

- 2 (t_{-1 month})

- 3 (t_{-5 months})

- 4 (t_{-6 months})

- 5 (t_{-6.5 months})
Outbreak progression

2009/10 (n=5)
Carriage study (2010/11 epi year)

- University of Sheffield Medical School (n=826)
- St George’s Hospital (n=156)
- Nottingham University Hospital/NHS (n=319)
- Oxford Vaccine Group (n=263)
- South Tees Hospital Foundation (n=121)
- University of Manchester (n=255)
- Liverpool School of Tropical Medicine (n=501)
- University of Southampton (n=308)
- University of Bristol (n=206)
- University of Surrey (n=13)

Outbreak progression

- 2009/10 (n=5)
- 2010/11 (n=13)
- 2011/12 (n=22)
Outbreak progression

- 2009/10 (n=5)
- 2010/11 (n=13)
- 2011/12 (n=22)
- 2012/13 (n=38)
Outbreak progression
Outbreak progression

- 2009/10 (n=5)
- 2010/11 (n=13)
- 2011/12 (n=22)
- 2012/13 (n=38)
- 2013/14 (n=76)
- 2014/15 (n=144)
- 2015/16 (n=163)
Other countries

- Brazil (1997-2011)
- Argentina (2008/2012)
- Chile (2008/2012)
Other countries

- Brazil (1997-2011)
- Argentina (2008/2012)
- Chile (2008/2012)
- Scotland (2012-15)
- Sweden (2014-16)
Other countries

- Brazil (1997-2011)
- Argentina (2008/2012)
- Chile (2008/2012)
- Scotland (2012-15)
- Sweden (2014-16)
- France (2014-16)
Other countries

- Brazil (1997-2011)
- Argentina (2008/2012)
- Chile (2008/2012)
- Scotland (2012-15)
- Sweden (2014-16)
- France (2014-16)
- Netherlands (2015-16)
Other countries

- Brazil (1997-2011)
- Argentina (2008/2012)
- Chile (2008/2012)
- Scotland (2012-15)
- Sweden (2014-16)
- France (2014-16)
- Netherlands (2015-16)
- Finland (2015-16)
MenW:cc11 – original UK vs. 2013
Age distribution

Proportionate distribution of each strain by age group

- UK strain (n=246)
- 2013 strain (n=185)
MenW:cc11— original UK vs. 2013
Clinical Presentation

Proportionate distribution by diagnosis

- UK strain (n=167)
- 2013 strain (n=94)
W strains – is there any difference between the original UK strain and 2013 strain?
Rapid Communications

Presentation with gastrointestinal symptoms and high case fatality associated with group W meningococcal disease (MenW) in teenagers, England, July 2015 to January 2016

H Campbell 1, SR Parikh 1, R Borrow 2, E Kaczmarski 2, ME Ramsay 1, SN Ladhani 1,3
1. Immunisation Department, Public Health England, London United Kingdom
2. Meningococcal Reference Unit, Public Health England, Manchester United Kingdom
3. St. George’s University of London, United Kingdom

Correspondence: Sydel R. Parikh (sydel.parikh@phe.gov.uk)

Citation style for this article:
Clinical characterization of cases with meningococcal disease by W135 group in Chile, 2012

Background: During 2012 in Chile, there were 60 cases of serogroup W135 meningococcal disease, which accounts for 57.7% of identified serogroup cases. Aim: To describe main clinical features of patients with serogroup W135 meningococcal disease confirmed in 2012. Material and Methods: Descriptive study of case series based on retrospective review of medical records. Results: Male patients represented 61.7% and 46.7% were children under 5 years. At first clinical attention, 3.4% of patients were suspected of meningococcal disease, while 83.3% had meningococcemia as final diagnosis. Also at first attention, the most common symptoms or clinical signs were fever $\geq 38.0^\circ C$ (60.3%), cold symptoms (52.5%), and nausea or vomiting (46.7%). Meningeal signs had a low frequency (8.7%). Diarrhea was the second most common symptom found among deceased patients (55.6%) and statistically higher than survivors (26.8%; $p = 0.034$). Six cases reported with sequelae: limb amputation, hearing loss or neurological damage, and mortality was 31.7%. Discussion: In 2012, serogroup W135 meningococcal disease reported high mortality, atypical clinical presentation, low initial meningococcal disease diagnosis, and a high number of cases with poor clinical course.
Strategies to control the MenW outbreak
**Timelines for MenACWY programme**

- Regular monitoring of MenW cumulative curve
- Reporting to the JCVI every 6 months
- **Oct 2014:** Concerns about doubling number of cases reported to the JCVI
  - Plan made to consider replacing teenage MenC at 13/14 years with MenACWY at next national tender
- **Feb 2015:** JCVI informed of accelerating number of cases
  - Modelling to estimate 2x & 4x increase in cases
  - Model using MenC trajectory from the late 1990’s
  - A programme to vaccinate all 14-18 years of age (school years 10-13) with MenACWY should be undertaken as soon as practicable
• Even though the number of cases is low, JCVI considered this situation a public health emergency
  • rapid increase in virulent MenW
  • international experience (e.g. South America)

• The MenACWY programme will have direct impact on vaccinated teenage cohorts (2nd highest incidence group)
  • Excellent protection expected after a single dose

• Importance of completing catch-up quickly: to generate herd protection across age range & slow the rate of increase
  • Important to balance supply and demand, offering the vaccine first to those at highest risk
Strategy to control MenW

Wide age range affected

- Incidence highest in infants and adolescents
- Still high number of cases in older adults

Strategy in Chile of vaccinating children, only impacted on vaccinated age group

- Failed to control overall disease rates

Only feasible strategy is to target carriers with conjugate ACWY vaccine

- Plan to immunise adolescents
- Vaccinating adolescent cohorts simultaneously in catch up will accelerate control: ~4x faster
Meningococcal carriage by age: a systematic review and meta-analysis

Hannah Christensen, Margaret May, Leah Bowen, Matthew Hickman, Caroline L Trotter

Lancet Infect Dis 2010; 10: 853-61
## ACWY programme – planned roll-out

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</thead>
<tbody>
<tr>
<td>01/09/2003-31/08/2004</td>
<td>Y6 – 10/11</td>
<td></td>
<td></td>
<td></td>
<td>Y9 ACWY</td>
<td></td>
</tr>
<tr>
<td>01/09/2002-31/08/2003</td>
<td>Y7 - 11/12</td>
<td></td>
<td></td>
<td></td>
<td>Y9 ACWY</td>
<td></td>
</tr>
<tr>
<td>01/09/2001-31/08/2002</td>
<td>Y8 - 12/13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Y9 ACWY</td>
</tr>
<tr>
<td>01/09/2000-31/08/2001</td>
<td>Y9 - 13/14</td>
<td></td>
<td></td>
<td></td>
<td>Y10 ACWY</td>
<td></td>
</tr>
<tr>
<td>01/09/1999-31/08/2000</td>
<td>Y10 - 14/15</td>
<td>Y10 MenC</td>
<td></td>
<td></td>
<td>Y12 ACWY</td>
<td></td>
</tr>
<tr>
<td>01/09/1998-31/08/1999</td>
<td>Y11 - 15/16</td>
<td></td>
<td></td>
<td></td>
<td>Y13 ACWY</td>
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<tr>
<td>01/09/1997-31/08/1998</td>
<td>Y12 - 16/17</td>
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<td>01/09/1996-31/08/1997</td>
<td>Y13 – 17/18</td>
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<td></td>
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<td>Y13 ACWY</td>
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</tbody>
</table>

### Key
- Routine schedule MenC
- Routine schedule ACWY
- School based catch-up ACWY
- Primary care catch-up cohorts
- Delivery mechanism to be decided
- Completed
Recommended vaccines

- Menveo® is supplied in 5 dose pack (powder in a vial and solution in a vial = 10 vials per pack), no needles.

- Nimenrix® is supplied in single pack as a powder in a vial (MenACWY) and 0.5ml solvent in a pre-filled syringe. Two needles are included.
Serum bactericidal antibody killing of UK W cc11 strains by serum from infants immunised with Bexsero®

<table>
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<th>Lab number</th>
<th>Site</th>
<th>Type</th>
<th>Pre-</th>
<th>Pool1</th>
<th>Pool2</th>
<th>Pool3</th>
<th>Pool4 Post 4th</th>
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<tr>
<td>M11-240758</td>
<td>Blood</td>
<td>W:NT1.5,2 cc11</td>
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<td>&gt;64</td>
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<tr>
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<td>Blood</td>
<td>W:NTP1.5,2 cc11</td>
<td>&lt;2</td>
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<td>&gt;64</td>
</tr>
</tbody>
</table>

This work suggests that children immunised with Bexsero may have some protection against the emerging strain of MenW.
Confirmed MenW cases in England

Vaccine Coverage: 36%
Confirmed MenW cases by epidemiological year, England

6 MenW cases in eligible cohort
VE =100% (-65 to 100%)
Trend Analysis: 68% reduction compared to predicted cases (IRR, 0.32; 95% CI, 0.12 to 0.86)
Cumulative Trends, MenW disease

Total case numbers over months by epidemiological year from 2010/2011 to 2016/2017.
Age Distribution of MenW cases
1. The UK has been experiencing an national MenW outbreak since 2009.

2. Cases increases initially in older adults ➔ all age groups, including teenagers, toddlers and infant

3. In 2013, a new MenW strain emerged ➔ ? More aggressive (younger age, higher fatality)

4. MenACWY vaccine programme started August 2015: plan to vaccinate all 13-18 year-olds over 24 months + university entrants

5. Impact in school leavers (17-18 year-olds) seen within 12 months, despite 36% vaccine coverage

6. Herd protection likely to take several years – 5 x faster because of catch-up programme for 13-18 year-olds
Resources for health professionals and patients

- PHE MenB Health Care Worker Q+A
- PHE MenB vaccine leaflet (long version)
- PHE MenB vaccine leaflet: 3 minute guide
- PHE MenACWY vaccination programme patient information leaflet and posters
- PHE MenACWY Health Care Worker Q+A
- PHE Paracetamol Patient Information Leaflet
- Training the trainer slide sets and animated voice over
- OVG video on parent consultation

- Meningitis Research Foundation: http://www.meningitis.org/
- Meningitis Now. https://www.meningitisnow.org/
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Thank you