

Clinical features and outcomes of invasive pneumococcal disease in Canada between 1991 and 2015

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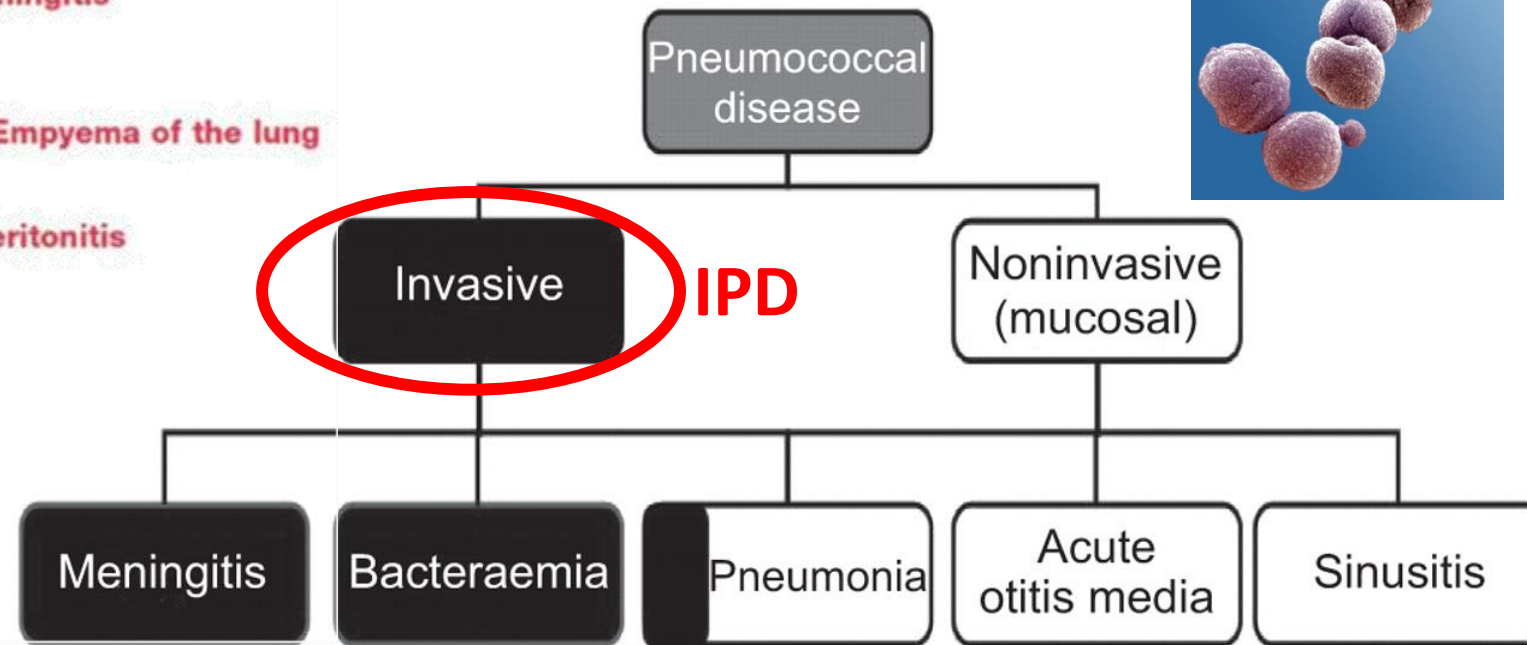
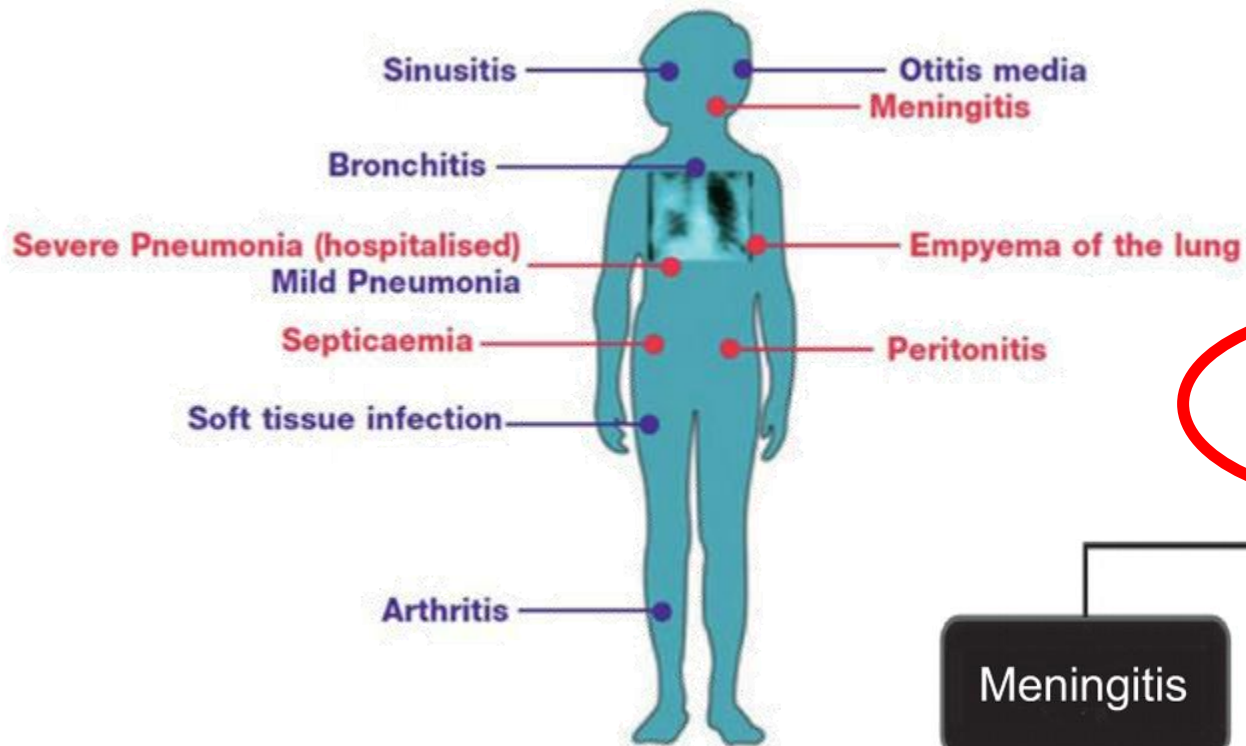
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A deadly disease



IPD: Invasive pneumococcal disease

Ludwig et al. Eur Resp Rev 2012

<https://fineartamerica.com/featured/1-streptococcus-pneumoniae-bacteria-sem-ami-images.html?product=canvas-print>

<https://www.finchchannel.com/society/health-beauty/65716-nearly-one-in-four-new-and-expectant-parents-have-never-heard-of-invasive-pneumococcal-disease>

Pneumococcal meningitis

- ❖ Death 5-10%
- ❖ Frequent complications
 - Hearing loss 30-40%
 - ~50% → cochlear implants
 - Significant neurological complications 25-35%
 - Quadriplegia
 - Cranial nerve dysfunction
 - Cortical blindness
 - Hydrocephalus
- ❖ Other outcomes less well described



Arditi et al. Pediatrics 1998

Kutz et al. Arch Otolaryngol Head Neck Surg 2006

<http://www.immune.org.nz/diseases/pneumococcal-disease>

Aims of this study

For children with IPD in Canada

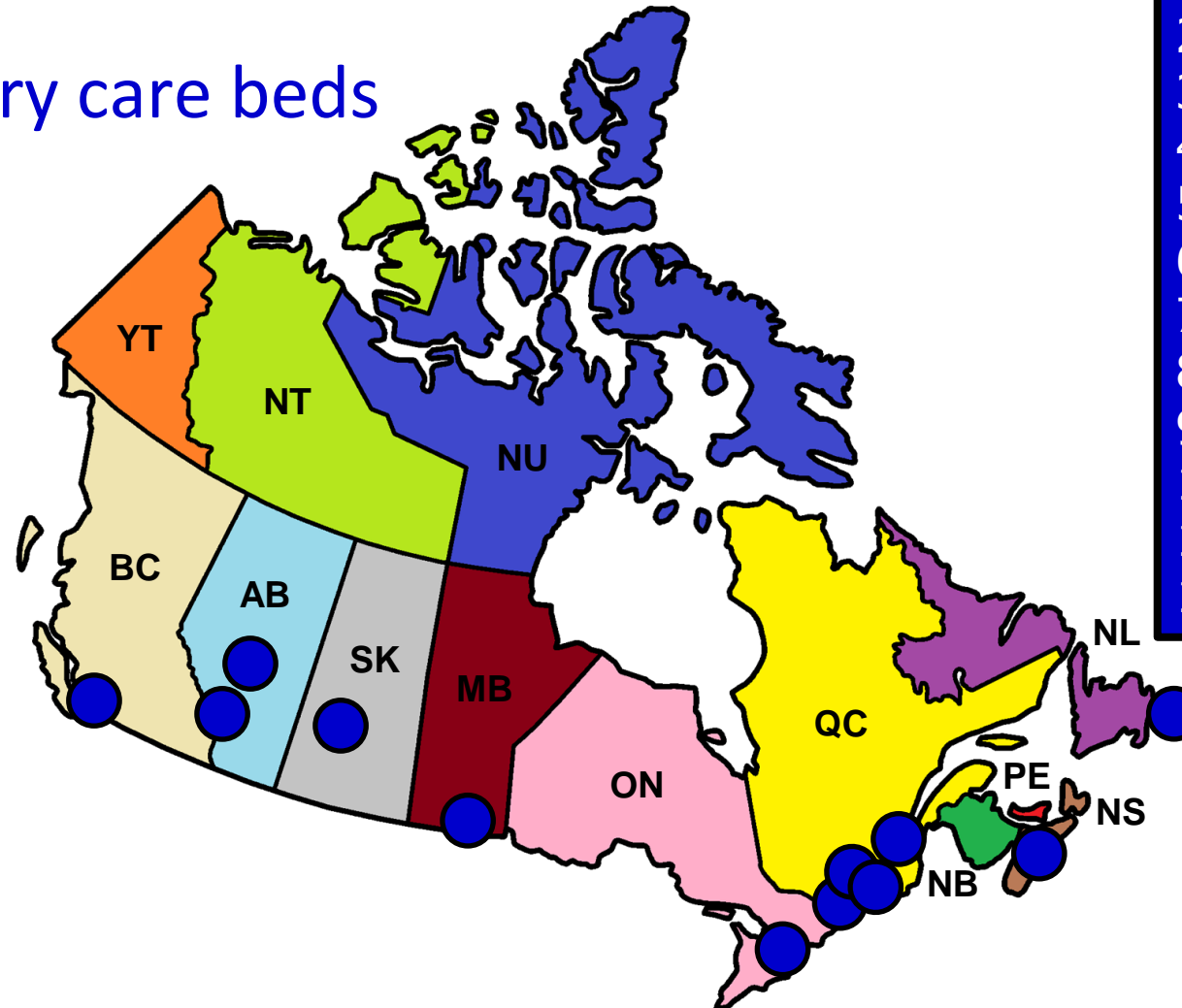
1. Describe clinical features
2. Assess outcomes
3. Determine risk factors for death and intensive care unit (ICU) admission

Study population

- ❖ Children aged 0-16 years
- ❖ Inpatients and outpatients between Jan 1991 & Dec 2015
- ❖ *Streptococcus pneumoniae* identified from sterile site
 - Blood, CSF, joint fluid, etc
 - Culture and/or PCR
- ❖ With/without other manifestations of pneumococcal disease
- ❖ Data collected in standardized case report forms from hospital charts
- ❖ IMPACT surveillance area

IMPACT Centres

- 🍁 Active, prospective, sentinel population-based surveillance
- 🍁 ~90% pediatric tertiary care beds



1. Vancouver, BC
2. Calgary, AB
3. Edmonton, AB
4. Saskatoon, SK
5. Winnipeg, MB
6. Toronto, ON
7. Ottawa, ON
8. Montreal, QC
9. Montreal, QC
10. Quebec City, QC
11. Halifax, NS
12. St. John's, NL

Population demographics

Total N **6,060**

Male sex, n (%) 3,495 (58%)

Age, n (%)

<1 month 56 (1%)

1-2 months 159 (3%)

3-5 months 356 (6%)

6-11 months 992 (16%)

1 year 1,724 (28%)

2-4 years 1,551 (26%)

5-9 years 842 (14%)

10-14 years 296 (5%)

15-16 years 84 (1%)

Ethnicity, n (% of known)

Caucasian 2,603 (67%)

Asian 478 (12%)

North American Aboriginal 335 (9%)

Black 291 (8%)

Latin, Central and South American 80 (2%)

Middle Eastern/Arabic 57 (2%)

Other/Mixed 61 (2%)

Unknown 2,155

1. Clinical manifestations

Manifestation	n	(%)
Bacteremia, with/without shock ^a	5,403	(89%)
Pneumonia (any) ^b	1,772	(29%)
Meningitis ^c	991	(16%)
Acute otitis media ^b	953	(16%)
Complicated pneumonia ^{c,d}	565	(9%)
Shock with/without bacteremia ^b	237	(4%)
Skin infection ^b	221	(4%)
Sinusitis ^b	189	(3%)
Bone/joint infection ^c	181	(3%)
Peritonitis ^c	71	(1%)
Pericarditis ^c	18	(0.3%)
Other	49	(0.8%)

a: Based on culture and/or PCR from blood

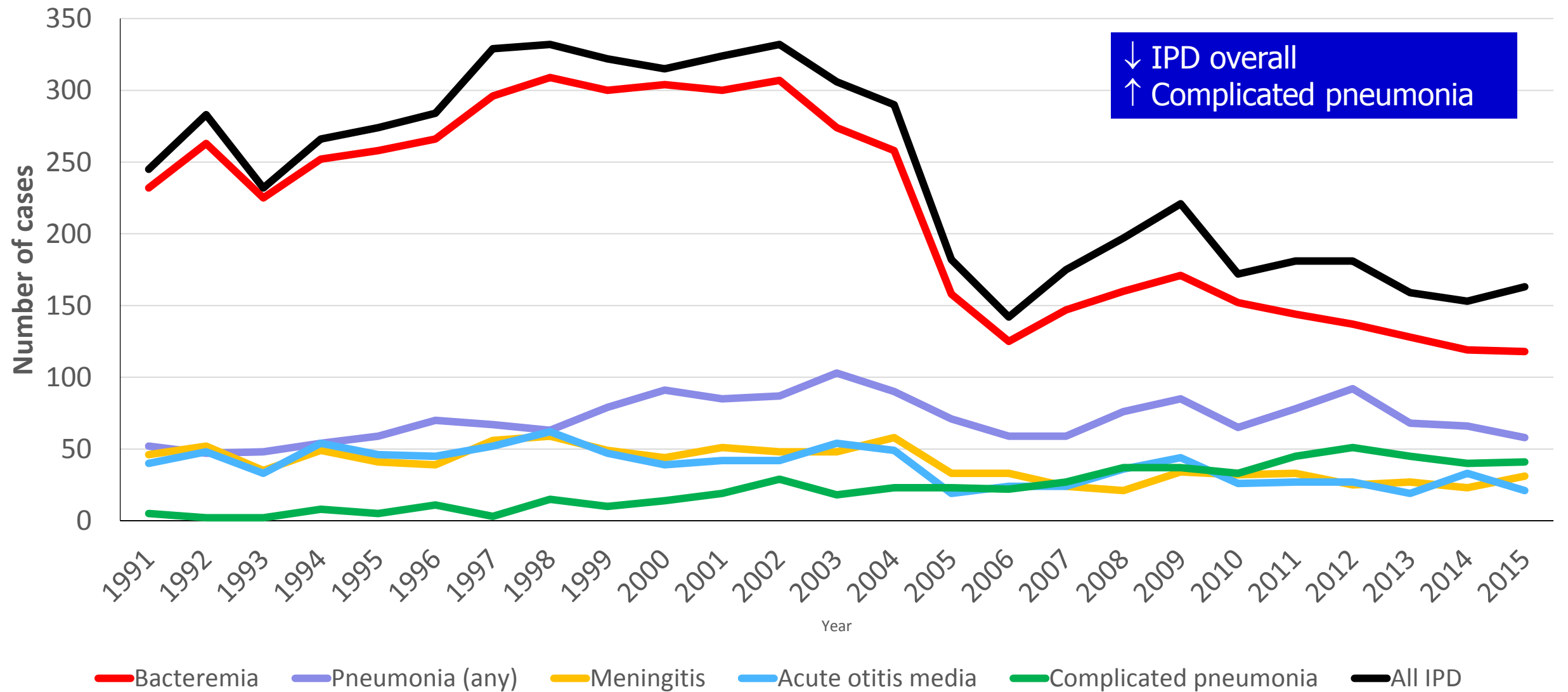
b: Based on a standardized clinical definition

c: Based on a standardized clinical definition
AND/OR positive culture and/or PCR from
relevant sterile site

d: Presence of empyema or parapneumonic
effusion

Some children had multiple manifestations

1. Clinical manifestations over time



2. Outcomes

- 🍁 4,590 cases (76%) hospitalized
 - Median length of stay 7 days (IQR 3-12)
- 🍁 1,064 children admitted to ICU
 - Median length of stay 3 days (IQR 2-6)
- 🍁 996 children had a specific risk factor for IPD
 - Cancer or cancer Rx in last 3 months (n=275, 5%)
 - Splenic dysfunction (n=105, 2%)
 - Chronic heart disease (n=96, 2%)
 - Transplant recipient (n=91, 2%)
- 🍁 182 deaths (3%)
 - Meningitis: 87/991 (10%) died

3. Risk factors for poor outcomes

Risk factor	Odds ratio (95% CI)	p-value
<i>For ICU admission</i>		
Meningitis	9.7 (8.06-11.62)	<0.0001
Pneumonia	2.31 (1.93-2.77)	<0.0001
Year of admission ^a	1.03 (1.02-1.04)	<0.0001
Acute otitis media	0.63 (0.50-0.80)	0.0001
Bacteremia	0.72 (0.59-0.89)	0.0015
<i>For death</i>		
Meningitis	4.05 (2.96-5.54)	<0.0001
Specific IPD risk factor	1.88 (1.31-2.65)	0.0005
Acute otitis media	0.30 (0.14-0.56)	0.0006

a: Value represents adjusted odds ratio for a 1-unit increase in admission year

Limitations

- ❖ All large pediatric hospitals
- ❖ Reliant on clinical data from hospital charts

- ❖ IPD remains a significant burden in children
 - Long lengths of hospital stay
 - High rates of ICU admission in those hospitalized
- ❖ Notable increase in complicated pneumonia since 2003
- ❖ Pneumococcal meningitis → poor outcome
 - Independent risk factor for ICU admission and death
- ❖ We need
 - High coverage of existing pneumococcal vaccines
 - Development of new vaccines for prevention

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<http://www.cps.ca/en/impact>

<http://www.cps.ca/fr/impact>

Babies and Toddlers

Meningitis ☐ and Septicaemia ☐ often occur Together ☐

	Fever, cold hands & feet		Floppy, listless, unresponsive
	Refusing food		Drowsy, difficult to wake
	Vomiting		Spots/Rash see Glass Test
	Pale, blotchy skin		Rapid breathing or grunting
	Fretful, dislike being handled		Unusual cry, moaning

Children and Adults

Meningitis ☐ and Septicaemia ☐ often occur Together ☐

	Fever, cold hands & feet		Stomach cramps & diarrhoea
	Vomiting		Spots/Rash see Glass Test
	Drowsy, difficult to wake		Severe headache
	Confusion & irritability		Stiff neck
	Severe muscle pain		Dislike bright lights

Trust your instincts –
Get medical help immediately

Symptoms can appear in any order,
some may not appear at all



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Thank you



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