CDC PUBLIC HEALTH GRAND ROUNDS

Maternal Immunization: Current Status and Future Directions

Event ID: 4157352

September 18, 2019

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Maternal Vaccination Against Influenza and Pertussis

CAPT Amy Parker Fiebelkorn, MSN, MPH

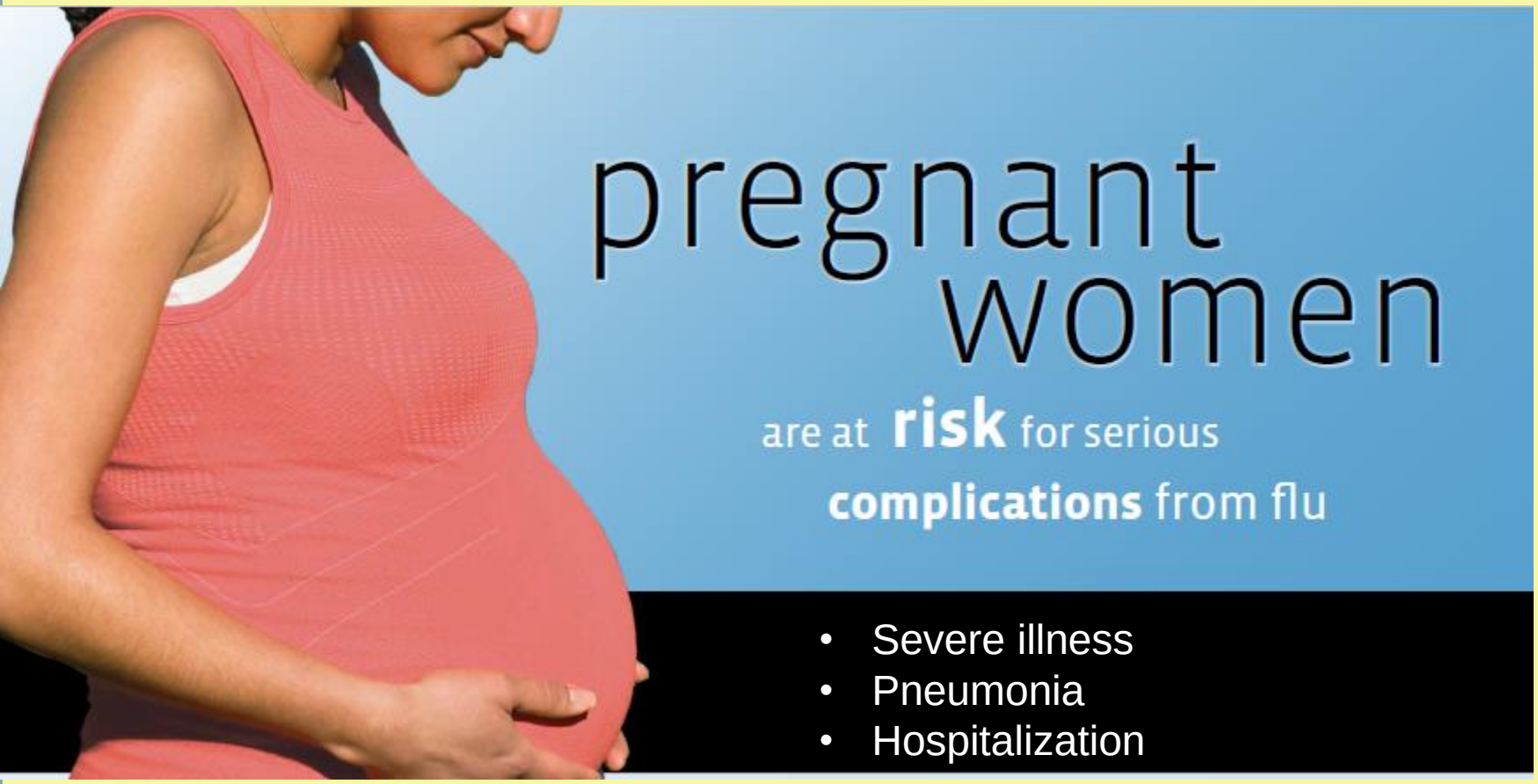
Vaccine Task Force Deputy, Adult and Influenza Immunization Team

Office of the Director, Immunization Services Division

National Center for Immunization and Respiratory Diseases

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Influenza


pregnant
women
are at risk for serious
complications from flu
• Severe illness
• Pneumonia
• Hospitalization


NO FLU
ON BOARD

Influenza Severity in Pregnant Women

- Pregnant women are at increased risk of influenza-related hospitalization compared with the general population

- Risk of influenza-related hospitalization increases later in pregnancy

Mertz D, Geraci J, Winkup J, et al. *Vaccine* 2017; 35(4): 521-28.
gis.cdc.gov/grasp/fluview/FluHospChars.html
Neuzil KM, Reed GW, Mitchel EF, Simonsen L, Griffin MR. *Am J Epidemiol* 1998; 148:1094–1102.

Impact of Influenza Among Infants

Infants aged <6 months:

- Highest rate of influenza-related hospitalizations and deaths of all pediatric age groups

- Five times as likely to be hospitalized and twice the incidence of death vs. children aged 6–23 months

Poehling KA, Edwards KM, Weinberg GA, et al. *N Engl J Med*. 2006; 355:31-40.
Shang M, Blanton L, Brammer L, et al. *Pediatrics*. 2018; 141(4).

Pertussis (Whooping Cough)

- Highly contagious, bacterial respiratory infection that can be deadly for infants
- Rapid, high-pitched whoop followed by vomiting and exhaustion
- Infants can have atypical symptoms
- Poorly controlled, despite high vaccination coverage

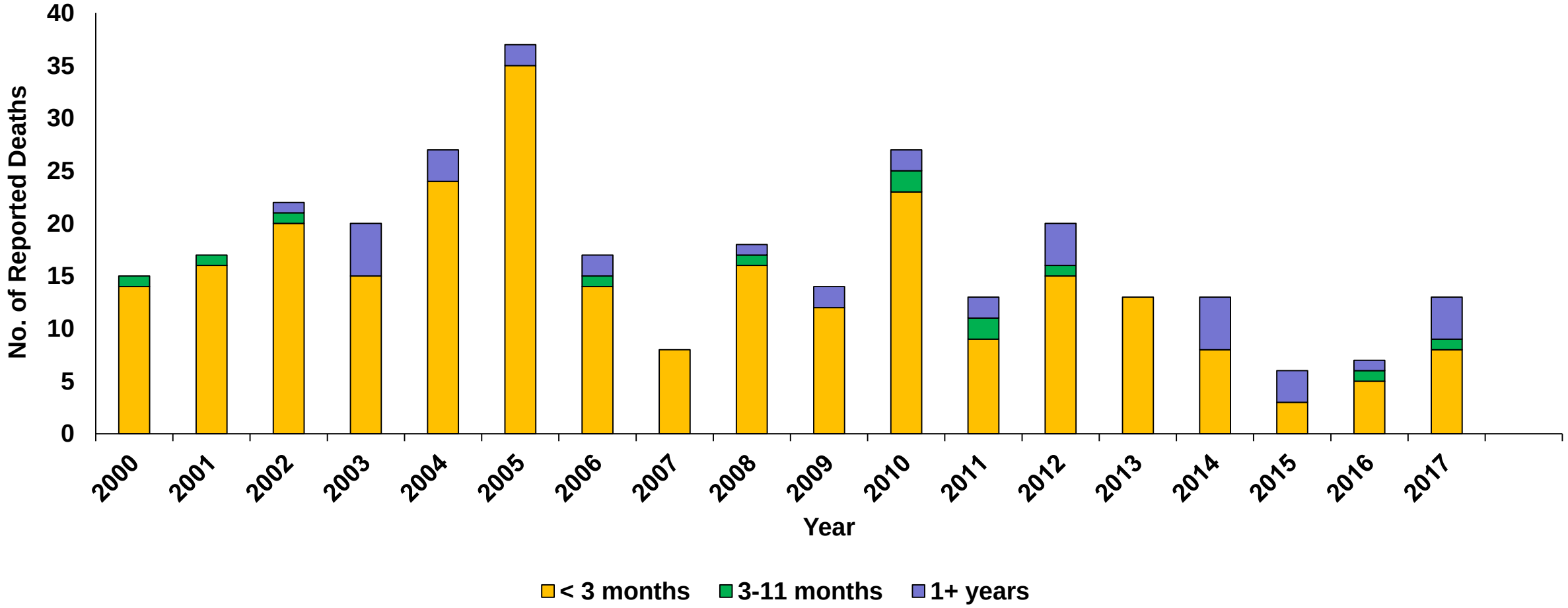
Burden of Pertussis in the United States

Infants aged <2 months have the **highest incidence rate** of pertussis

Approximately 67% of infants aged <2 months with pertussis need treatment in the **hospital**

Skoff T, Hadler S, Hariri S. *Clin Infect Dis*. 2018; ePub ahead of print.

Pertussis Deaths by Age Group, United States, 2000–2017



CDC. National Notifiable Diseases Surveillance System, 2017

Vaccination Recommendations During Pregnancy

The Advisory Committee on Immunization Practices (ACIP) recommends that all women:

who are pregnant during flu season receive influenza vaccine (at any time during pregnancy)

receive tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine during each pregnancy (preferably during the early part of gestational weeks 27– 36)

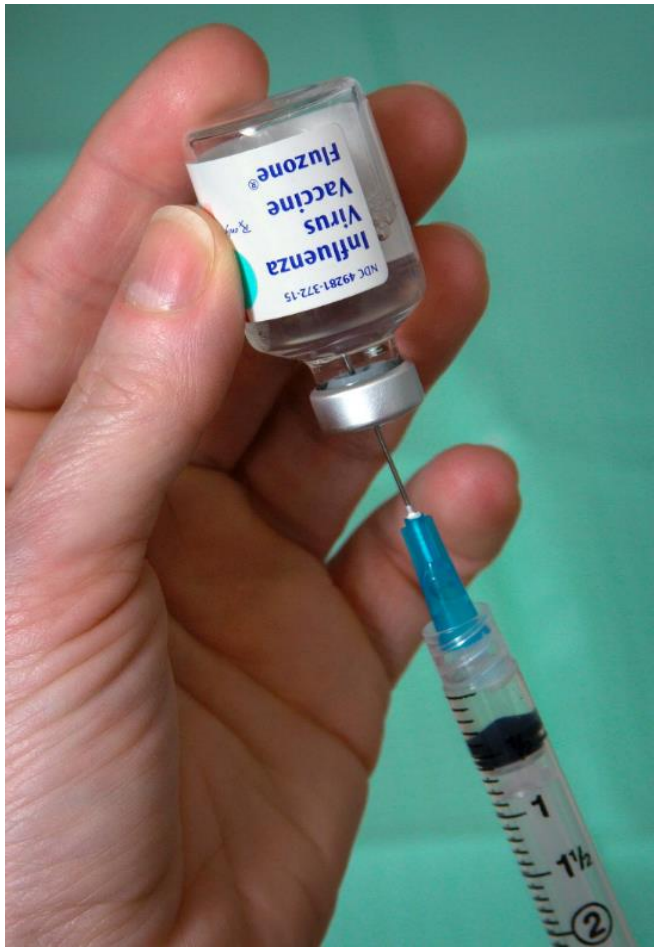
www.cdc.gov/mmwr/volumes/68/rr/pdfs/rr6803-H.pdf
www.cdc.gov/mmwr/volumes/67/rr/rr6702a1.htm

Effectiveness of Influenza Vaccines Given During Pregnancy

Reduces risk of influenza in pregnant women by about 50%, and is 40% effective against influenza-associated hospitalization during pregnancy

Reduces antibiotic use, medical visits, loss of work days

Reduces risk of laboratory-confirmed influenza and influenza hospitalization among infants during the first several months of life



Thompson MG, Kwong JC, Regan AK, et al. *Clin Infect Dis.* 2019;68(9):1444-1453.
Steinhoff M, Katz J, Englund JA, et al. *Lancet Infect Dis* 2017;17(9):981-9.
Tapia MD, Sow SO, Tamboura B, et al. *Lancet Infect Dis* 2016;16: 1026–35.3.
Nunes et al. *Human Vaccines & Immunotherapeutics* 2018; 14(3);758-66.

Effectiveness of Tdap Vaccines Given During Pregnancy

Tdap during third trimester of pregnancy is 78% effective in preventing pertussis in infants <2 months of age

Infants with pertussis born to vaccinated mothers less likely to be hospitalized or admitted to ICU

Baxter R, Bartlett J, Fireman B, et al. *Pediatrics*.2017;139 (5).
Winter K, Nickell S, Powell M, Harriman K. *Clin Infect Dis* 2017;64:3–8.
Skoff T, Hadler S, Hariri S. *Clin Infect Dis*. 2017; 65 (12):1977-83.

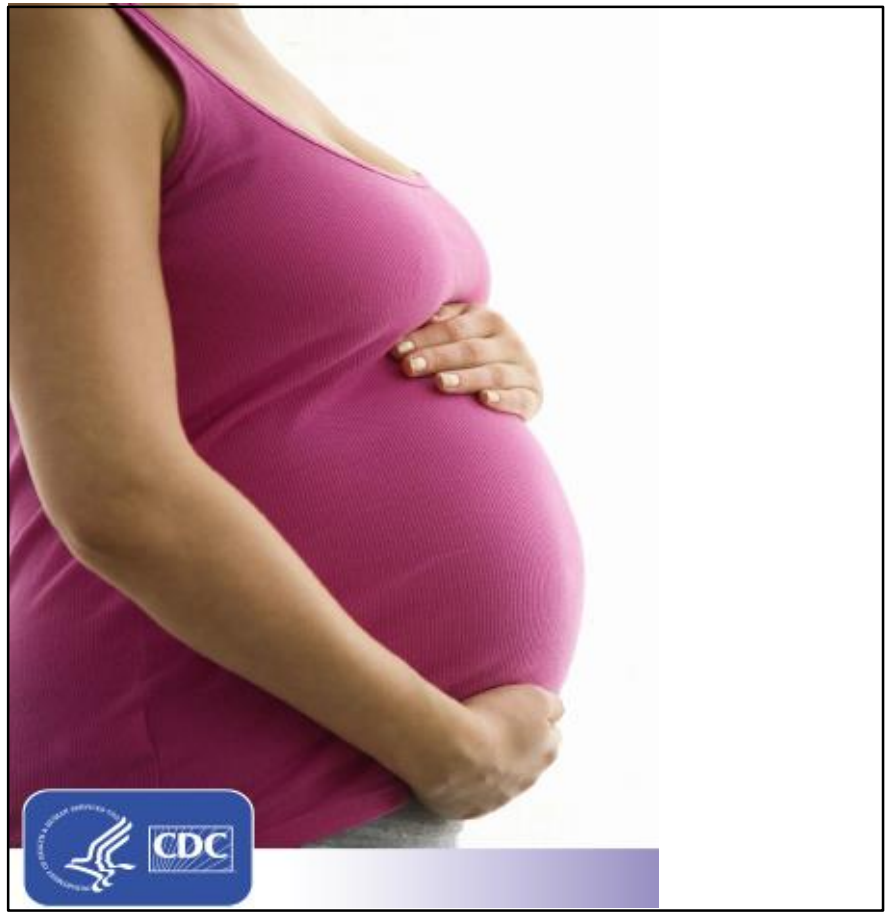
 Tdap: tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine

Safety of Influenza and Tdap Vaccinations During Pregnancy

Two systematic reviews of influenza vaccination show no increased risk for spontaneous abortion, fetal death, or congenital malformations

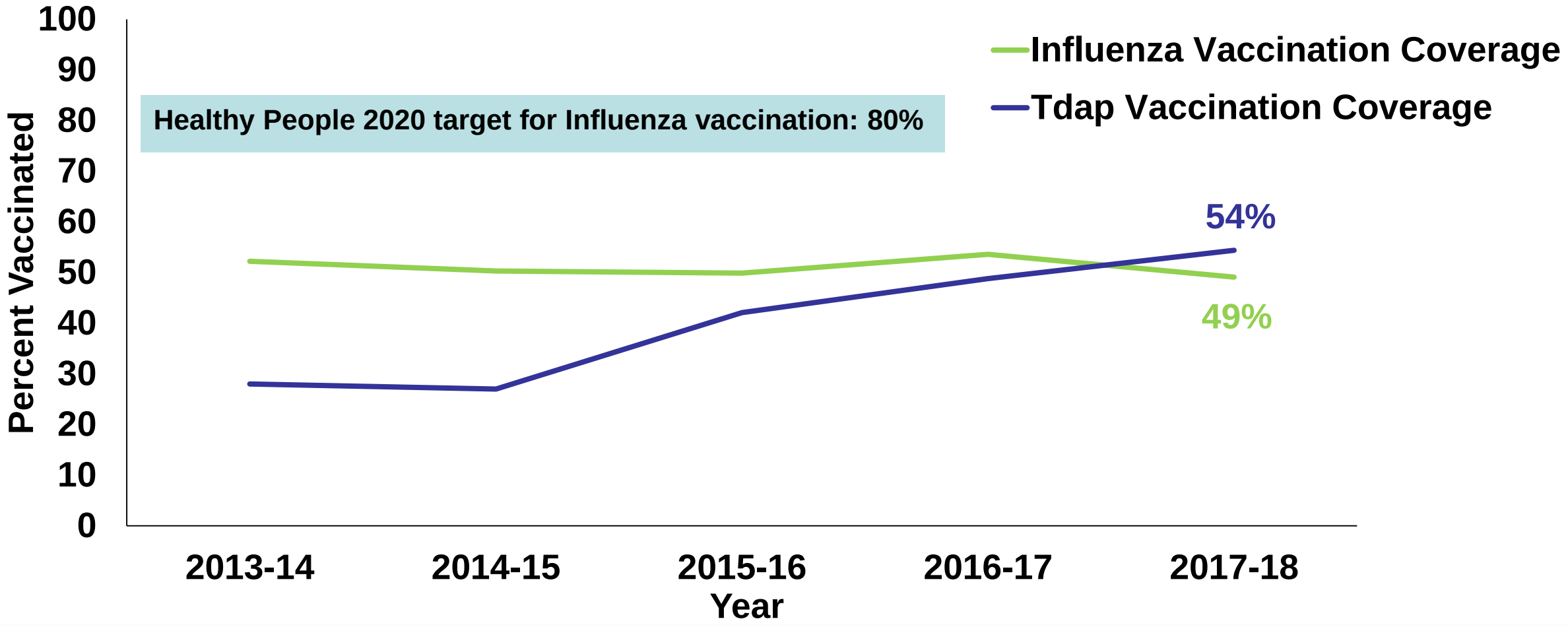
Tdap in pregnancy does not increase the risk of adverse reactions for the mother or infant

No association between vaccination with either vaccine during pregnancy and risk of infant hospitalization or death in first 6 months of life



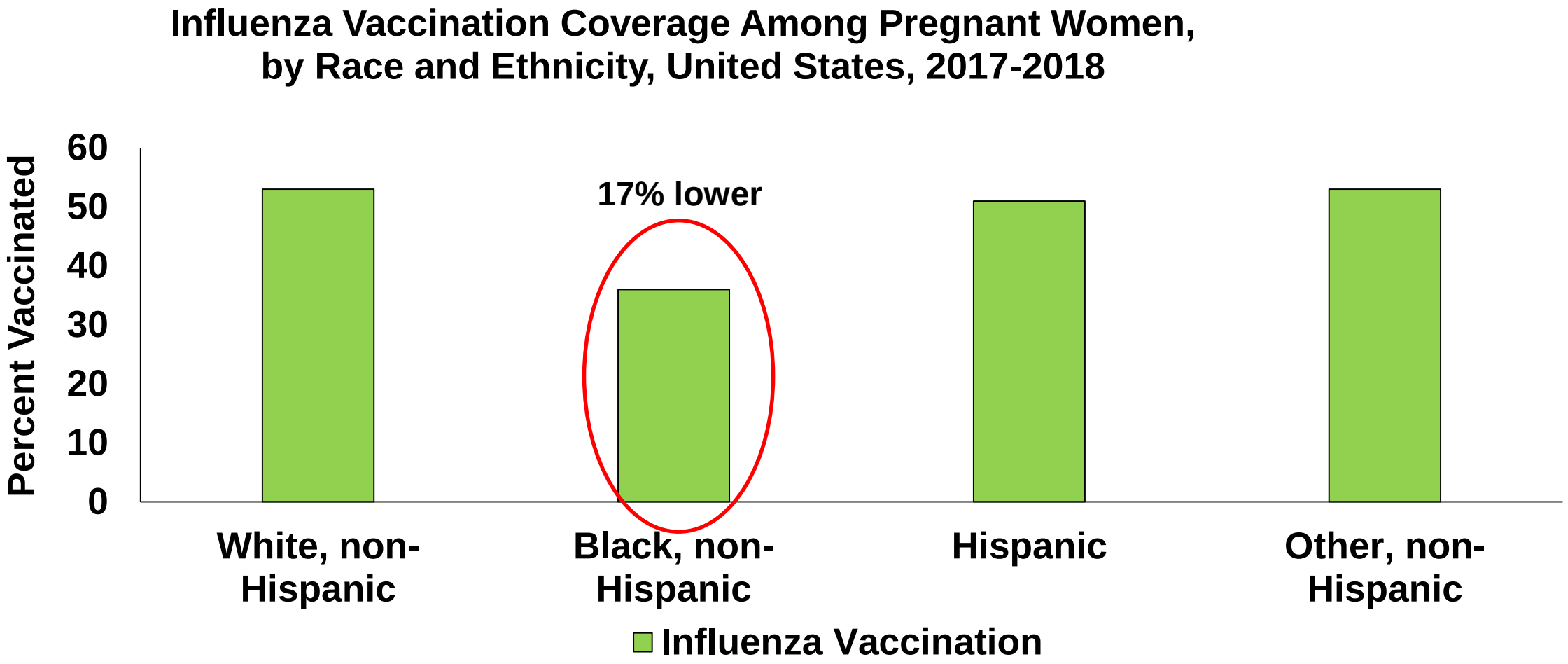
Bratton KN, Wardle MT, Orenstein WA, Omer SB. *Clin Infect Dis*. 2015 Mar 1;60(5):e11-9. Epub 2014 Nov 18.
McMillan M, Porritt K, Kralik D, et al. *Vaccine.* 2015; 33: (18):2108-17.
Sukumaran L, McCarthy NL, Kharbanda EO, et al. *JAMA*. 2015;314(15):1581-7.
Munoz FM, Bond NH, Maccato M, et al. *JAMA*.2014;311 (17):1760-9.
Sukumaran L, McCarthy NL, Kharbanda EO, et al. *Pediatrics.* 2018;141(3).
www.cdc.gov/vaccinesafety/index.html

Influenza and Tdap Vaccination Coverage Among Pregnant Women, 2013-14 through 2017-18 Influenza Seasons, United States



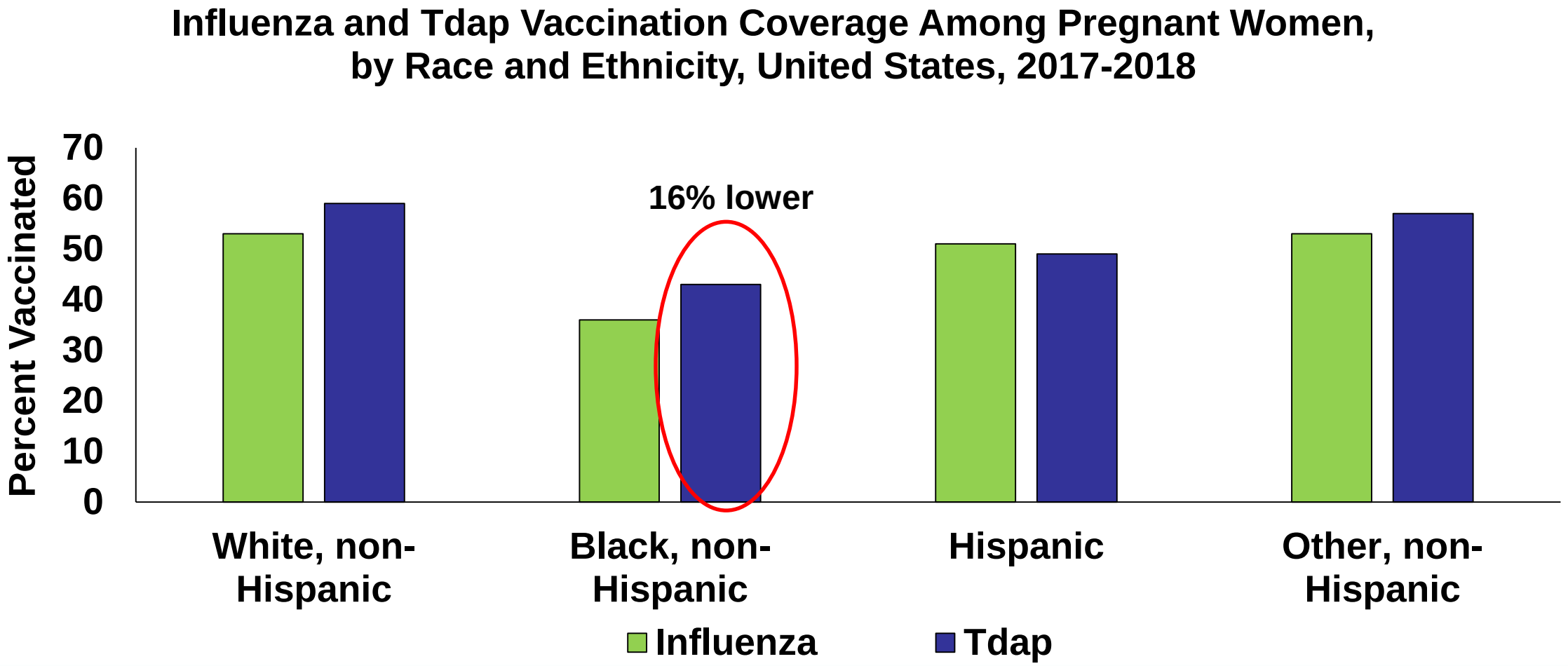
Kahn KE, Black CL, Ding H, et al. *MMWR Morb Mortal Wkly Rep* 2018;67:1055–1059.

Disparities in Maternal Vaccination Coverage



Kahn KE, Black CL, Ding H, et al. *MMWR Morb Mortal Wkly Rep* 2018;67:1055–1059.

Disparities in Maternal Vaccination Coverage



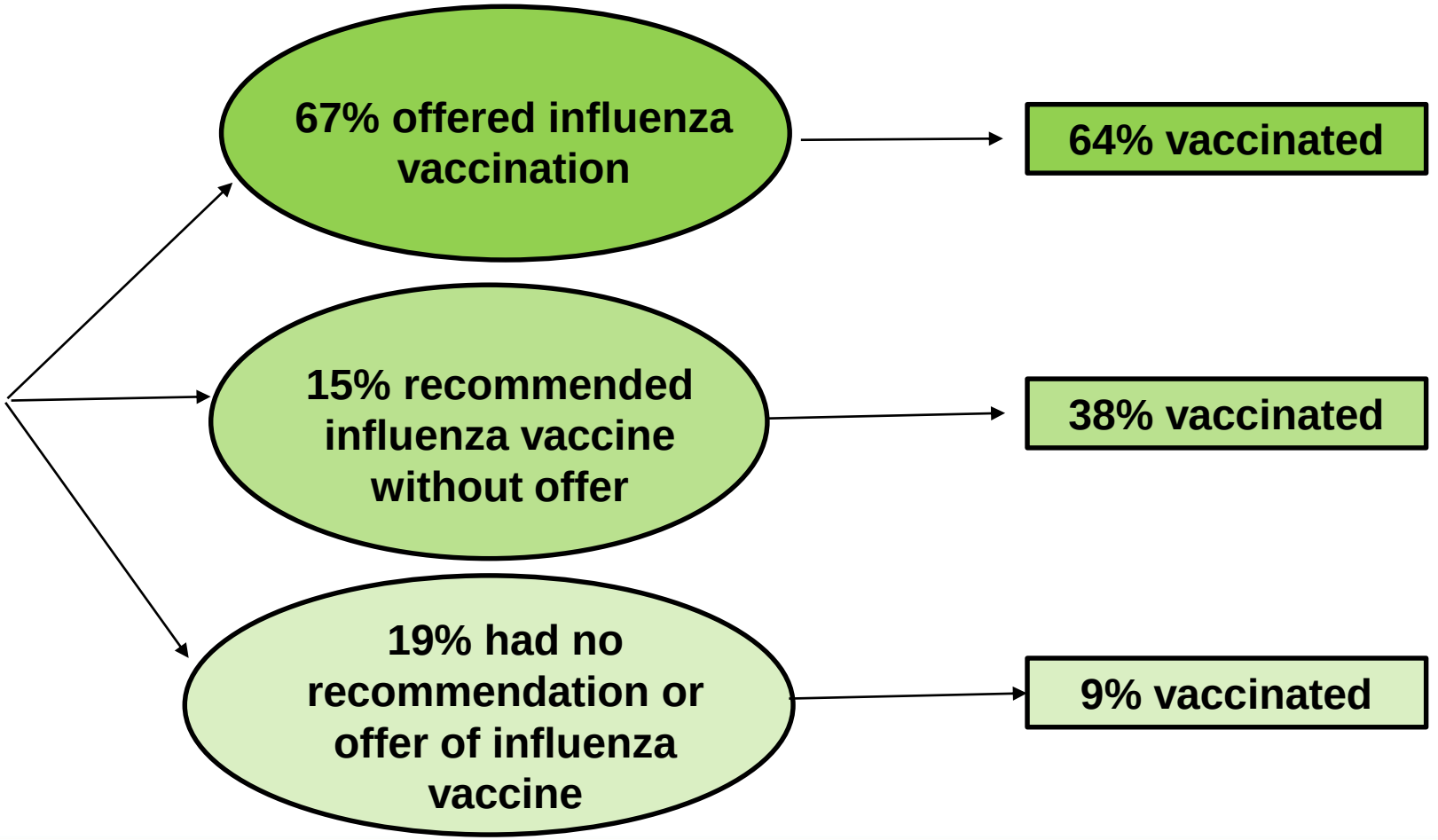
Kahn KE, Black CL, Ding H, et al. *MMWR Morb Mortal Wkly Rep* 2018;67:1055–1059.

Vaccination in Pregnant Women by Provider Offer or Recommendation of Vaccine, United States, 2017-2018

Provider Vaccine Recommendation

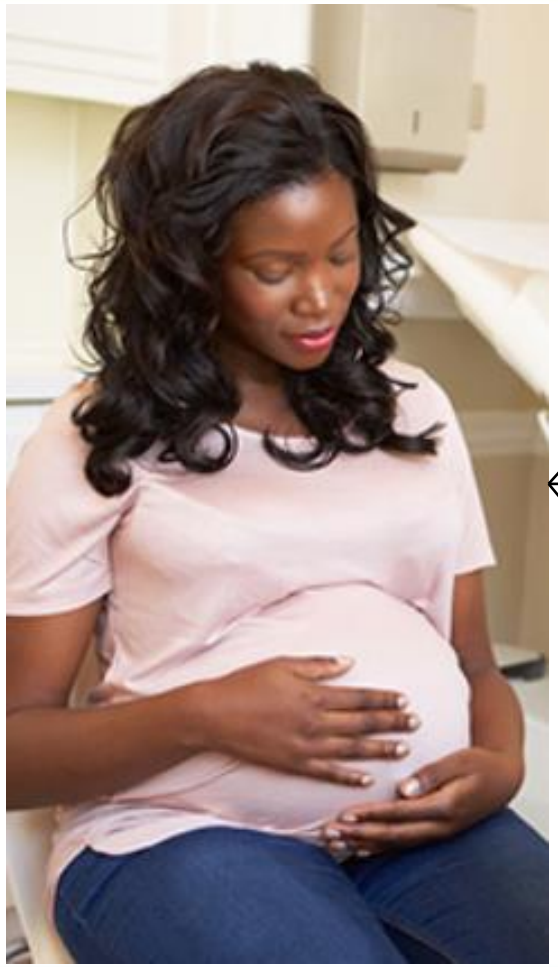
Provider Vaccine Offer

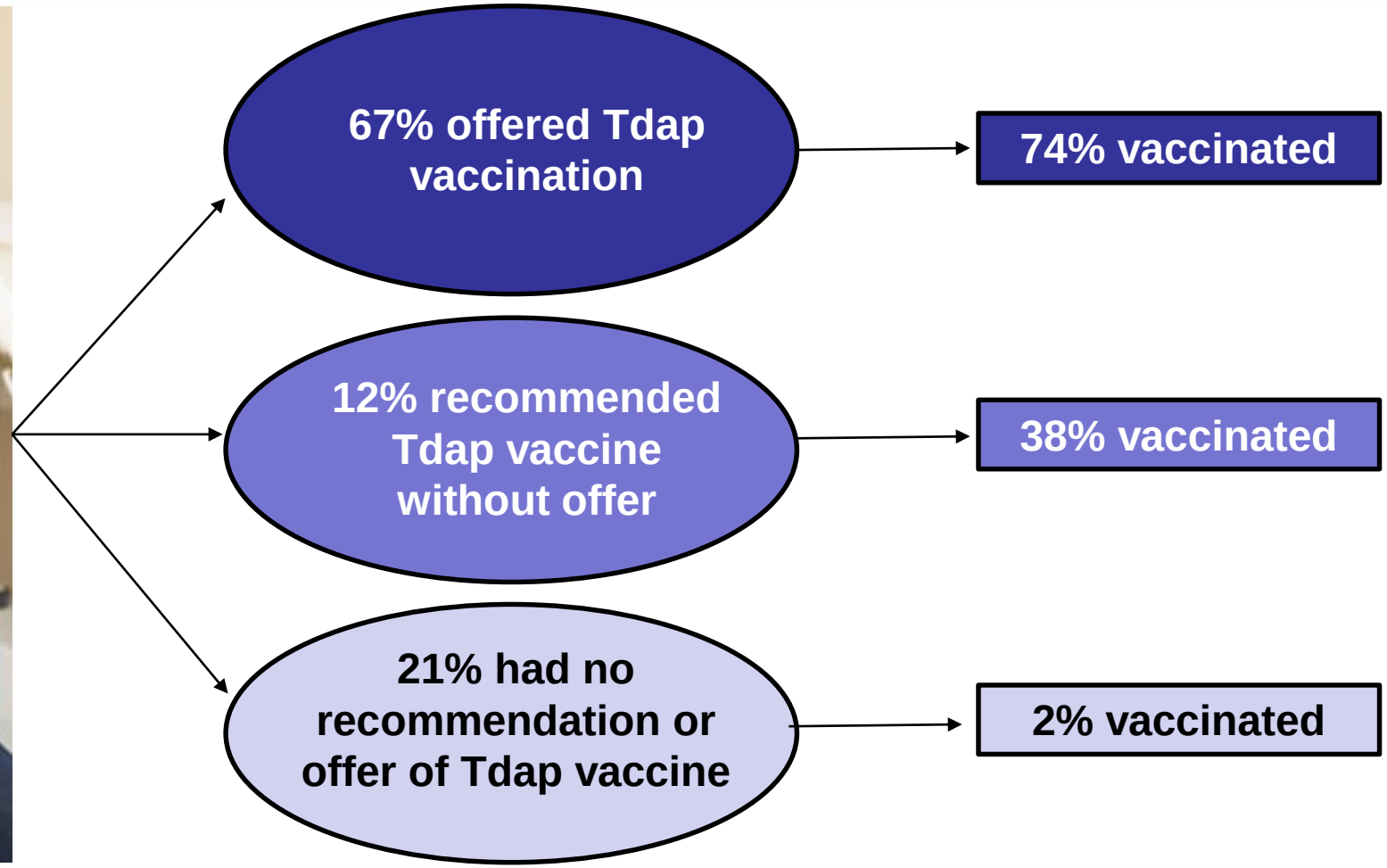
Influenza Vaccination in Pregnant Women by Provider Offer or Recommendation of Vaccine, United States, 2017-2018



Kahn KE, Black CL, Ding H, et al. *MMWR Morb Mortal Wkly Rep* 2018;67:1055–1059

Tdap Vaccination in Pregnant Women by Provider Offer or Recommendation of Vaccine, United States, 2017-2018





Kahn KE, Black CL, Ding H, et al. *MMWR Morb Mortal Wkly Rep* 2018;67:1055–1059

Tdap: tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine

Summary

- Both influenza and pertussis are serious diseases for infants. Influenza is also a serious disease for pregnant women.
- Maternal vaccination is effective and safe and can reduce complications, but vaccination coverage is too low.
- HCP offering vaccines is strongly associated with vaccination.

HCP: healthcare provider

Helping Clinicians Prioritize Maternal Vaccination

Laura E. Riley, MD

Given Foundation Professor and Chair, Department of Obstetrics and Gynecology

Weill Cornell Medicine

Obstetrician and Gynecologist-in-Chief at New York Presbyterian Hospital

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

The American College of Obstetricians and Gynecologists

- Founded in 1951, ACOG is the professional organization dedicated to the improvement of women's health.
- In 2005, ACOG called together a Task Force on Immunization.

Impact of H1N1 Pandemic on Maternal Vaccination

- **2009 H1N1 pandemic**
  - Pregnant women were at high risk of influenza-related complications and death

- **H1N1 influenza vaccination rates for pregnant women increased from <u>15%</u> to <u>50%</u>**
  - First significant increase

ACOG Immunization Program Timeline Since the H1N1 Pandemic

2010

Immunization Expert Work Group convened to continue momentum from H1N1 pandemic of immunizing pregnant women.

- **Awarded several multimillion dollar, multiyear immunization grants.**

2011

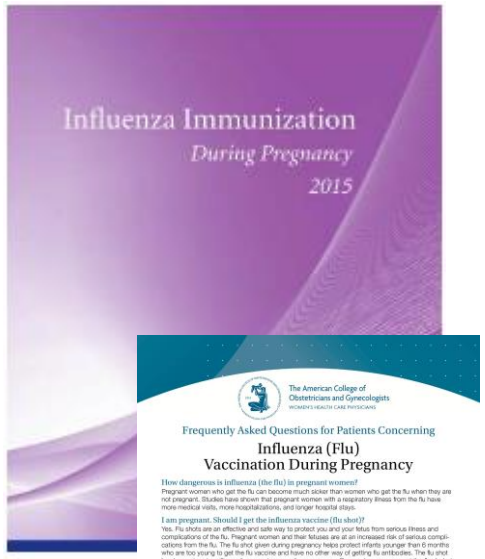
ACOG's Immunization for Women website developed: www.immunizationforwomen.org

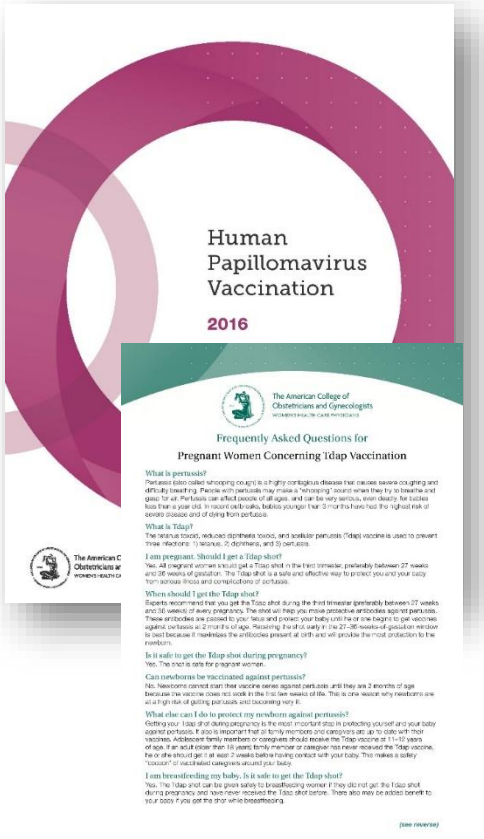
2015

ACOG partnered with CDC, which resulted in development of immunization tool kits from first round of grants.

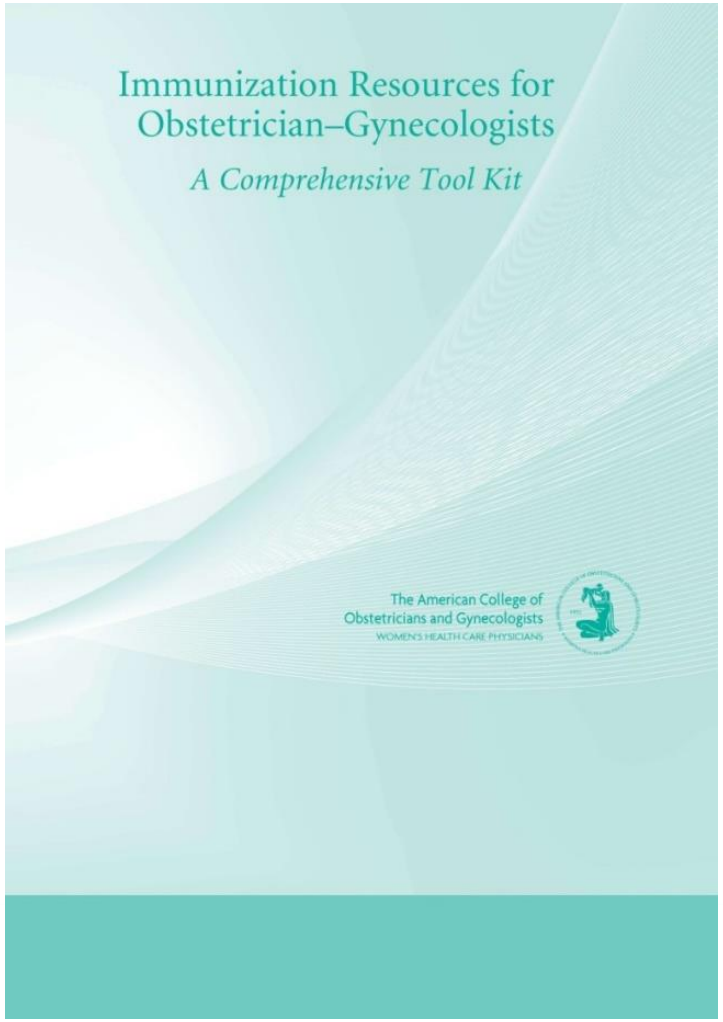
ACOG: American College of Obstetricians and Gynecologists

ACOG Efforts to Improve Adult Immunization Rates: Tool Kits (2011-2018)





Immunization Resources for Obstetrician-Gynecologists: A Comprehensive Tool Kit*



Promotes immunization assessment, recommendation, administration and documentation as routine part of ob-gyn practice.

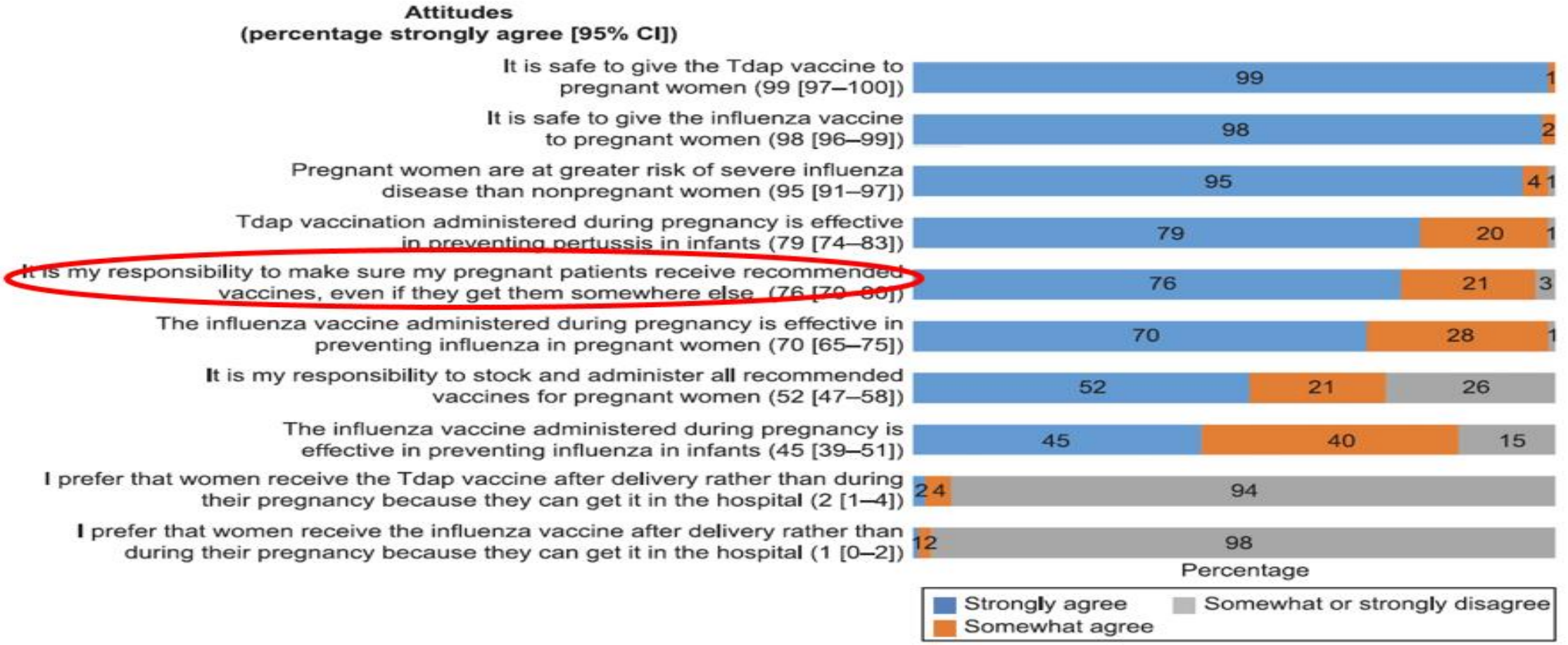
Distribution 2013:

- All 35,000 Ob-Gyns in practice in U.S.
- Residents and Residency Directors
- ACOG District Leadership
- State Maternal and Child Health Directors
- Key CDC Staff
- Partner Organizations

*Funding for distribution of this tool kit was provided by CDC, ASTHO, and Merck. ACOG does not allow companies to influence ACOG's programs, publications, or advocacy positions.

Attitudes of Ob/Gyn Providers on Vaccinating Pregnant Patients

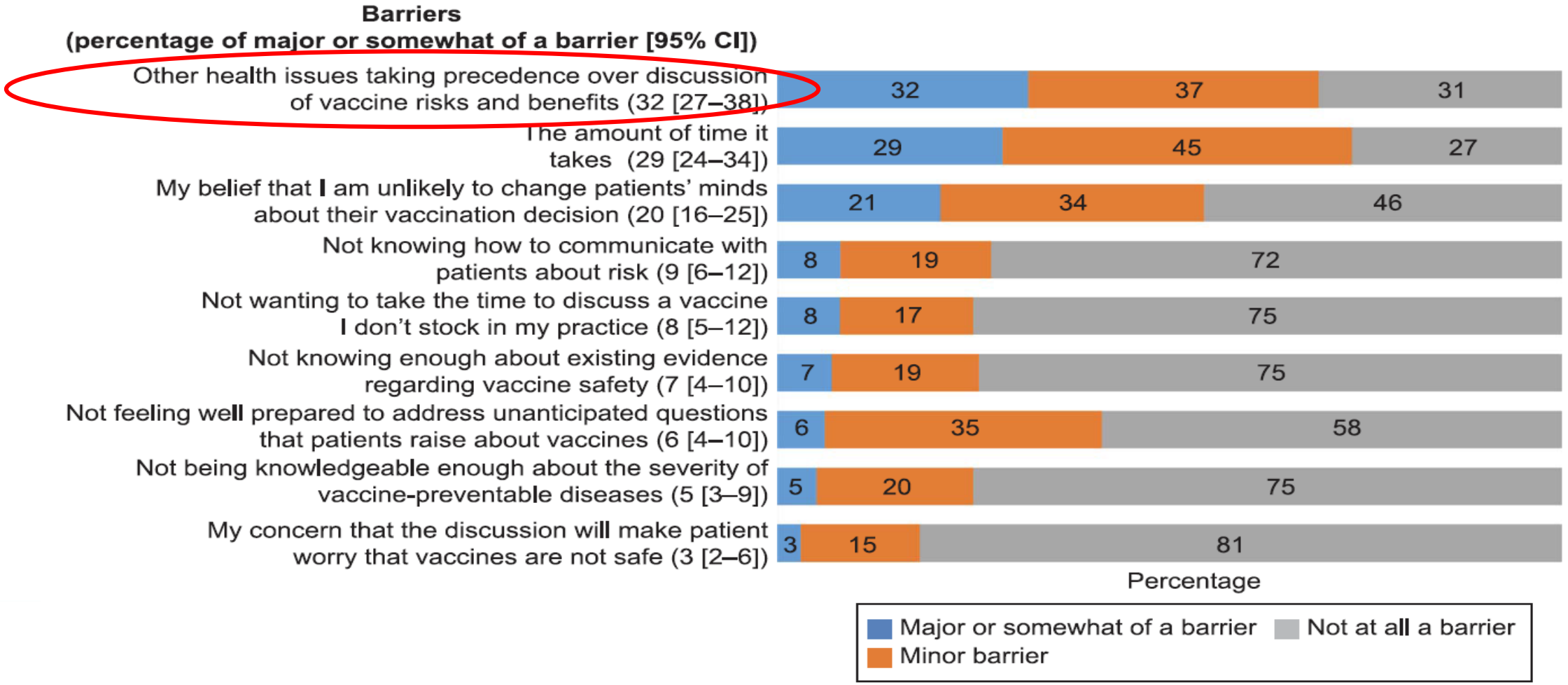
Ob/Gyn Survey on Vaccination Practices (n= 331)



O'Leary, ST et al. Obstet Gynecol 2019: 133: 40-7

Barriers Identified to Vaccinating Pregnant Patients

Ob/Gyn Survey on Vaccination Practices (n= 331)



O'Leary, ST et al. Obstet Gynecol 2019: 133: 40-7

The American College of Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

ACOG COMMITTEE OPINION

Number 741, June 2018

Immunization, Infectious Disease, and Public Health Preparedness Expert Work Group

Table 1. Summary of Maternal Immunization Recommendations

Vaccine*	Indicated During Every Pregnancy	May Be Given During Pregnancy in Certain Populations	Contraindicated During Pregnancy	Can Be Initiated Postpartum or When Breastfeeding or Both
Inactivated influenza	X†,1,2			X‡
Tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap)	X†,3,4			X‡
Pneumococcal vaccines		X§,5,6		X§,5,6
Meningococcal conjugate (MenACWY) and Meningococcal serogroup B		X‖,7		X‖,7
Hepatitis A		X¶,8		X¶,8
Hepatitis B		X#,9,10		X#,9,10
Human papillomavirus (HPV)**				X**,11,12
Measles–mumps–rubella			X††,13,14	X††
Varicella			X††,13,15,16	X††

*An "X" indicates that the vaccine can be given in this window. See the corresponding numbered footnote for details.

†Inactivated influenza vaccination can be given in any trimester and should be given with each influenza season as soon as the vaccine is available. The Tdap vaccine is given at 27–36 weeks of gestation in each pregnancy, preferably as early in the 27–36-week window as possible. The Tdap vaccine should be given during each pregnancy in order to boost the maternal immune response and maximize the passive antibody transfer to the newborn. Women who did not receive Tdap during pregnancy (and have never received the Tdap vaccine) should be immunized once in the immediate postpartum period.[1–3]

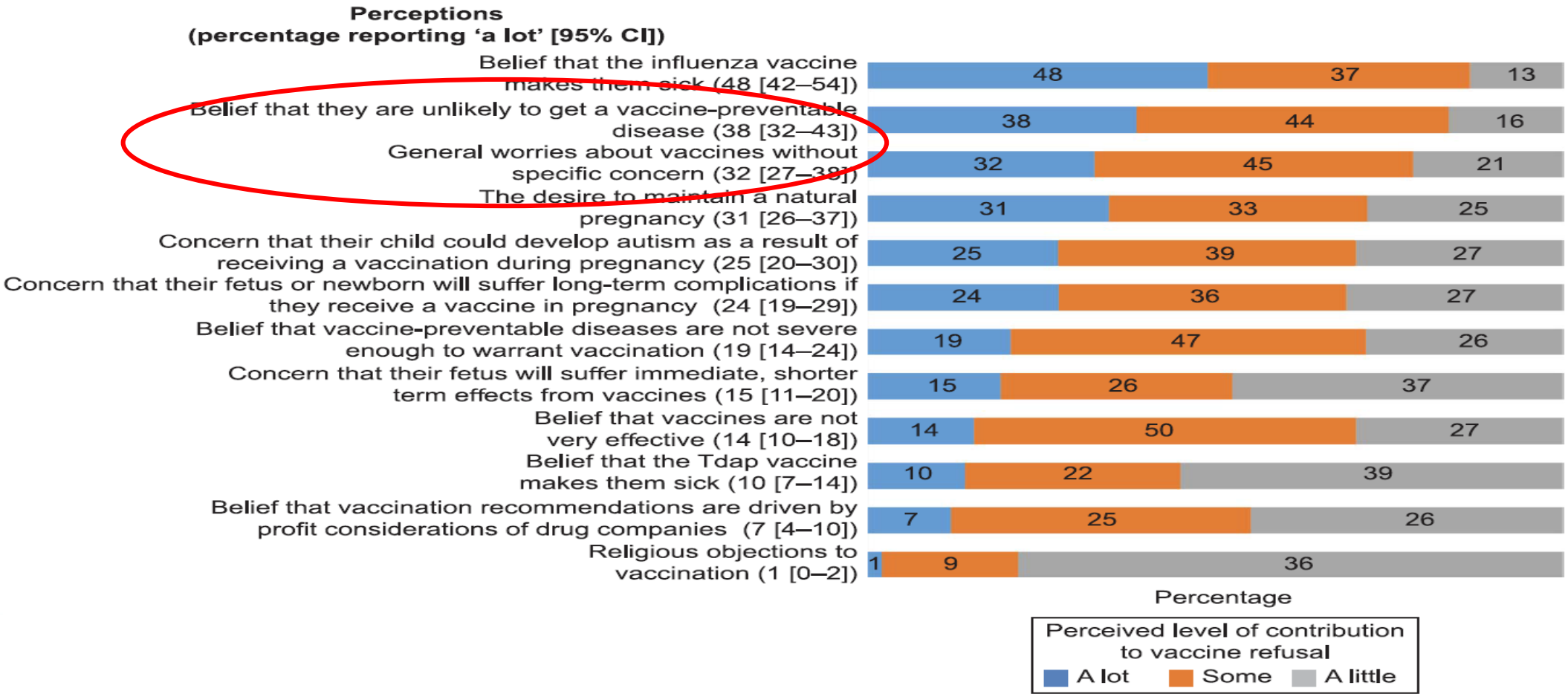
‡Vaccination during every pregnancy is preferred over vaccination during the postpartum period to ensure antibody transfer to the newborn.[3,4]

§There are two pneumococcal vaccines: 1) the 23-valent pneumococcal polysaccharide vaccine (PPSV23) is recommended in reproductive-age women who have heart disease, lung disease, sickle cell disease, and diabetes as well as other chronic illnesses; 2) the 13-valent pneumococcal vaccine (PCV13) is recommended for reproductive-aged women with certain immunocompromised conditions, including human immunodeficiency virus (HIV) infection and asplenia. The PCV13 vaccine should be deferred in pregnant women, unless the woman is at increased risk of pneumococcal disease and after consultation with her health care provider the benefits of vaccination are considered to outweigh the potential risks.[5,6]

‖Quadrivalent conjugate meningococcal vaccine is routinely recommended for adolescents aged 11–18 years, along with individuals with HIV infection, complement component deficiency (including eculizumab use), functional or anatomic asplenia (including sickle cell disease), exposure during a meningococcal disease outbreak, travel to endemic or hyperendemic areas, or work as a microbiologist routinely exposed to *Neisseria meningitidis*. If indicated, pregnancy should not preclude vaccination. The serogroup B vaccine should be deferred in pregnant women, unless the woman is at increased risk of serogroup B meningococcal disease[7] and, after consultation with her health care provider, the benefits of vaccination are considered to outweigh the potential risks.[7]

Ob/Gyn Perceptions on Why Women Refuse Vaccines

Ob/Gyn Survey on Vaccination Practices (n= 331)



O'Leary, ST et al. Obstet Gynecol 2019: 133: 40-7

Next Steps to Promote Maternal Immunization

- **Continue to emphasize risk for disease to the fetus or newborn to increase vaccine uptake**
- **Continue to educate about risk of maternal disease complications such as preterm birth, ICU admission for influenza-related morbidity**
- **Introduce education about both maternal and childhood immunization earlier in pregnancy**
- **Partner with others to decrease vaccine hesitancy and refusal**

ICU: intensive care unit

How Grady Memorial Hospital Works to Promote and Increase Maternal Immunization

Denise Jamieson, MD, MPH

James Robert McCord Professor and Chair

Department of Gynecology and Obstetrics

Emory University School of Medicine

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Grady Health System

- **One of the largest public health systems in the U.S.**
- **Safety net institution for medically underserved patients in Atlanta**
- **Approximately 3,000 deliveries per year**
  - 88% Medicaid-eligible
  - 68% non-Hispanic black
  - 23% non-native English speakers
  - 44% inadequate prenatal care utilization
    - Defined by an index that includes when prenatal care began, and the number of prenatal visits from when prenatal care began until delivery (Kotelchuk index)

Maternal Vaccination Promotion at Grady

- Universal provider recommendation
- Routine assessment of immunization status
- Standing orders
- All sites stock influenza and Tdap vaccines
- Vaccines provided at no additional charge

ACOG Strategies for Effectively Integrating Immunizations into Routine Obstetric-Gynecologic Care

1. **Administer routinely discussed and recommended vaccines.**

2. **Create a culture of immunization by educating and involving all staff in immunization processes.**

3. **Develop a standard process for assessing, recommending, administering, and documenting immunization status of patients.**

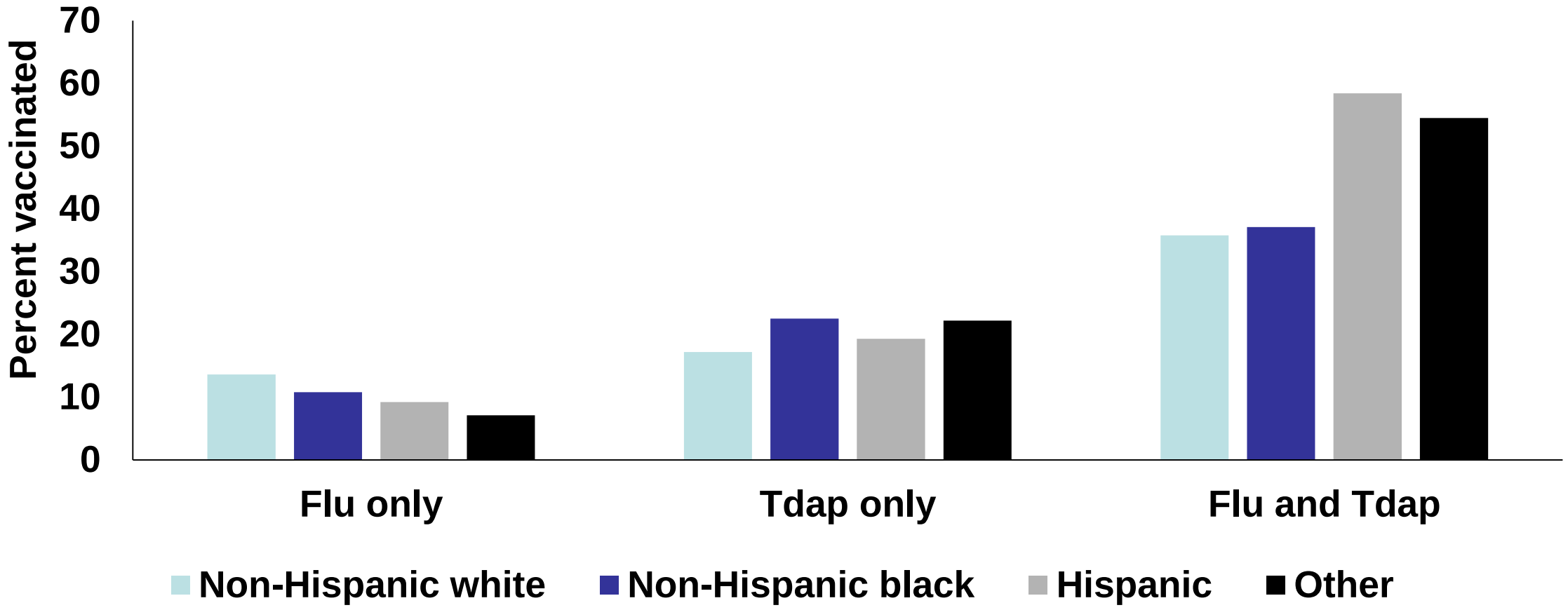
4. **Use existing systems and resources to conduct periodic assessments of immunization rates among patients to determine if and where progress is needed.**

immunizationforwomen.org/integratingimmunizations.php

Assessing Maternal Immunization Rates at Grady

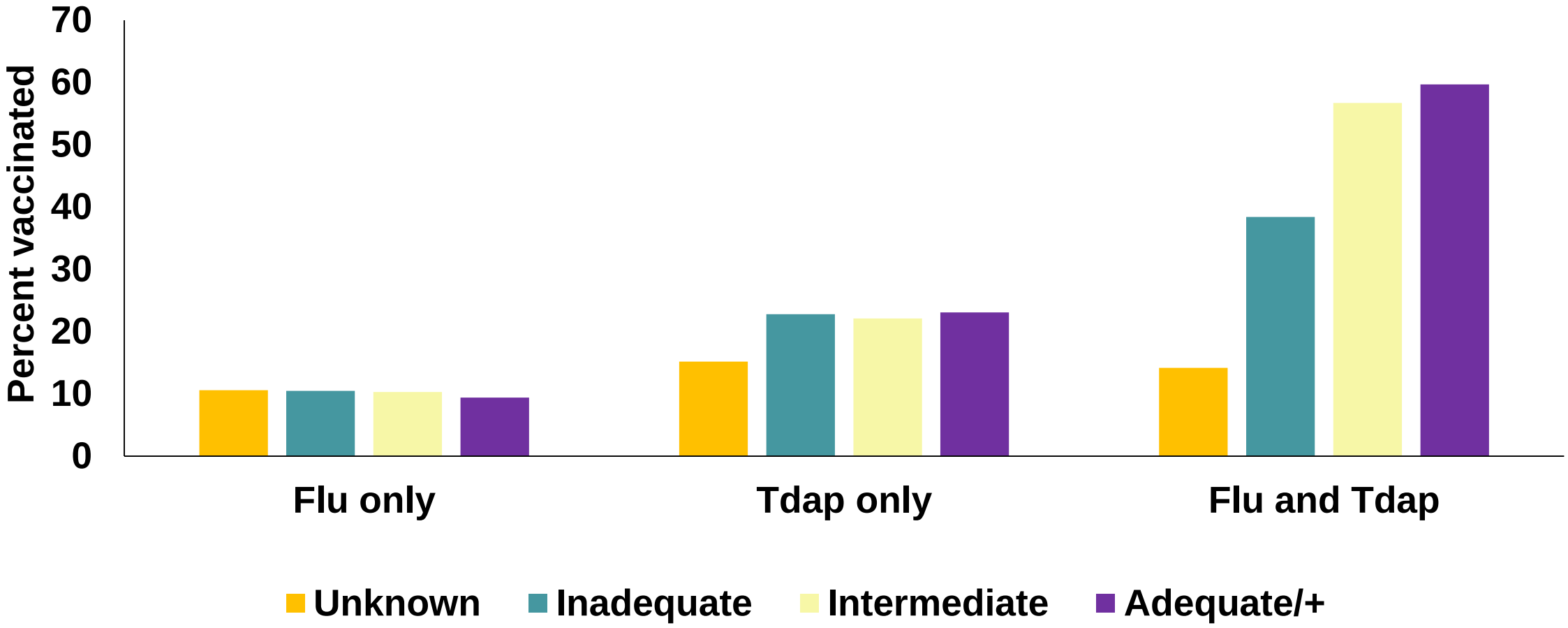
- **Infectious Diseases in Pregnancy (IDPREG) study: Maternal Infections and Outcomes at Grady Memorial Hospital**
- **Retrospective cohort study of around 3,700 deliveries between July 1, 2016 and June 30, 2018**
- **Documented demographic and clinical characteristics of patients, including influenza and Tdap vaccination**

IDPREG: Influenza and Tdap Vaccination Coverage by Race and Ethnicity, Grady Hospital, July 2016-June 2018



Unpublished data

IDPREG: Influenza and Tdap Vaccination Coverage by Prenatal Care Utilization, Grady Hospital, July 2016-June 2018



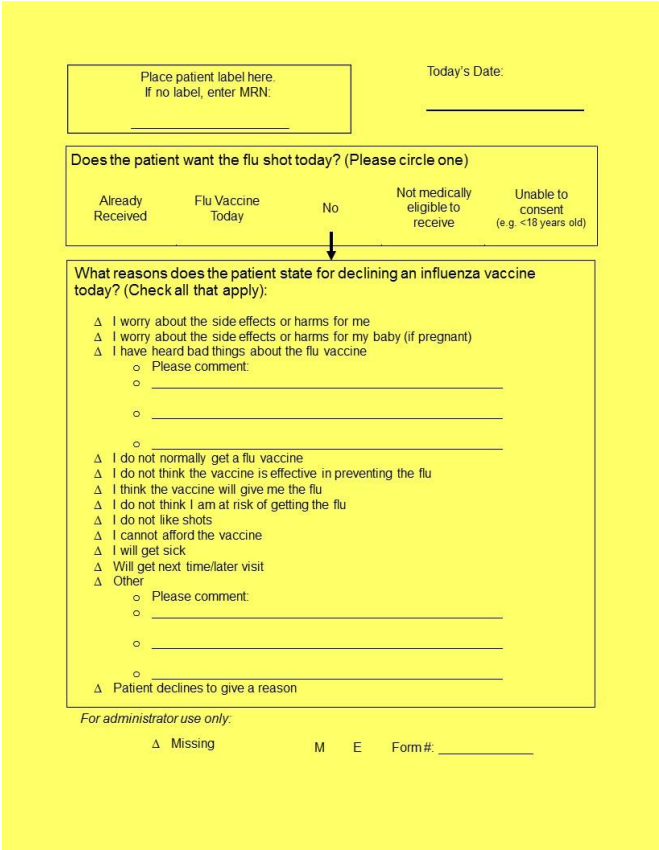
Unpublished data

IDPREG Conclusions

- **Rate of receiving both Tdap and influenza vaccination is higher than national average (43% vs 33%).**
- **Hispanic women have highest rates of receiving both influenza and Tdap vaccination.**
- **Vaccination coverage declines with decreasing rates of prenatal care utilization.**
  - >40% of women at Grady had inadequate prenatal care use.

“Yellow Sheet” Project

- **Goals**
  - Prospectively track influenza vaccine acceptance in Grady OB/GYN clinic.
  - Identify reasons for refusal.
  - Develop interventions to improve vaccine coverage.
- **All patients seen in clinic from 9/18/2018 through 4/8/2019**



Place patient label here.
If no label, enter MRN:
_____

Today's Date:
_____

Does the patient want the flu shot today? (Please circle one)

Already Received | Flu Vaccine Today | No | Not medically eligible to receive | Unable to consent (e.g. <18 years old)

What reasons does the patient state for declining an influenza vaccine today? (Check all that apply):

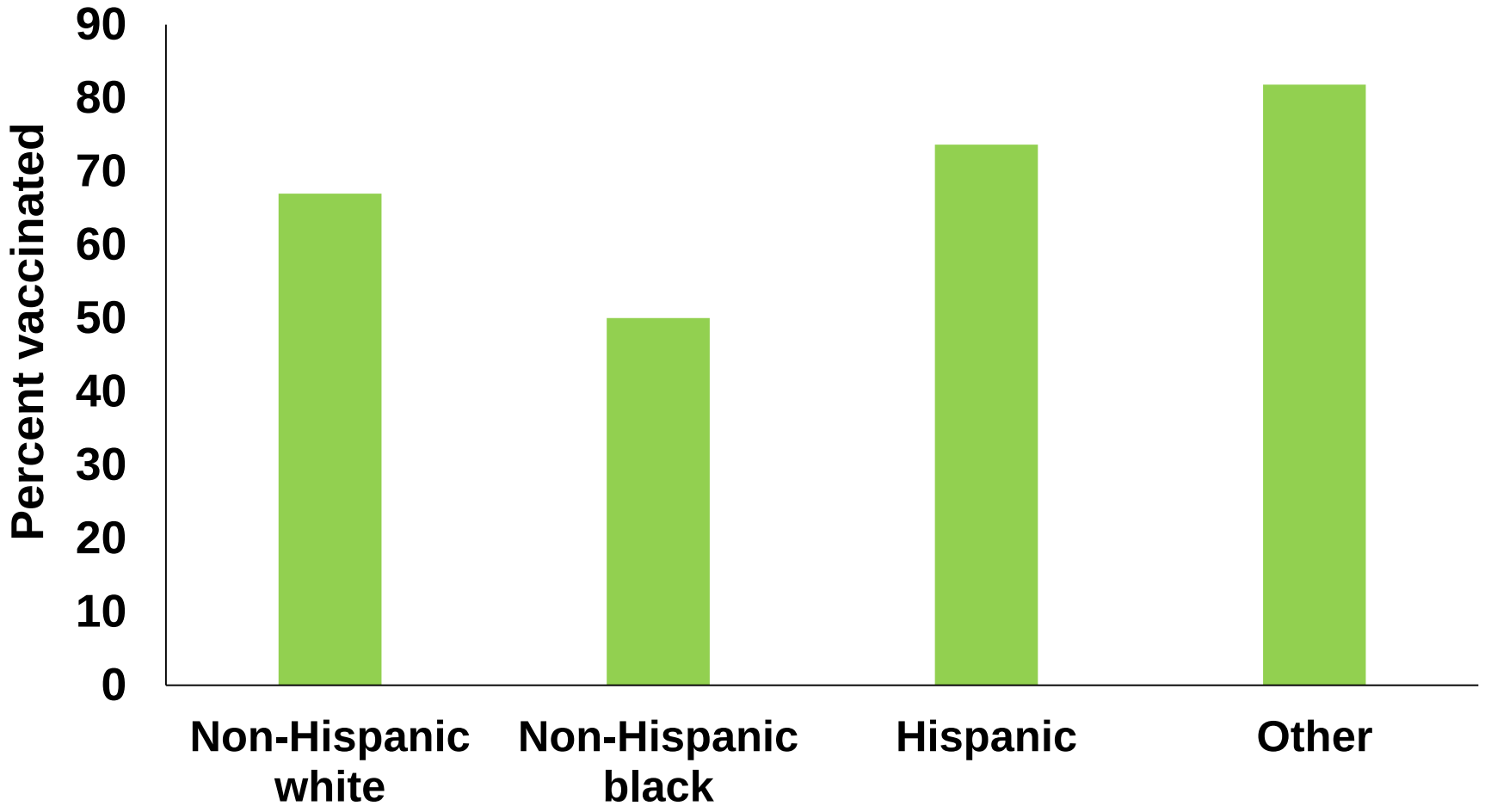
- Δ I worry about the side effects or harms for me
- Δ I worry about the side effects or harms for my baby (if pregnant)
- Δ I have heard bad things about the flu vaccine
  - o Please comment:
  - o _____
  - o _____
  - o _____
- Δ I do not normally get a flu vaccine
- Δ I do not think the vaccine is effective in preventing the flu
- Δ I think the vaccine will give me the flu
- Δ I do not think I am at risk of getting the flu
- Δ I do not like shots
- Δ I cannot afford the vaccine
- Δ I will get sick
- Δ Will get next time/later visit
- Δ Other
  - o Please comment:
  - o _____
  - o _____
  - o _____
- Δ Patient declines to give a reason

For administrator use only:

Δ Missing M E Form #: _____

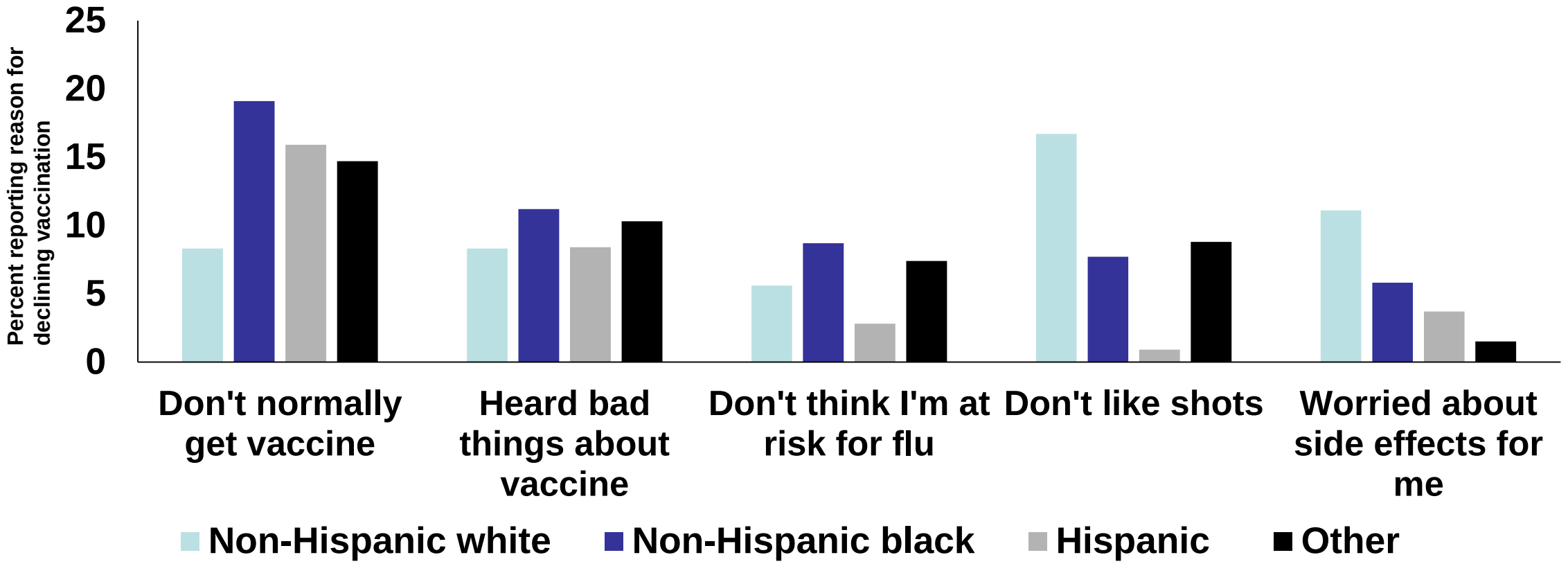
OB/GYN: obstetrics and gynecology

Preliminary Results – Influenza Vaccination of Pregnant Women at Grady Hospital, 9/2018 through 4/2019



Unpublished data

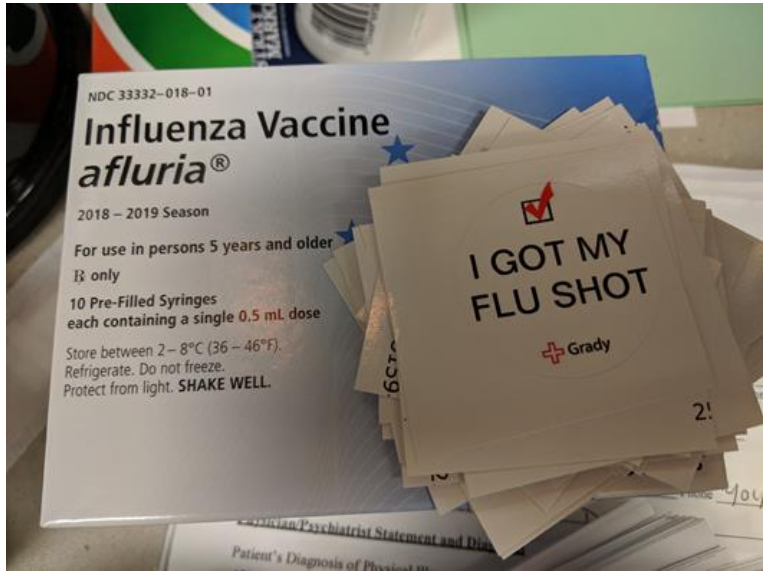
Top Five Reasons for Influenza Vaccine Refusal Among Pregnant Women



Unpublished data

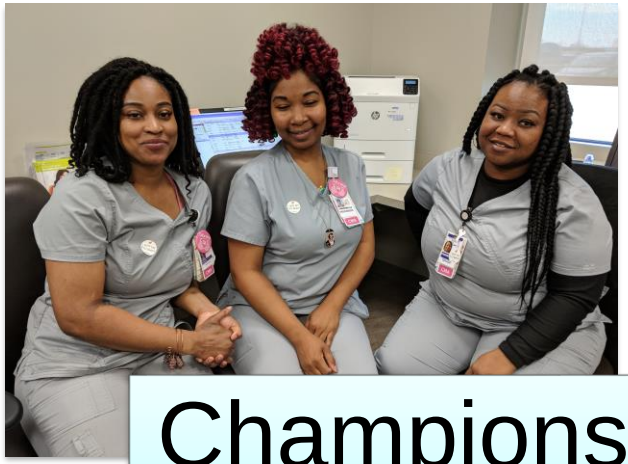
Preliminary Results – Influenza Vaccination

Overall vaccination rate for pregnant women at Grady Hospital for the 2018-2019 flu season was 55% (**a 5% increase from the previous two seasons**)



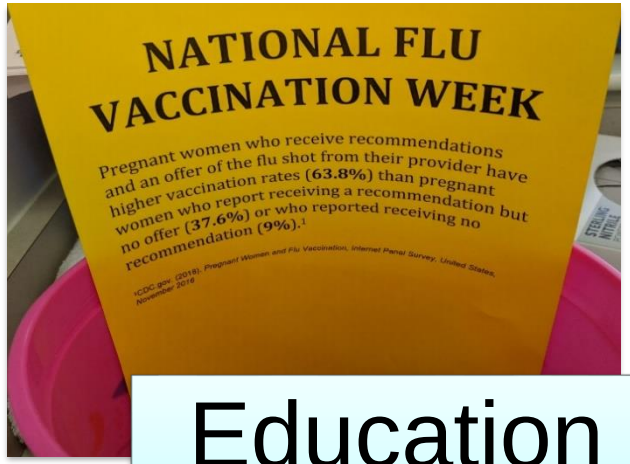
Vaccine trade name shown for identification purposes only

Keys to Success in Increasing Maternal Immunization

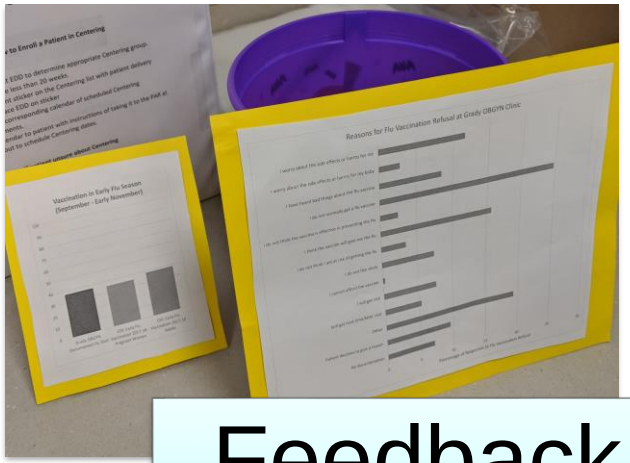


Champions

Incentives



Education

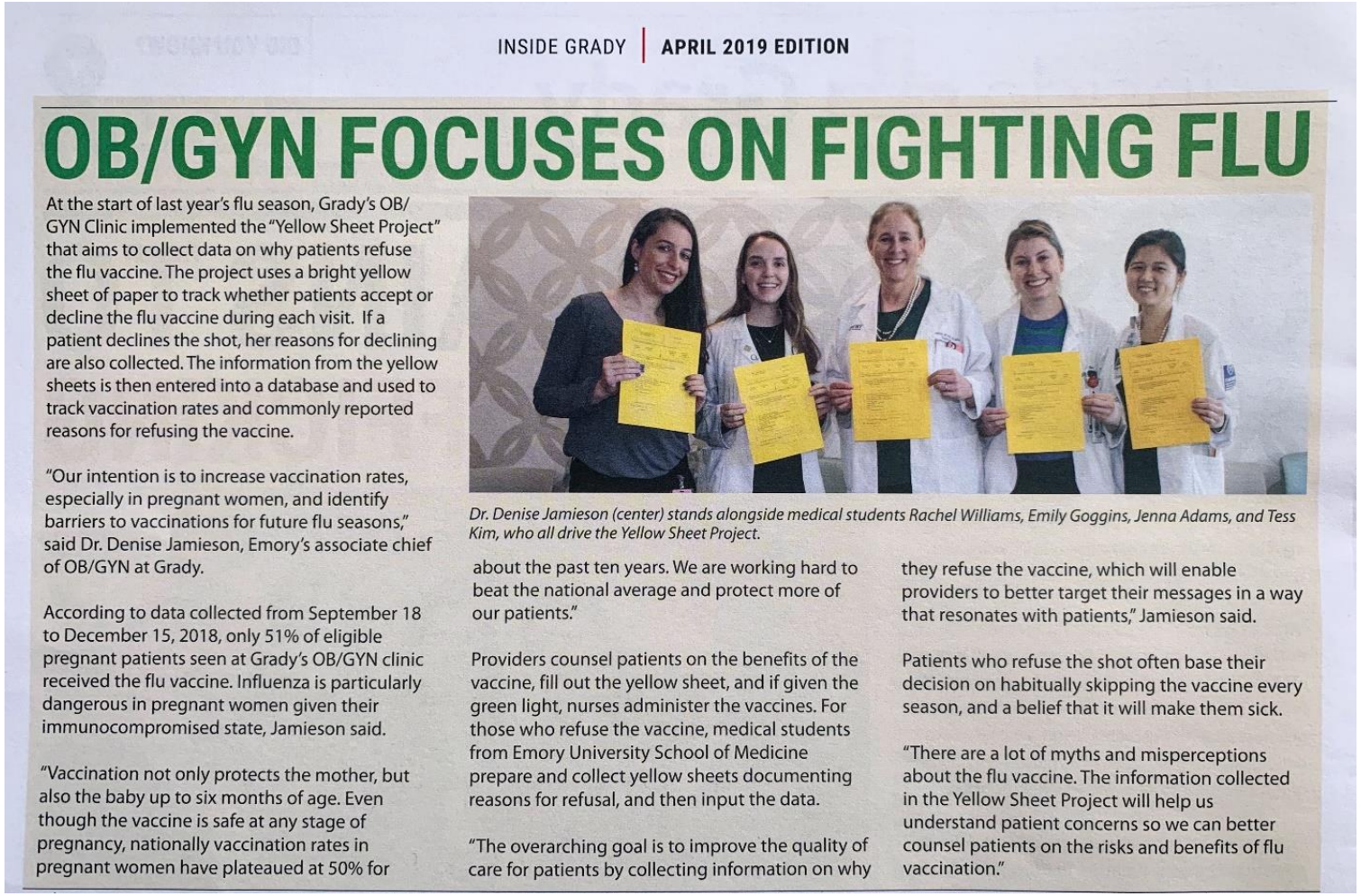


Feedback

Celebration

Our Grady Team

Sheree Boulet
Jenna Adams
Hope Biswas
Miah Davis
Kamini Doraivelu
Emily Goggins
Lisa Haddad
Tess Kim
Mumu Rahman
Michelle Saums
Rachel Williams
Roland Matthews
Franklyn Geary



INSIDE GRADY | APRIL 2019 EDITION

OB/GYN FOCUSES ON FIGHTING FLU

At the start of last year's flu season, Grady's OB/GYN Clinic implemented the "Yellow Sheet Project" that aims to collect data on why patients refuse the flu vaccine. The project uses a bright yellow sheet of paper to track whether patients accept or decline the flu vaccine during each visit. If a patient declines the shot, her reasons for declining are also collected. The information from the yellow sheets is then entered into a database and used to track vaccination rates and commonly reported reasons for refusing the vaccine.

"Our intention is to increase vaccination rates, especially in pregnant women, and identify barriers to vaccinations for future flu seasons," said Dr. Denise Jamieson, Emory's associate chief of OB/GYN at Grady.

According to data collected from September 18 to December 15, 2018, only 51% of eligible pregnant patients seen at Grady's OB/GYN clinic received the flu vaccine. Influenza is particularly dangerous in pregnant women given their immunocompromised state, Jamieson said.

"Vaccination not only protects the mother, but also the baby up to six months of age. Even though the vaccine is safe at any stage of pregnancy, nationally vaccination rates in pregnant women have plateaued at 50% for about the past ten years. We are working hard to beat the national average and protect more of our patients."

Dr. Denise Jamieson (center) stands alongside medical students Rachel Williams, Emily Goggins, Jenna Adams, and Tess Kim, who all drive the Yellow Sheet Project.

Providers counsel patients on the benefits of the vaccine, fill out the yellow sheet, and if given the green light, nurses administer the vaccines. For those who refuse the vaccine, medical students from Emory University School of Medicine prepare and collect yellow sheets documenting reasons for refusal, and then input the data.

"The overarching goal is to improve the quality of care for patients by collecting information on why they refuse the vaccine, which will enable providers to better target their messages in a way that resonates with patients," Jamieson said.

Patients who refuse the shot often base their decision on habitually skipping the vaccine every season, and a belief that it will make them sick.

"There are a lot of myths and misperceptions about the flu vaccine. The information collected in the Yellow Sheet Project will help us understand patient concerns so we can better counsel patients on the risks and benefits of flu vaccination."

Accelerating Progress with New Maternal Vaccines

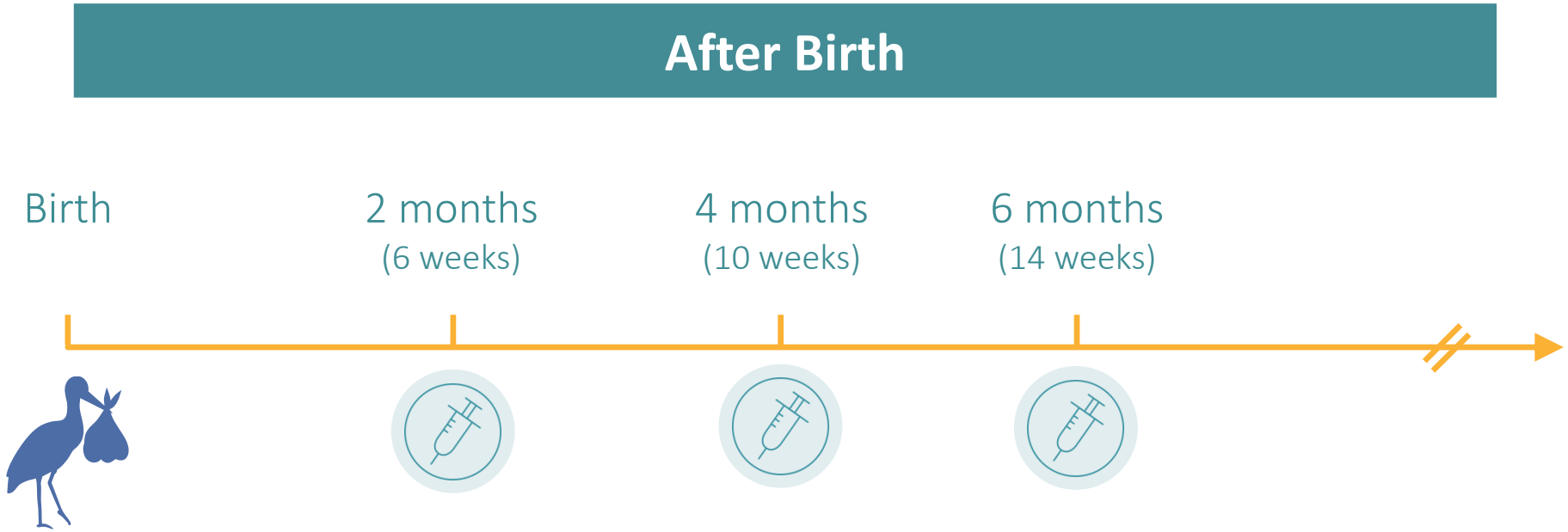
Saad B. Omer, MBBS, MPH, PhD

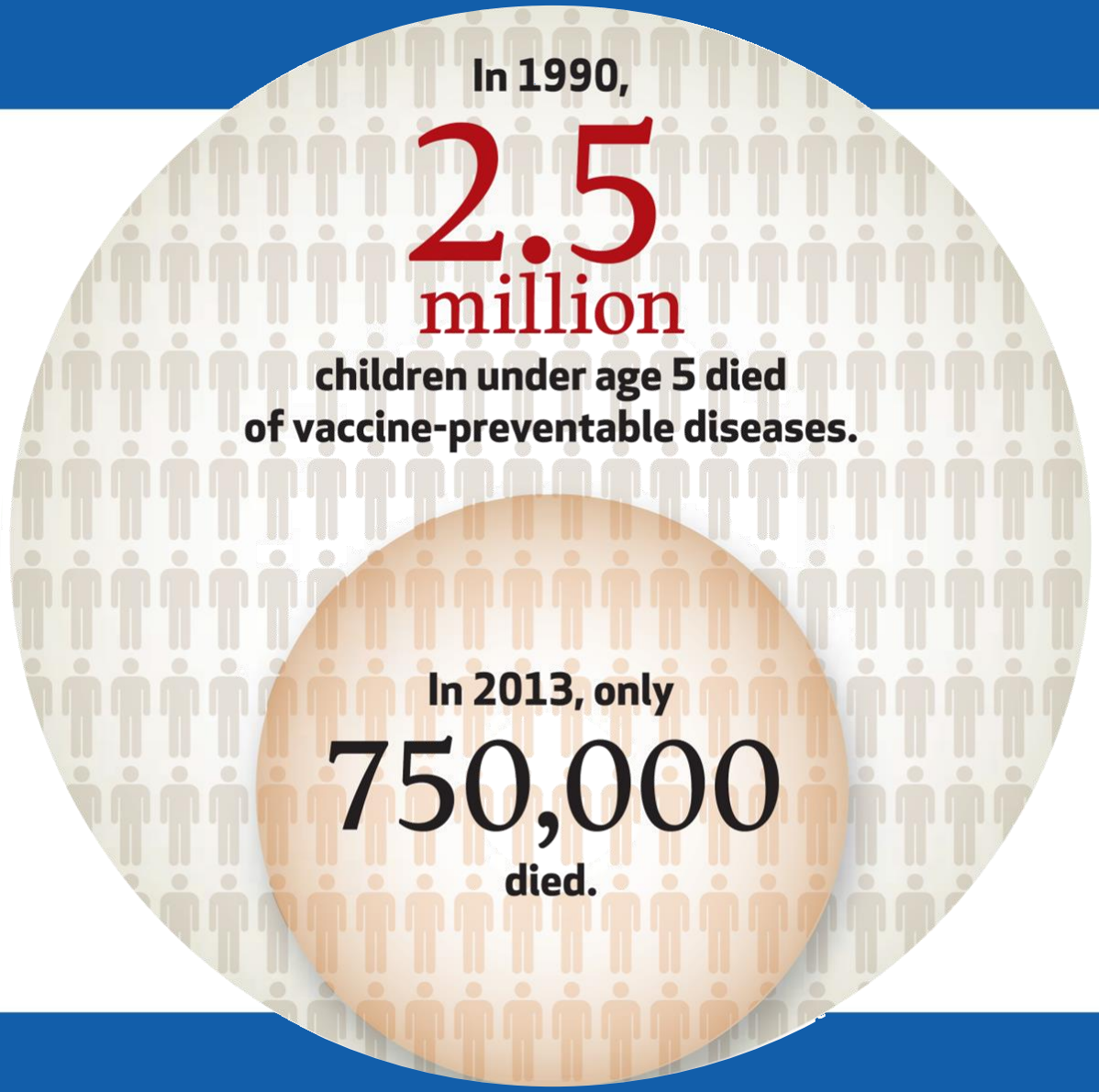
Director, Yale Institute for Global Health

Professor of Medicine, Yale School of Medicine

Susan Dwight Bliss Professor of Epidemiology of Microbial Diseases, Yale School of Public Health

General Infant Immunization Schedule

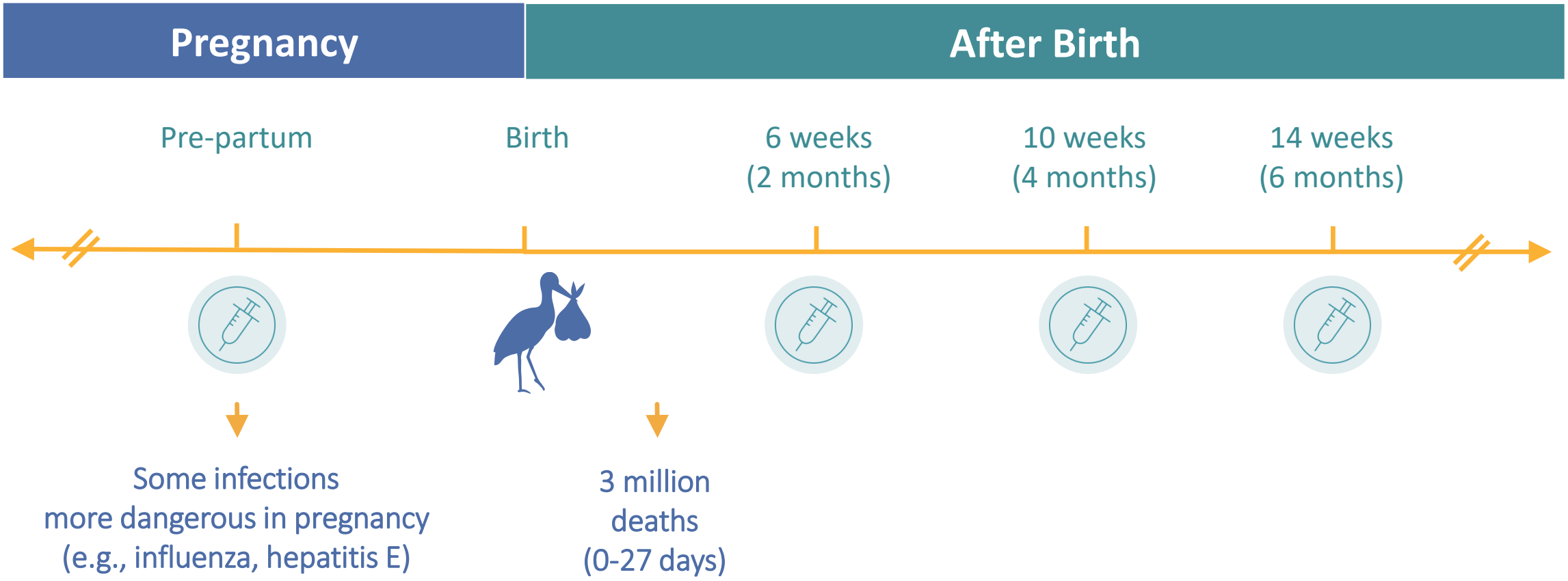




GBD Collaborators, Lancet; 2015

Haakenstad A, Birger M, Singh L et al. Health Aff (Millwood). 2016 Feb;35(2):242-9.

Role of Maternal Immunization in Protecting Neonates



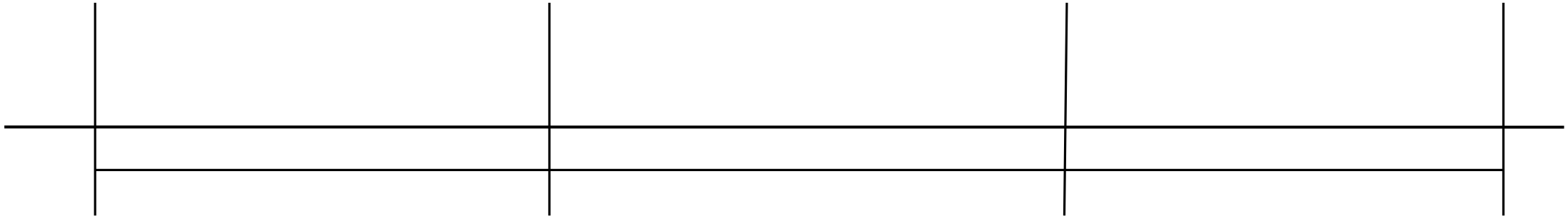
Liu L, Johnson HL, Cousens S et al. Lancet. 2012 Jun 9;379(9832):2151-61. Epub 2012 May 11. Erratum in: Lancet. 2012 Oct 13;380(9850):1308.

Group B Streptococcus
Respiratory syncytial virus
Cytomegalovirus (CMV)

Hepatitis E
Pneumococcus
Rotavirus*

Meningococcus
Hepatitis A
Hepatitis B

Tetanus
Influenza**
Pertussis**



Vaccine in development that could be used by pregnant women

Vaccine licensed; not routinely recommended for pregnant women

Vaccine licensed; can be given to pregnant women but not routinely recommended

Vaccine licensed; routinely recommended for pregnant women

* Live vaccine contraindicated for use in pregnancy; inactivated vaccine has been developed but is not currently recommended for use
** Recommended for routine vaccination of pregnant women in some high-income countries including United States

Group B Streptococcus (GBS) Vaccine

Invasive Group B Streptococcus Disease in Infants

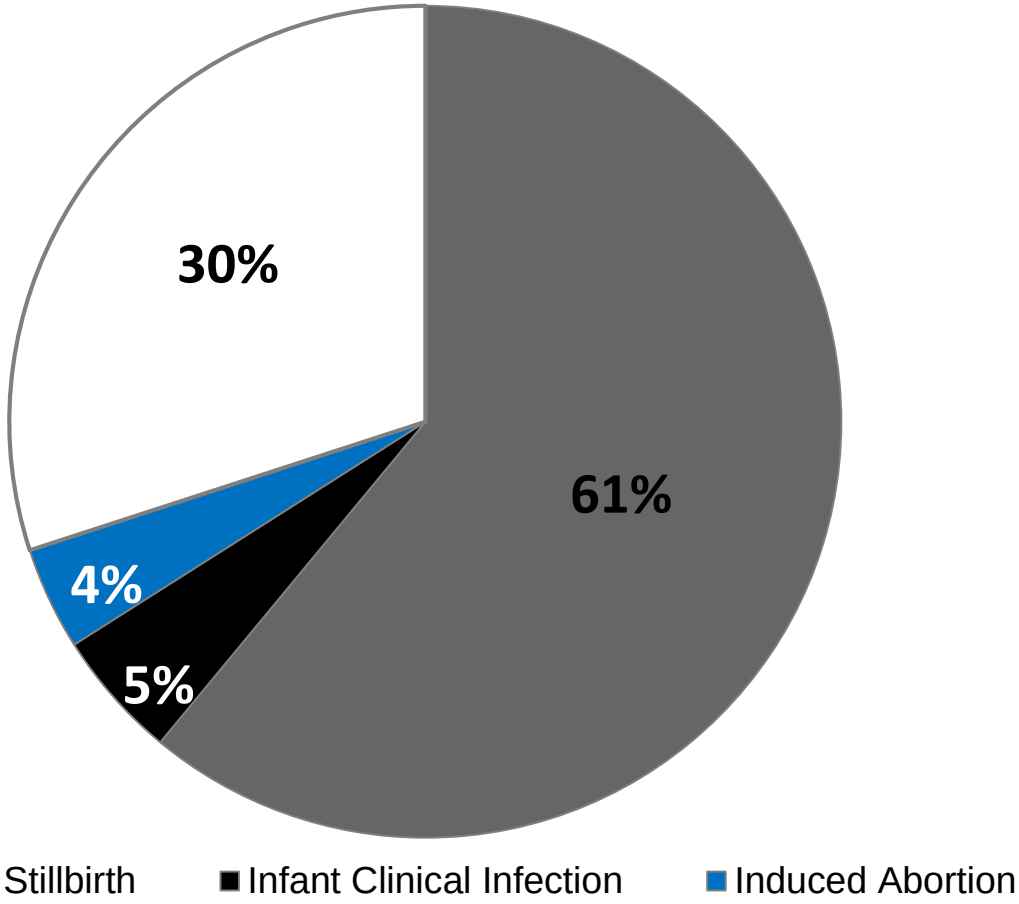
- **Early-onset Group B Streptococcus (EOGBS) occurs before age 7 days**
  - sepsis (80%-95%)
  - pneumonia (10%-15%)
  - meningitis (5%-10%)

- **Late-onset GBS (LOGBS) occurs in infants aged 7 to 89 days old**
  - Meningitis more frequent (21%−35%)
    - 30% of infants have permanent complications (e.g., hearing loss, developmental delay)

Healy and Baker in Vaccines, 6th Ed.

Pregnancy Outcomes Among Women with Invasive GBS

- **Active, population-based surveillance in 10 U.S. states**
- **Identified 409 invasive GBS infections in pregnant women**

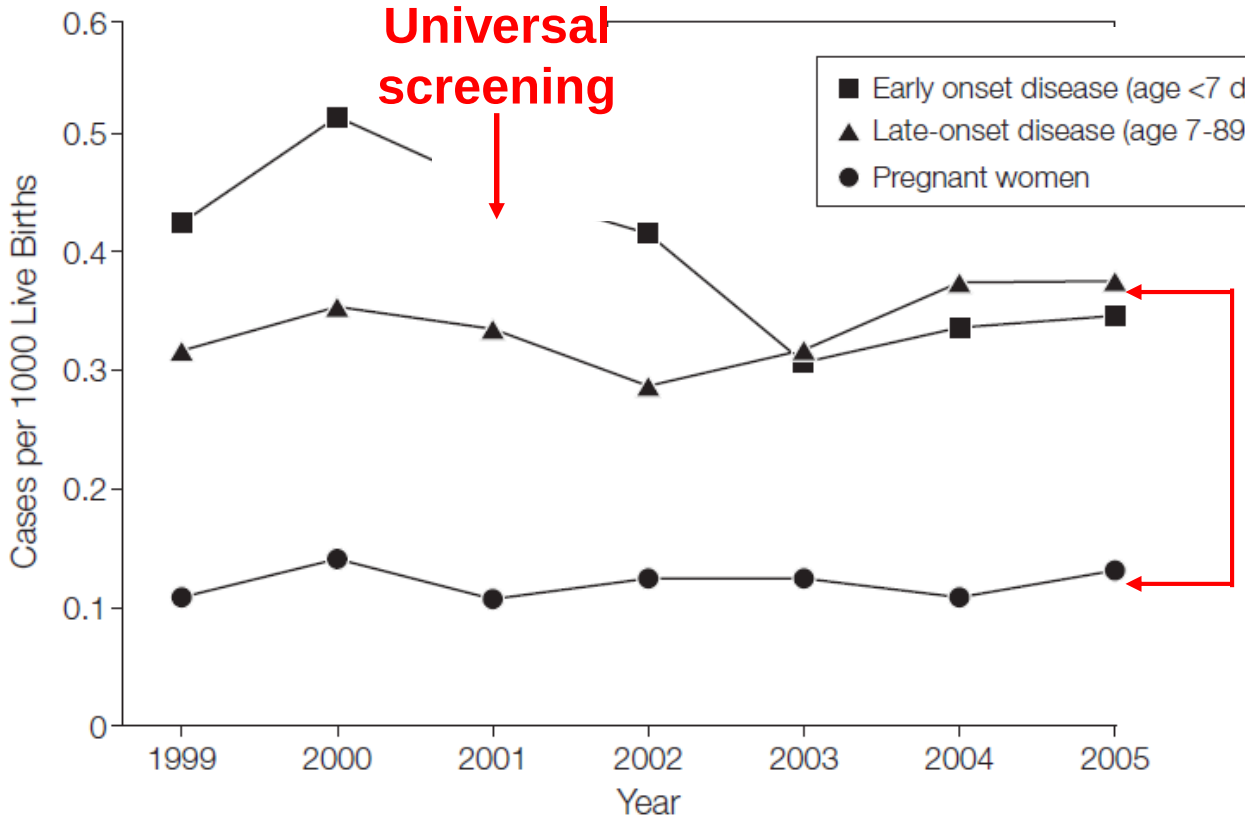


Phares CR, Lynfield R, Farley MM et al. JAMA. 2008 May 7;299(17):2056-65.

GBS: Group B Streptococcus
SAB: spontaneous abortion

Epidemiology of GBS Infection in Pregnant Women in Select U.S. Areas

Figure 2. Incidence of Invasive Group B Streptococcal Disease Among Infants (<90 Days) and Pregnant Women in Select US Areas, 1999-2005



No decrease in late-onset disease in infants, or disease in pregnancy

Phares CR, Lynfield R, Farley MM et al. JAMA. 2008 May 7;299(17):2056-65.

GBS Vaccine Progress

- **Trivalent Type Ia, Ib and III vaccine to prevent GBS infection (Novartis®)**
- **Purified capsular polysaccharide conjugated to CRM197**

(nontoxic version of diphtheria toxin, used to make polysaccharides more immunogenic)

- **Phase I and II trials**
  - Phase I: small groups of people receive the trial vaccine
  - Phase II: vaccine is given to people who have characteristics similar to those for whom the new vaccine is intended

www.cdc.gov/vaccines/basics/test-approve.html
Trade name shown for identification purposes only

Respiratory Syncytial Virus (RSV) Vaccine

Infants Under 6 Months and Premature Infants at High Risk for Hospitalization Due to RSV

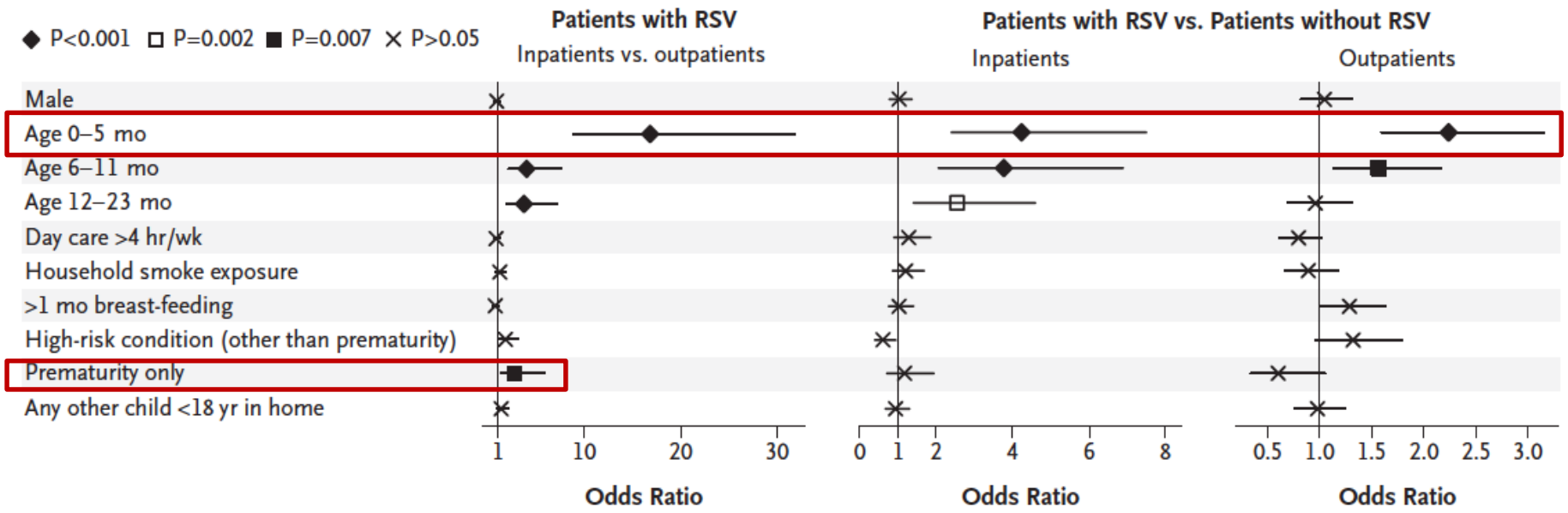
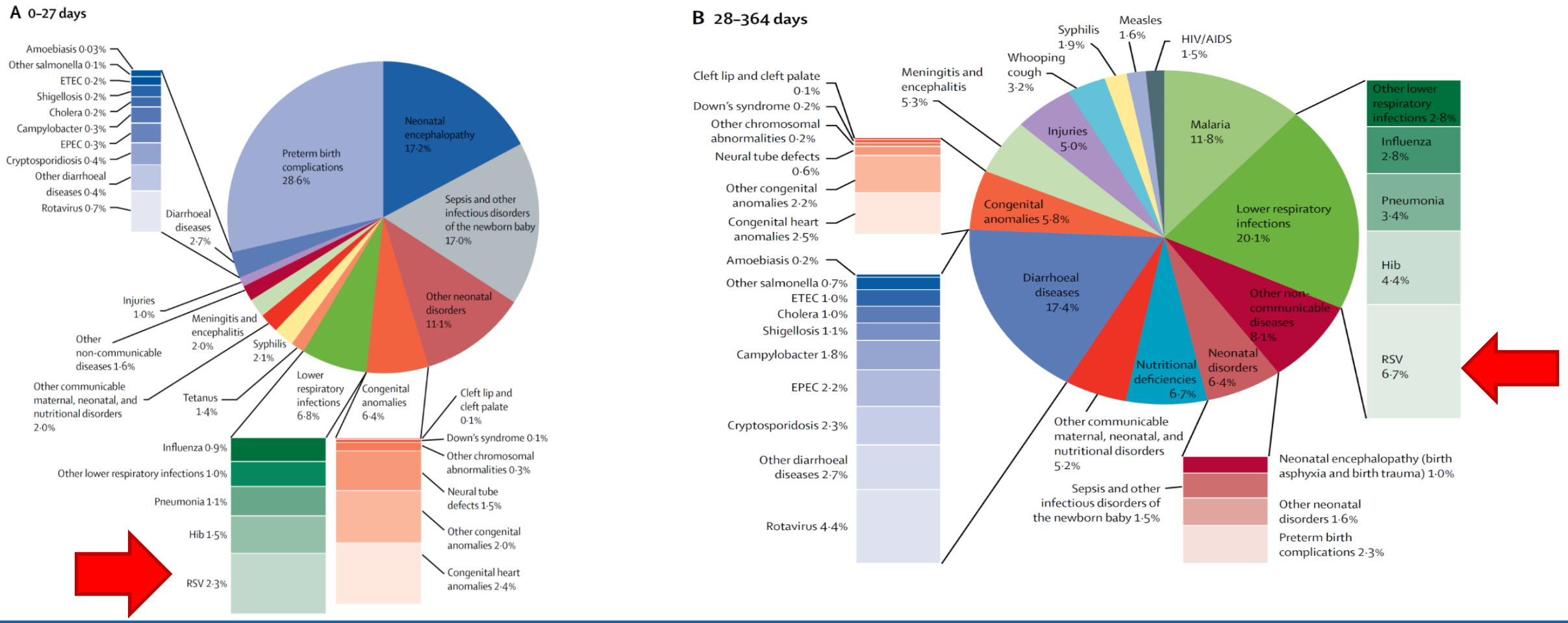


Figure 2. Odds Ratios for Potential Risk Factors in Patients with and Those without Respiratory Syncytial Virus (RSV) Infection, According to Treatment Site.

According to multiple logistic-regression analyses, the only risk factors associated with RSV illness requiring hospitalization were an age of less than 2 years (especially under 6 months) and a history of prematurity. For age groups, the reference group is patients between the ages of 24 months and 59 months. Horizontal lines indicate 95% confidence intervals.

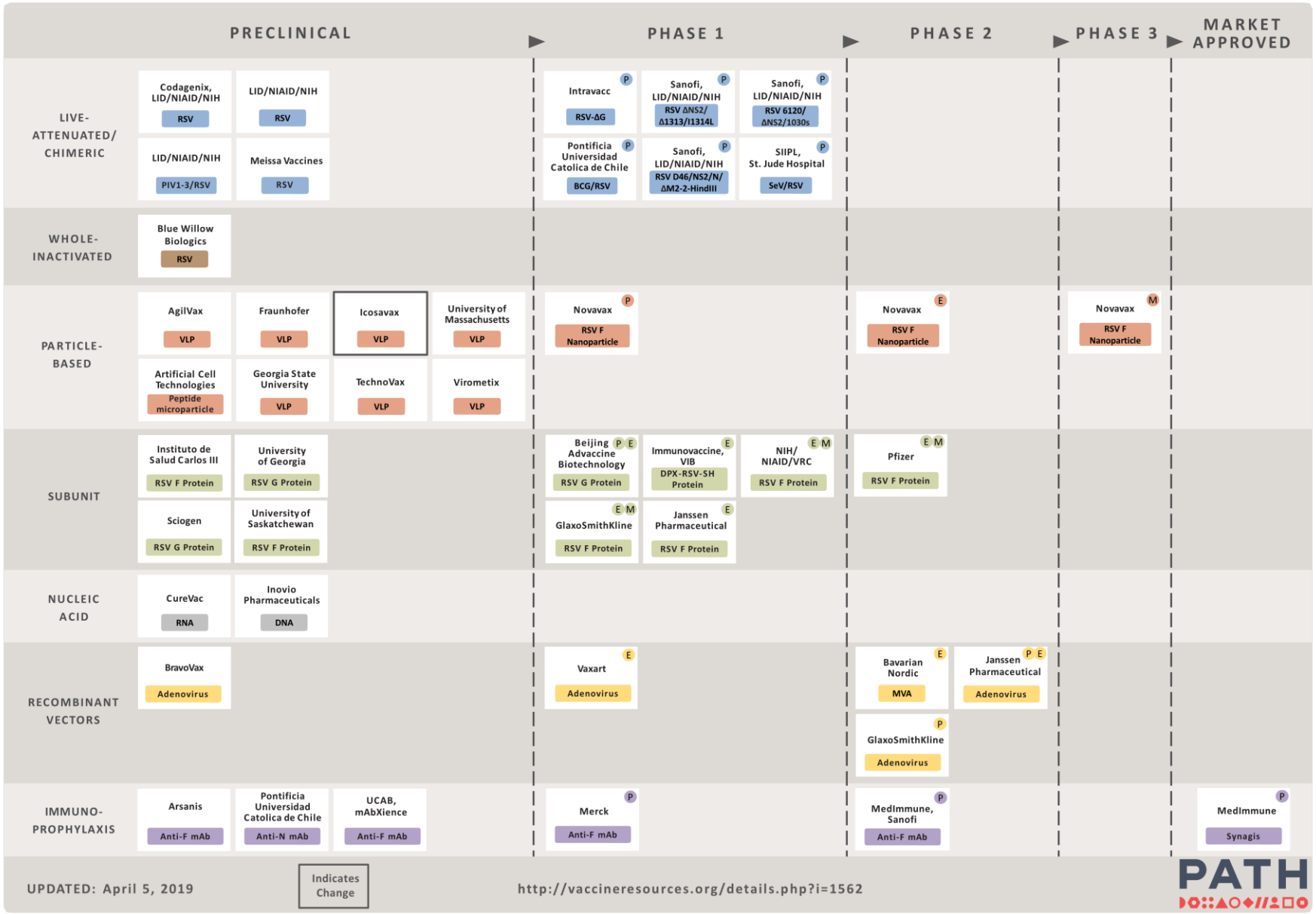
Hall CB, Weinberg GA, Iwane MK et al. N Engl J Med. 2009 Feb 5;360(6):588-98

Large Numbers of Global Neonatal and Infant Deaths Due to RSV, 2010

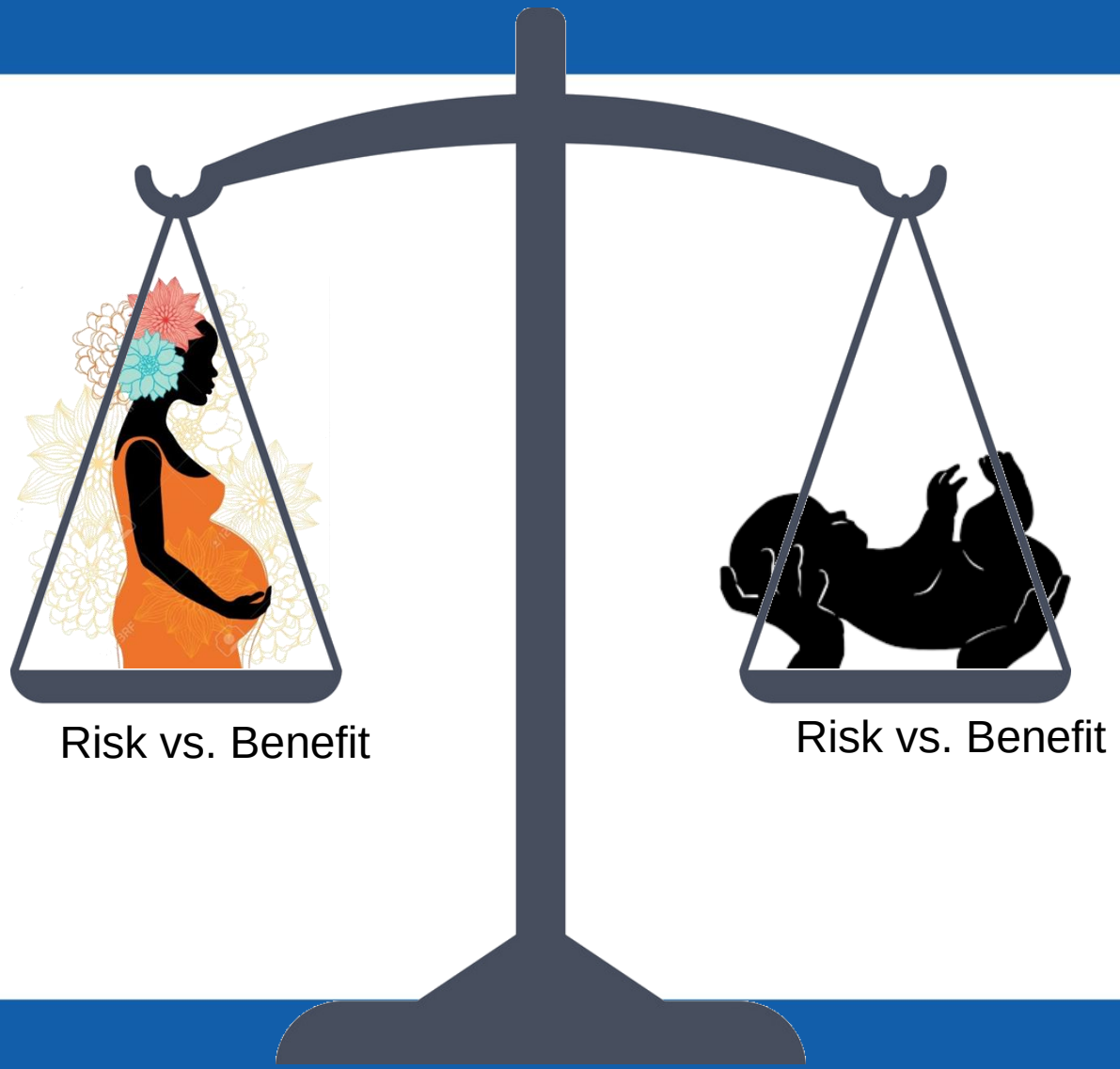


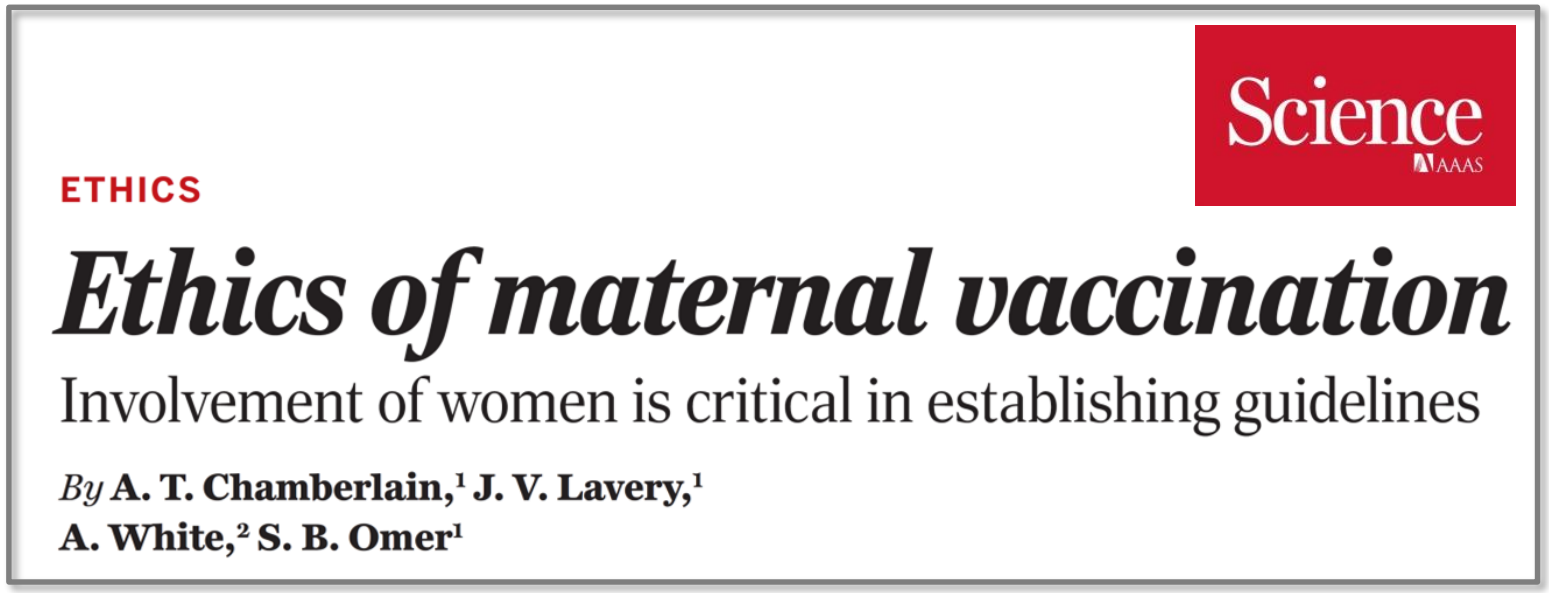
Lozano R, Naghavi M, Foreman K et al. Lancet. 2012 Dec 15;380(9859):2095-128.

RSV Vaccine and mAb Snapshot



Ethics of Maternal Vaccination


Risk vs. Benefit
Risk vs. Benefit



"…legitimacy of a mother's interests in the welfare of her fetus/infant …"

Chamberlain AT, Lavery JV, White A, Omer SB. Science. 2017 Oct 27;358(6362):452-453.

Characteristics of an Interests-based Approach

Mother's self-determination front and center

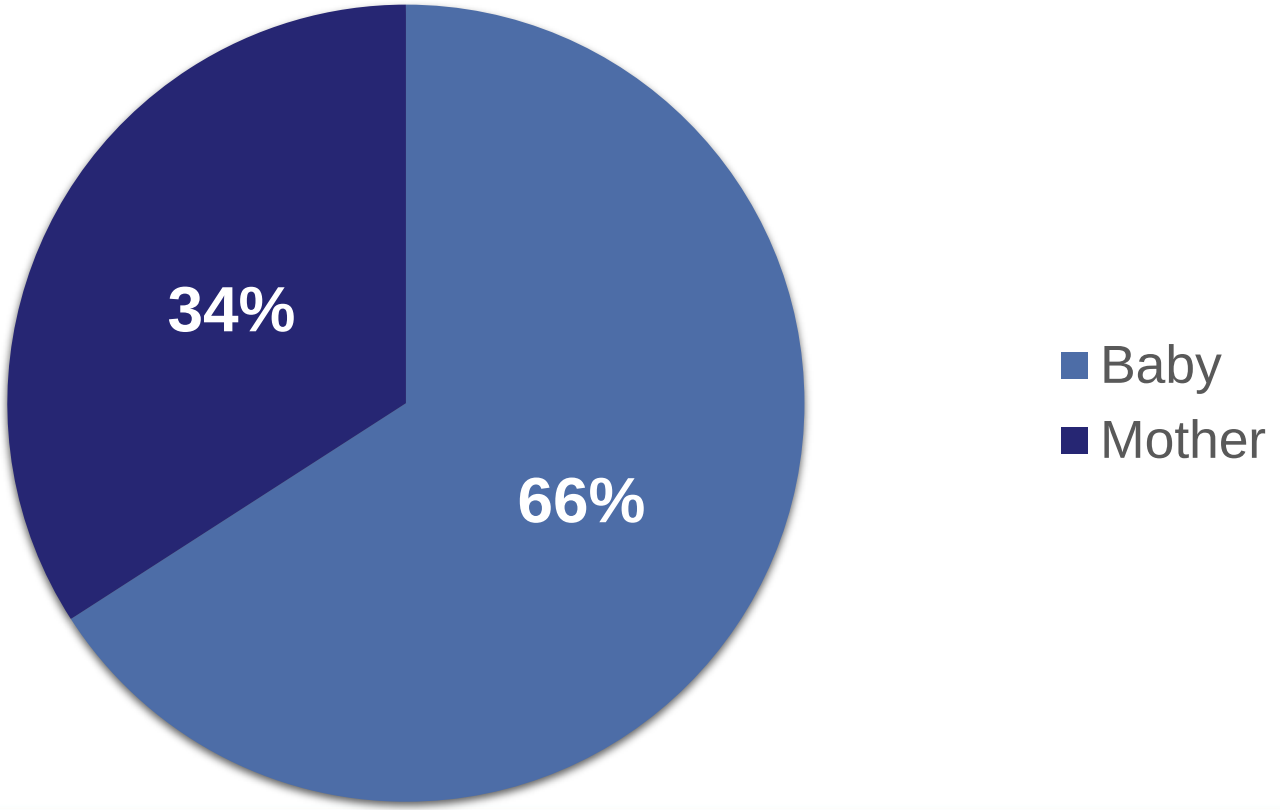
Inclusion of women in decision-making

Limits options for mandatory maternal immunization

Chamberlain AT, Lavery JV, White A, Omer SB.Science. 2017 Oct 27;358(6362):452-453.

Priorities when Vaccinating Among 601 Pregnant Kenyan Women

When deciding to get a vaccine, whose benefit do you prioritize first (the mother or the baby)?



MVAC study (unpublished data)

Overall Summary and Conclusions

- **Maternal vaccinations are important for protecting pregnant women and their babies.**
- **With the support of professional organizations and local immunization champions, vaccination coverage of pregnant women has improved over the course of the past decade, but there is a long way to go.**
- **As new vaccines for pregnant women are being developed, continuous improvement in vaccination coverage can prevent more disease.**