Updates in Acute Otitis Media

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Objectives:

- Understand the prevalence of disease and burden on the US healthcare market
- Describe importance of routine vaccinations on incidence of otitis media
- Identify and implement appropriate treatment timing for differing patient presentations

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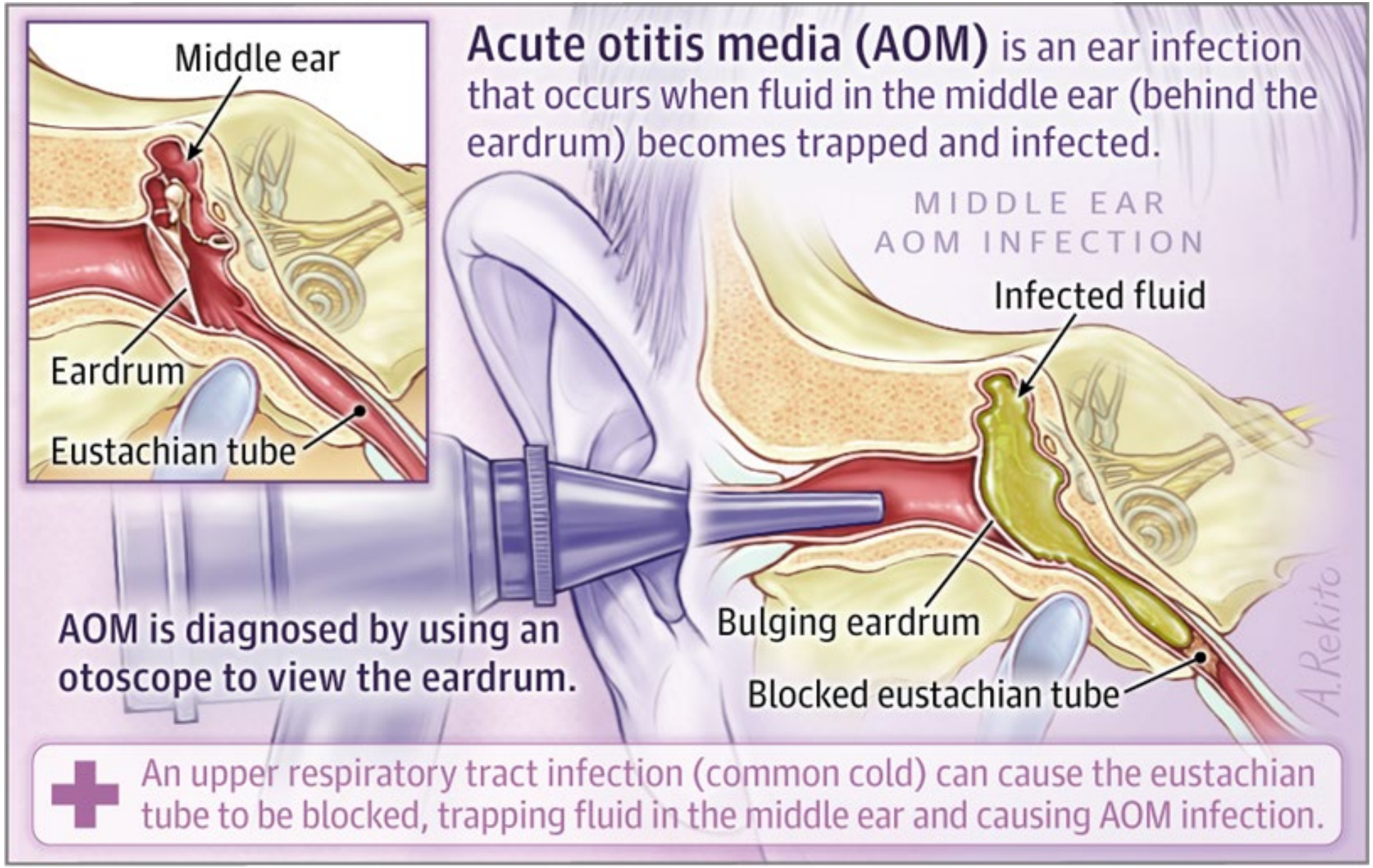

(Caroline R. Paul, 2020)

AOM by the Numbers

- Estimated total cost:
  - $4.3 billion (2012)
  - $2.98 billion (2004)

- 15.8 million cases annually

- 2012 mean cost per diagnosis:
  - $329 - Commercial Insurance
  - $189 - Medicaid

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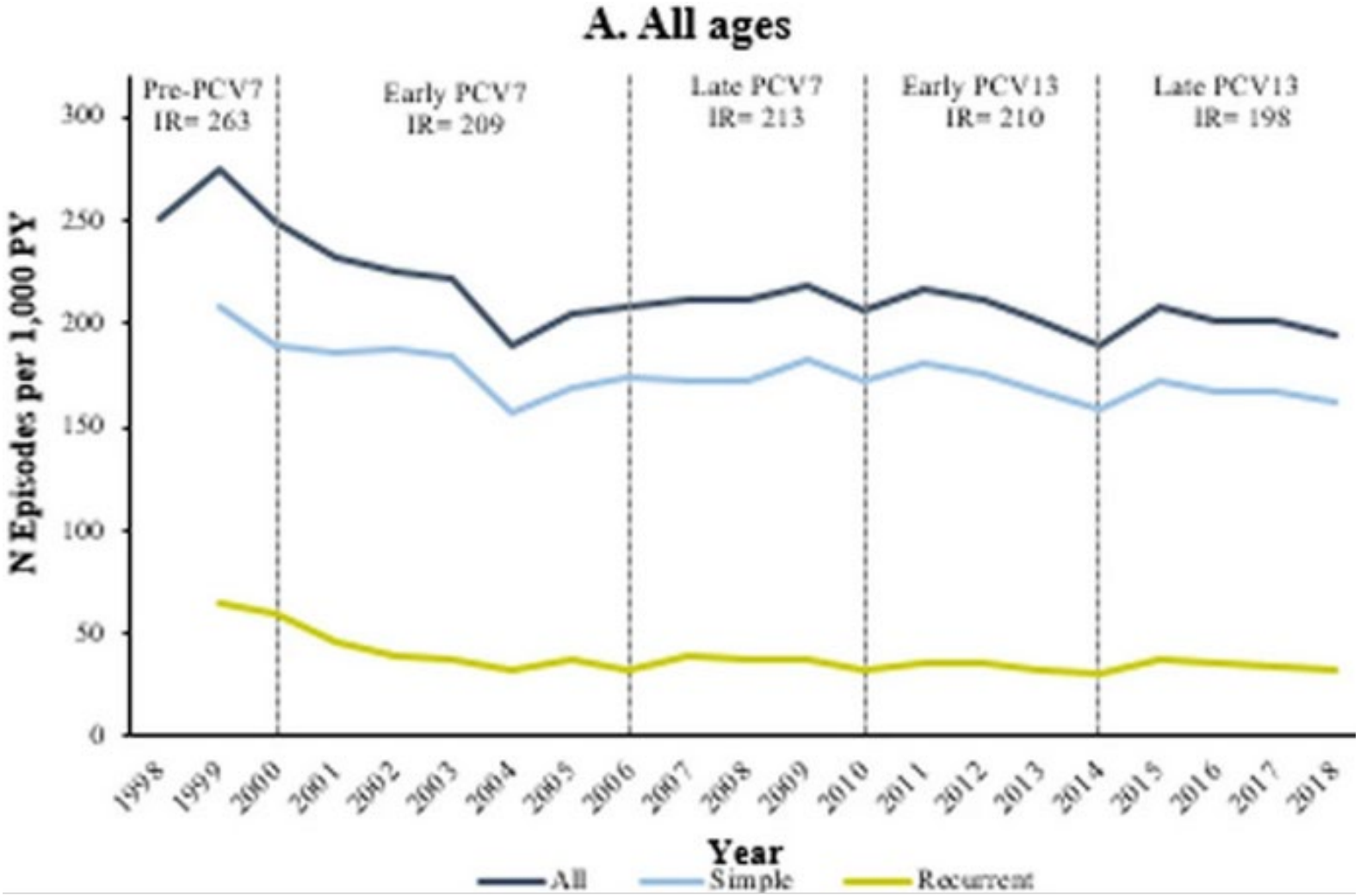
Incidence of AOM 1998-2018



(Hu, 2022)

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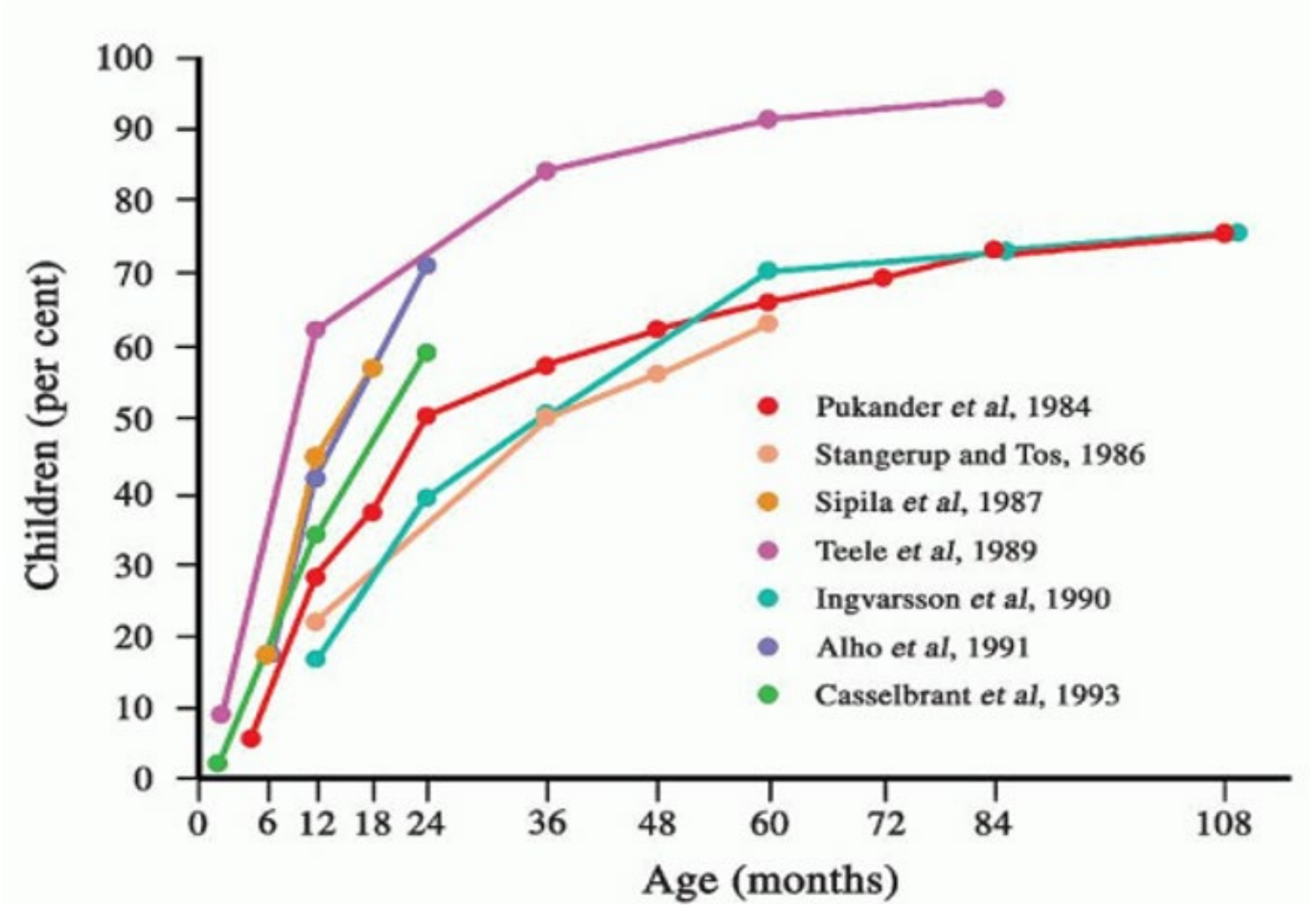
Cumulative Incidence of First Episode of AOM



(Casselbrant, 2016)

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Recurrent AOM

- 3 episodes w/in 6 months
- 4 episodes w/in 12 months

- Epidemiology of AOM in Post-PCV Era (Kaur, 2017)
  - Prospective, longitudinal study (2006-2016)
  - Age: 6mo – 36mo
  - Rochester, NY

Epidemiology of AOM

- 24% ≥ 3 episodes AOM by age 3
- Risk Factors:
  - Early occurrence of first AOM
  - Daycare attendance
  - Family history of AOM
  - Smoking?
  - Atopy?
- Protective: Breastfeeding (>50% of feeds)

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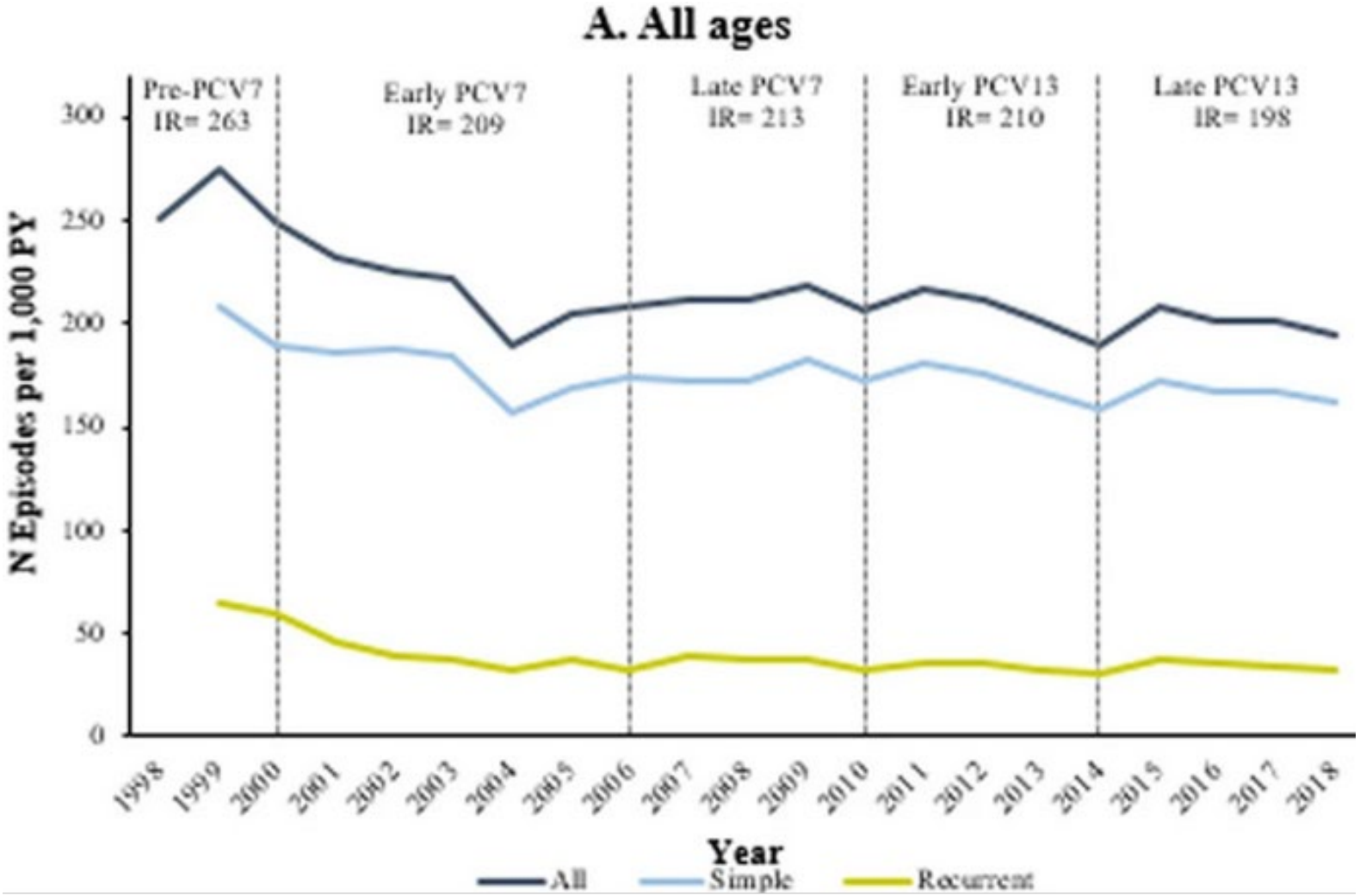

(Hu, 2022)

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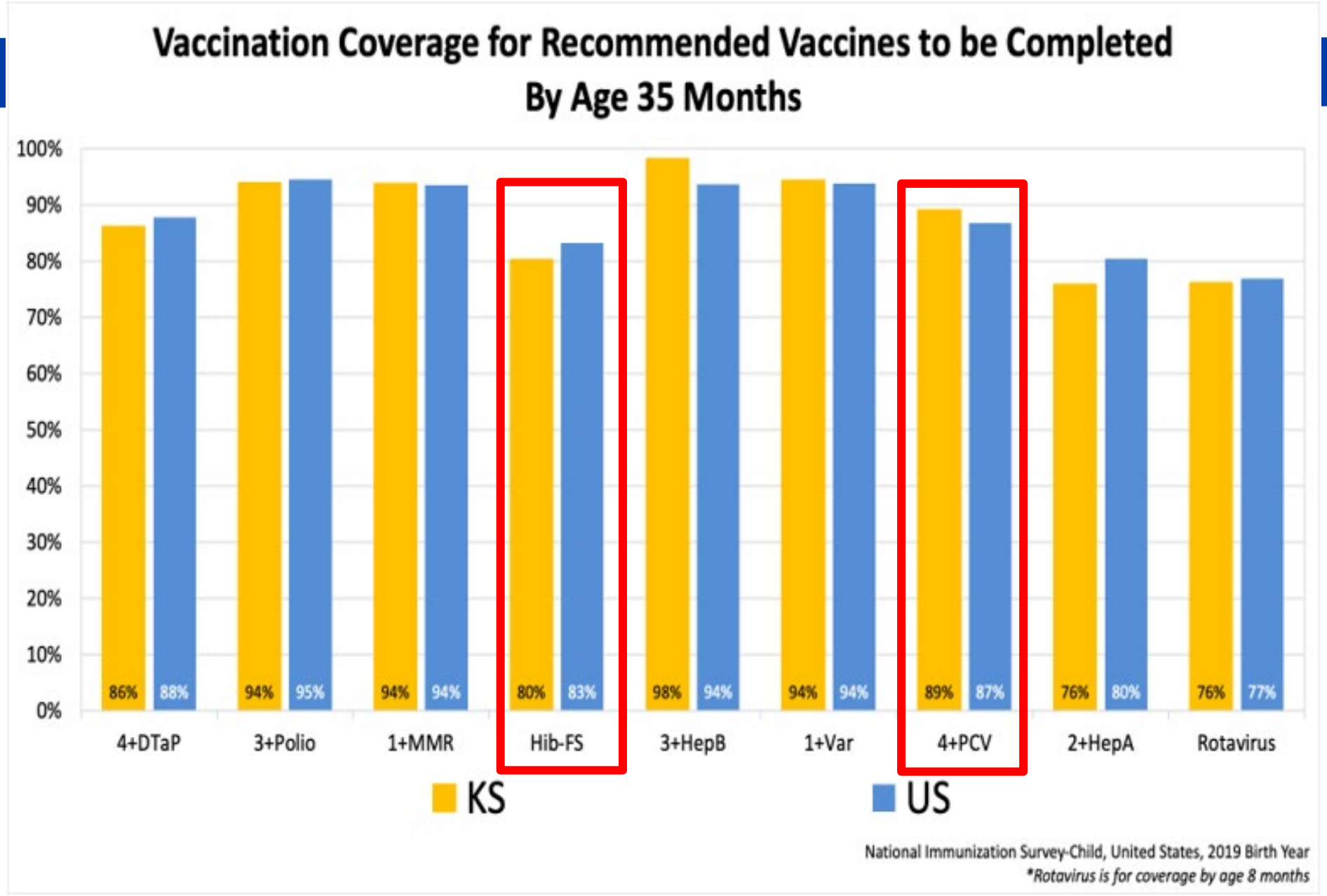
Bacterial Pathogens

- *Streptococcus pneumoniae*
- *Haemophilus influenzae*
- *Moraxella catarrhalis*



(Immunize Kansas Coalition, 2024)

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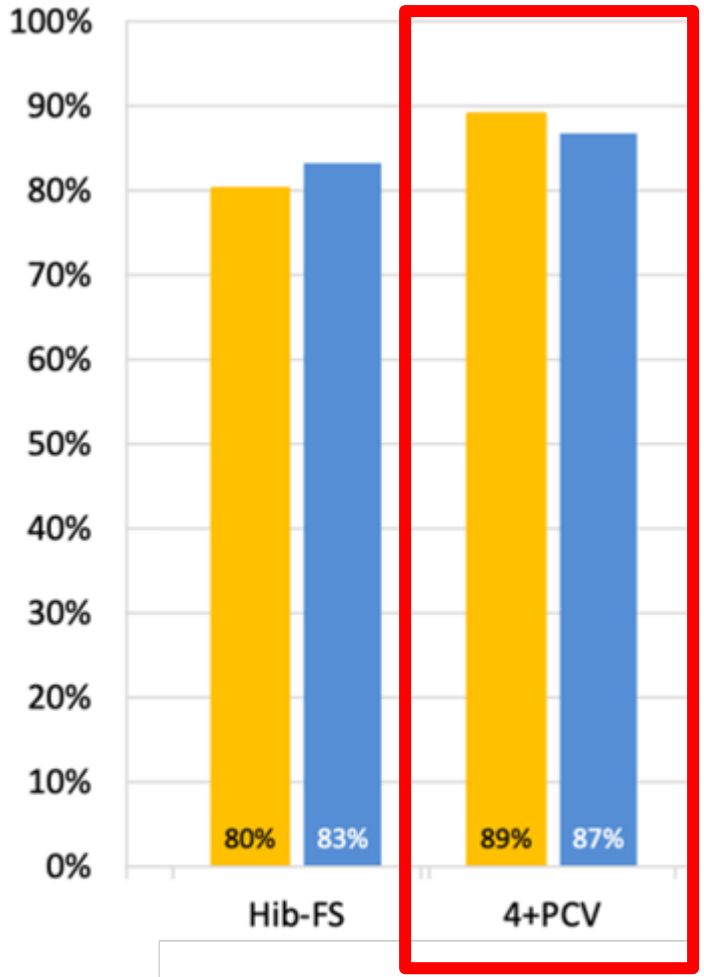
S. Pneumoniae

- Nasopharyngeal flora
- 4-dose series at:
  2, 4, 6, 12–15 months
- Prevnar 20
- Pneumovax 23



(Immunize Kansas Coalition, 2024)

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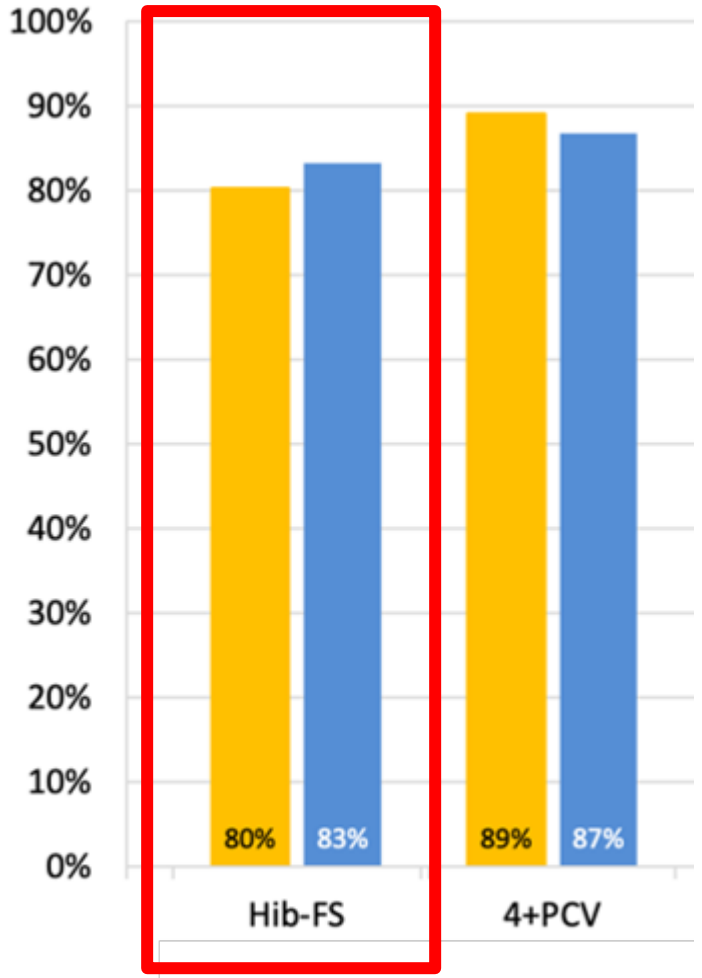
H. influenzae

- Nasopharyngeal flora
- 4-dose series at:
  2, 4, 6, 12–15 months
- B serotype: meningitis, epiglottitis, bacteremia
- Non-typeable: OM, sinusitis, PNA



(Immunize Kansas Coalition, 2024)

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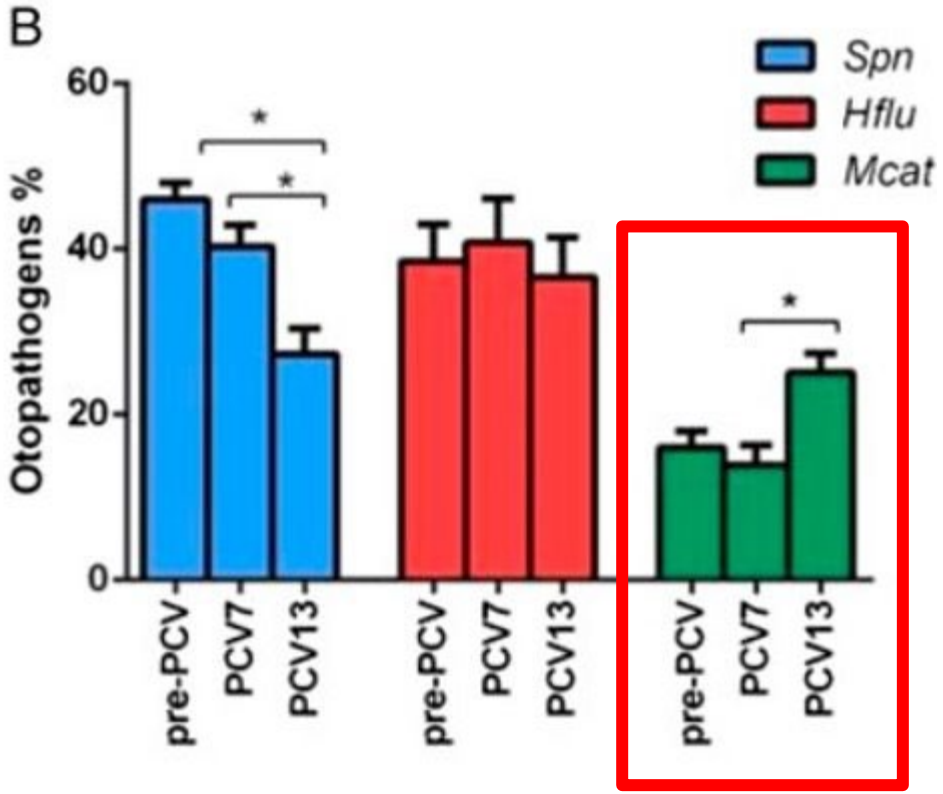
M. catarrhalis

- Increasing prevalence since introduction of PCV
- GSK Stage 2 trial; targeting reduction in COPD exacerbations



(Kaur, 2017)

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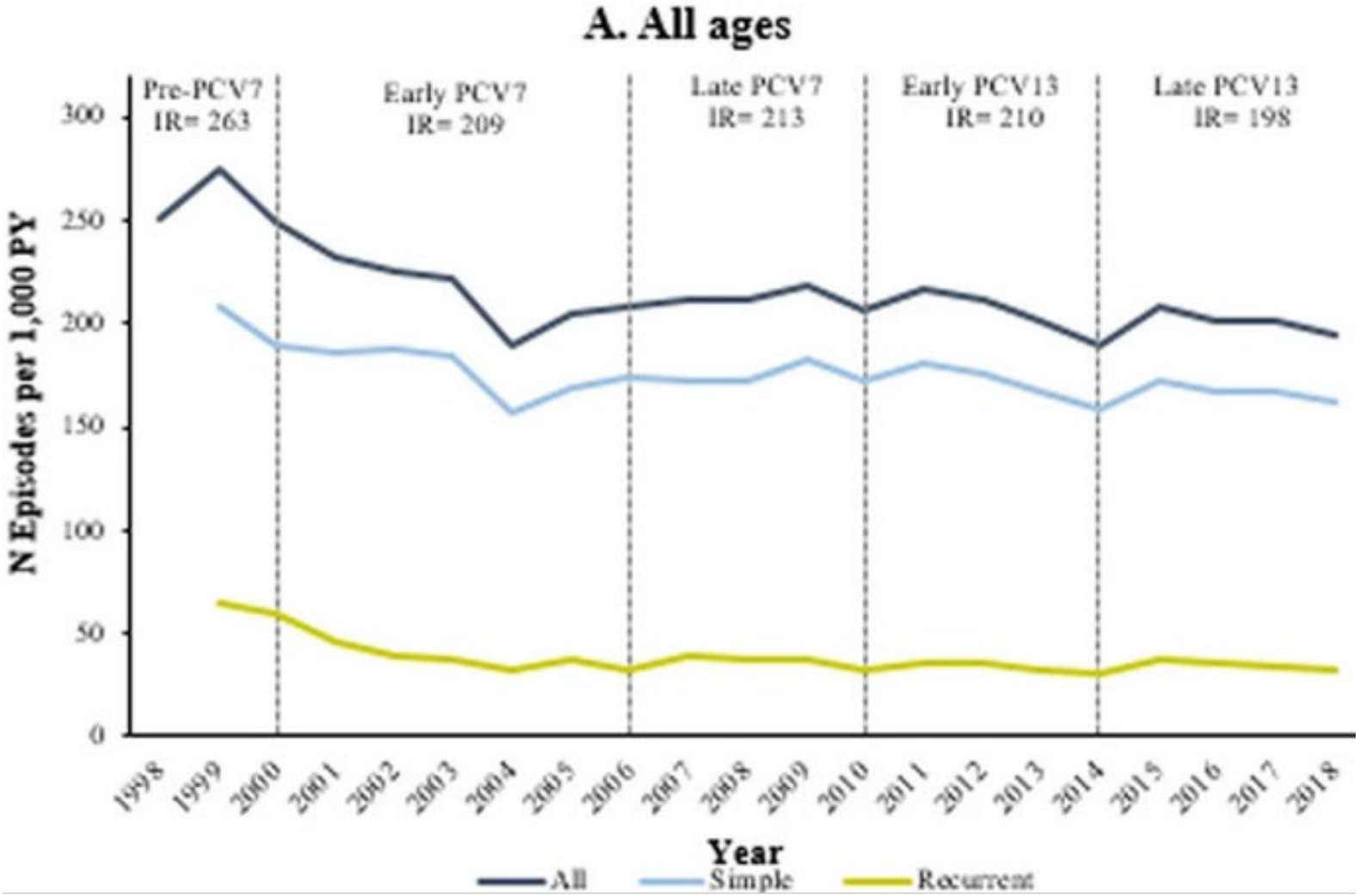

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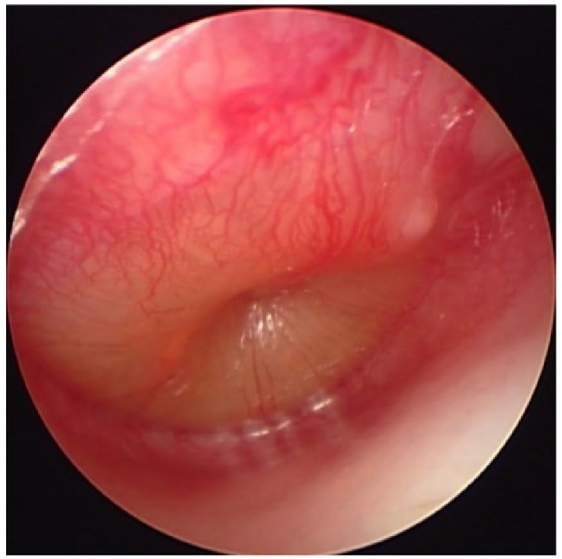
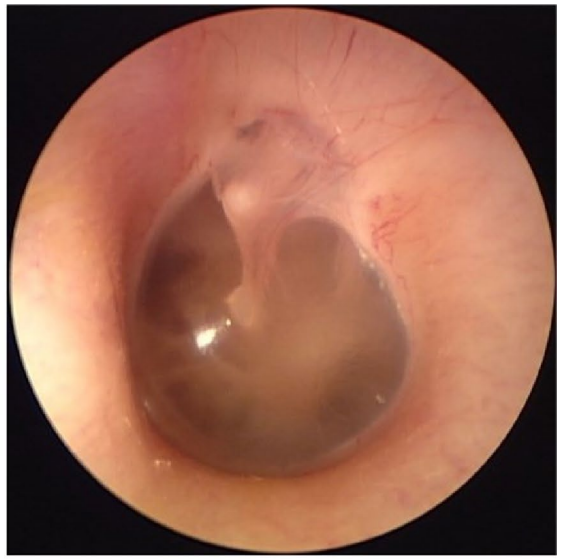
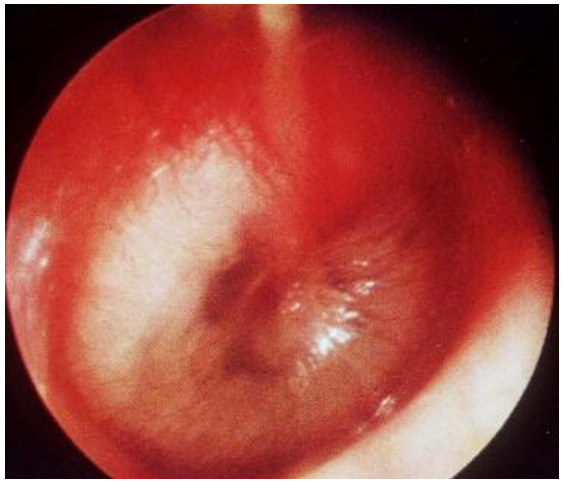


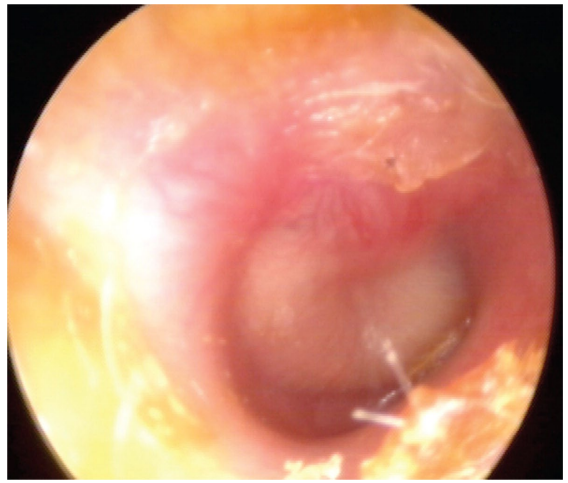
(a) AOM

(b) OME



(c) NOE





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Indications for Treatment

- AOM <6 mo
- Age 6-23 mo with bilateral AOM
- Severe AOM, regardless of age
  - Moderate or severe otalgia
  - Otalgia ≥ 48 hours
  - Temp 39°C [102.2°F] or higher

- Consider watchful waiting (if reliable follow-up):
  - Non-severe
  - Age 6-23 mo with unilateral AOM
  - ≥2 yo with unilateral or bilateral AOM

(Lieberthal A.S, 2013)

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Antibiotic Coverage

If mild/moderate and no risk factors for resistance:

- Amoxicillin 80-90 mg/kg/day PO in 2 divided doses
  (max 2 g/dose)

If severe or risk factors for resistance:

- Amoxicillin/clavulanate 80-90 mg/kg/day and 6.4 mg/kg/day PO, in 2 divided doses
  (max 2 g/dose)

Treatment Failure:

- Rocephin 50mg/kg for 1 or 3 days
- Clindamycin

(Lieberthal A.S, 2013)

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Tympanostomy Indications

- Bilateral chronic otitis media with effusion (OME) for three months and hearing loss
- Unilateral/bilateral OME for three months and reduced quality of life due to OME
- Recurrent acute otitis media with effusion at time of assessment for TT
- At-risk children
  - Permanent hearing loss
  - Speech/language delay
  - Developmental delay

(Rosenfeld, 2013)

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Tympanostomy Outcomes

- 2 to 5 children have to undergo tympanostomy tube placement (TTP) to prevent 1 child from a subsequent case of AOM in 6 months

- TTP improves hearing at 1 to 3 months compared with watchful waiting
  - No benefit by 12 to 24 months

(Rana, 2023)

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Tympanostomy Tubes or Medical Management

- Tympanostomy tube placement did not reduce episodes of AOM in the two-year period following placement among children 6-35 months w/ recurrence
- TTP beneficial in patients with early incidence of AOM
- Medical management favored with increasing days of otorrhea by history
- Remove at 2 years if still retained

(Hoberman, 2021)

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Indications for Treatment

Treat with antibiotics:

- AOM in <6 mo
- Age 6-23 mo with bilateral AOM
- Severe AOM, regardless of age

Consider watchful waiting (if reliable follow-up):

- Nonsevere
- Age 6-23 mo with unilateral AOM
- ≥2 yo with unilateral or bilateral AOM

(Lieberthal A.S, 2013)

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Treatment Indicated

Treat with antibiotics:

- AOM in <6 mo
- Age 6-23 mo with bilateral AOM
- Severe AOM, regardless of age
- Immunodeficiency
- Medical / Anatomical conditions involving ear
- Tympanostomy tubes
- Ruptured TM
- History of recent of hard to treat AOM

(Lieberthal A.S, 2013)

Watchful Waiting

- Guidelines for initial observation of AOM
  - Netherlands, 1990
  - US, 2004

- Wait and See Prescriptions (WASP)

- Safety Net Antibiotic Prescriptions (SNAP)
  - Wait to fill rx for 48hrs unless child is not better or worse, excluding severe AOM

(Lieberthal A.S, 2013)

SNAP - WASP

- Barriers: Time, parental pressure for relief
- 0.5% patients with AOM were offered SNAP
  - 27.5% would qualify
- Aim: Increase from 0.5% to 15%
  - Increased to 7%
- QI Interventions: algorithm development, provider education, EMR aids

(Dagget, 2022)

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SNAP - WASP

- 1/3 delayed prescriptions filled (31%)
  - No significant difference in patient satisfaction

(Frost, 2021)

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Safety Net Antibiotic Prescriptions (SNAP) for Middle Ear Infections

Many ear infections get better in 2-3 days without antibiotics. Children who meet criteria can be safely monitored for 2-3 days to see if symptoms improve without antibiotics. If symptoms are not better in 2-3 days, or if symptoms worsen, (temperature > 102.2, ear pain is not controlled with pain medications, or new drainage is seen from ear,) the antibiotic should be started.

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Patients Who Qualify for a SNAP:

- 6-24 months old: mild symptoms and infection in 1 ear
- Over 24 months old: mild symptoms and infection in 1 or 2 ears
- Mild Symptoms: no more than mild ear pain for less than 48 hours, fever lower than 102.2 F

Patients Who Do NOT Qualify for a SNAP:

- Severe signs and symptoms at any age. (Severe ear pain, fever higher than 102.2)
- Infants < 6 months
- Children 6-24 months with ear infection in both ears
- Immune deficiencies
- Medical conditions involving the ear
- Ear tubes in place
- Ruptured ear drum (ear drainage present)
- History of recent or hard-to-treat ear infections

Recommended Duration of Antibiotic Therapy by Age/Severity

10 days

- Children with severe middle ear infection
- Children < 24 months of age

7 days

- Children 2-5 years of age with non-severe middle ear infection

5-7 days

- Children ≥ 6 years of age with non-severe middle ear infection

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Examples of Tympanic Membrane Exams

Sundgaard, JV, Harte, J, Bray, P, et al. Deep metric learning for otitis media classification. Medical Image Analysis. 2021;71:102034. https://doi.org/10.1016/j.media.2021.102034. Images by CC 4.0.

Authors: Jennifer McKinsey, MD and Holly Austin, MD, members CMH UC AOM SNAP QI team Updated 6/6/2022 Images CC by 4.0.

Normal Ear Drums

Otitis Media with Effusion (OME)
(Ear drums with clear fluid trapped behind them)

Acute Otitis Media (AOM)
(Middle ear infection)

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(CMH, 2022)

Watchful Waiting for Ear Infections

BE ANTIBIOTICS AWARE
SMART USE, BEST CARE

Your child's ear infection may go away on its own, so your healthcare professional may suggest watching and waiting for 2–3 days to see if your child needs an antibiotic. **If so, you will not receive a prescription today**. Many ear infections will resolve on their own, and it's safer not to use antibiotics if they aren't needed.

To help your child feel better in the meantime, they should:

- Rest.
- Drink extra water and fluids.
- Use over-the-counter medicines as needed for relief of pain and fever:
  Ibuprofen. Dose and Frequency: _____
  Acetaminophen. Dose and Frequency: _____

(CDC Watchful Waiting)

Treatment Risks

- Antibiotic Side Effects
- Growing Resistance Patterns
- Cost

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QUESTIONS?

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REFERENCES

Ahmed S, Shapiro NL, Bhattacharyya N. Incremental health care utilization and costs for acute otitis media in children. *Laryngoscope*. 2014;124(1):301–305

Caroline R. Paul, M. (2020, March 1). *Acute otitis media*. JAMA Pediatrics. https://jamanetwork.com/journals/jamapediatrics/fullarticle/2759422

Casey JR; Adlowitz DG; Pichichero. (2010, April 29). New patterns in the otopathogens causing acute otitis media six to eight years after introduction of pneumococcal conjugate vaccine. *The Pediatric infectious disease journal*. https://pubmed.ncbi.nlm.nih.gov/19935445/

Casselbrant, M. L., & Mandel, E. M. (2016, May 24). Otitis media in the age of antimicrobial resistance. *Ento Key*. https://entokey.com/otitis-media-in-the-age-of-antimicrobial-resistance/

Children's Mercy Hospitals. (n.d.). Safety Net Antibiotic Prescriptions (SNAP) for Middle Ear Infections. Visual Aid for Safety Net Antibiotic Prescriptions. https:www.childrensmercy.org/siteassets/media/health-care-providers/pediatric-guides/antimicrobial-stewardship/visual-aid-for-safety-net-antibiotic-prescriptions.pdf

Holly M. Frost, Jennifer D. Monti, Leisha M. Andersen, Chuck Norlin, Destani J. Bizune, Katherine E. Fleming-Dutra, Christopher A. Czaja; Improving Delayed Antibiotic Prescribing for Acute Otitis Media. *Pediatrics* June 2021; 147 (6): e2020026062. 10.1542/peds.2020-026062

Daggett A, Wyly DR, Stewart T, Phillips P, Newell C, Lee BR, Burns A, Sharma N, Shastri N, Rodean J, El Feghaly RE. Improving Emergency Department Use of Safety-Net Antibiotic Prescriptions for Acute Otitis Media. *Pediatr Emerg Care*. 2022 Mar 1;38(3):e1151-e1158. doi: 10.1097/PEC.0000000000002525. PMID: 35226640

Hoberman, A. (2021, May 13). Tympanostomy tubes or medical management for ... *The New England Journal of Medicine*. https://www.nejm.org/doi/full/10.1056/nejmoa2027278

Hu, T., Done, N., Petigara, T. et al. Incidence of acute otitis media in children in the United States before and after the introduction of 7- and 13-valent pneumococcal conjugate vaccines during 1998–2018. *BMC Infect Dis* 22, 294 (2022). https://doi.org/10.1186/s12879-022-07275-9

Immunize Kansas Coalition. (n.d.). Data Dashboard. Data Dashboard | IKC. https://www.immunizekansascoalition.org/datadash.asp

Kaur R, Morris M, Pichichero ME. Epidemiology of Acute Otitis Media in the Postpneumococcal Conjugate Vaccine Era. *Pediatrics*. 2017 Sep;140(3):e20170181. doi: 10.1542/peds.2017-0181. Epub 2017 Aug 7. Erratum in: Pediatrics. 2018 Feb 28;: PMID: 28784702; PMCID: PMC5574724.

Lieberthal A.S., Carroll A.E., Chonmaitree T., Ganiats T.G., Hoberman A., Jackson M.A., Joffe M.D., Miller D.T., Rosenfeld R.M., Sevilla X.D., et al. The diagnosis and management of acute otitis media. *Pediatrics*. 2013;131:e964–e999. doi: 10.1542/peds.2012-3488.

Rana E. El Feghaly, Mary Anne Jackson; Predicting Recurrent Acute Otitis Media and the Need for Tympanostomy: A Powerful Tool. *Pediatrics* February 2023; 151 (2): e2022060110. 10.1542/peds.2022-060110

Rosenfeld RM, Schwartz SR, Pynnonen MA, Tunkel DE, Hussey HM, Fichera JS, Grimes AM, Hackell JM, Harrison MF, Haskell H, Haynes DS, Kim TW, Lafreniere DC, LeBlanc K, Mackey WL, Netterville JL, Pipan ME, Raol NP, Schellhase KG. Clinical practice guideline: Tympanostomy tubes in children. *Otolaryngol Head Neck Surg*. 2013 Jul;149(1 Suppl):S1-35.

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