Syphilis in Pregnancy and Congenital Syphilis

Rosalyn E. Plotzker, MD, MPH | Sexually Transmitted Diseases Fellow
California Department of Public Health, California Prevention Training Center
Disclosure:

- Rosalyn Plotzker, MD, MPH has no relevant financial relationships with an entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on patients.
Learning Objectives

• Discuss Pathophysiology of Syphilis in Pregnancy and CS

• Prevention of Congenital Syphilis

• Management of Infants Born to Mothers with Syphilis
One Slide on Epidemiology
Congenital Syphilis Cases vs Females of Childbearing Age (15-44) Early Syphilis* Cases by Pregnancy Status California, 2009–2018

![Graph showing the number of cases of congenital syphilis and early syphilis among females of childbearing age (15-44) in California, 2009–2018, by pregnancy status. The graph indicates an increase in cases over the years, with a notable rise in the number of cases from 2016 onwards.](image-url)
Pathophysiology
Syphilis staging: My most complicated slide.

For pts with a reactive non-treponemal test (RPR/VDRL) \( \geq \) fourfold the previous titer PLUS a positive confirmatory treponemal test (FTA-ABS, TPPA, EIA)

- Exposure 30-50%
- Primary 30%
- Secondary 25%
- Latent 30%
- Tertiary 2-20 years

**Incubation Period** 3-4 weeks

**Chancre (ulcer)**
- Single, painless, indurated, clean-based lesion with rolled edges.
- Can go unrecognized, especially anal and vaginal.
- Possible regional adenopathy (rubbery, bilateral, painless)

**Secondary signs**
- Rash (75-90%), involving palms/soles (60%)
- Generalized lymphadenopathy (70-90%)
- Constitutional symptoms (50-80%)
- Mucous patches (5-30%)
- Condyloma lata (5-25%)
- Patchy alopecia (10-15%)
- Symptoms of neurosyphilis (1-2%)

**Early latent**
- Latent w/evidence of infection within the past 12 months
- Otherwise: Considered Late-Latent or Unknown Duration

Neurosyphilis can occur at any stage

Transmission from mother to fetus can occur at any stage

To be discussed in more detail soon...
More than two-thirds of pregnant women with syphilis were diagnosed with late syphilis or unknown duration.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Early syphilis</th>
<th>Late syphilis or Unknown duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>33%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Source: 2016-2017 California surveillance data
Serology and stage

Non-treponemal titers (RPR/VDRL)

- Can be non-reactive for ~25% of patients with primary syphilis
- Typically peak in secondary stage
- Decline in latent disease, even if the disease is untreated.
- Are non-specific and measure disease burden

Mother To Child Transmission

- **Transplacental transmission**
  - rarely via contact of infectious lesions at birth
- Associated with...
  - Earlier maternal **stage** of disease
  - High maternal disease **titers** (VDRL, RPR)
How does the bacteria *T. pallidum* affect the fetus?

It’s complicated….

- *T. Pallidum* can vegetate in fetal tissues until appropriate biological conditions promote virulence and pathogenicity
  - Includes late gestation infections, and post-partum CS cases
  - Contributing to factor to why some neonates are asymptomatic at birth
  - One reason treatment is important even late in pregnancy and in the post-partum period.

- Hypothesis of protective apoptosis of infected cells at the maternal-fetal interface

- Virulence of *T. pallidum* may be modulated by maternal immune response, and/or the conceptus’ genetic background

---


Prenatal Diagnosis? Not Routinely Done

• The isolation of *T. pallidum* from up to 74% of amniotic fluid specimens from women with early syphilis

• Suggests organism can traverse fetal membranes, and result in fetal infection.

Hollier et al. Obstet Gynecol. 2001;97:947*
Sonography? Only if diagnosed after 20 weeks’ gestation

* Should not delay treatment in pregnancy

**Sonographic signs:**

- hepatomegaly (70-80%)
- thickened placenta (25%)
- ascites (10%)
- Non-immune hydrops
- fetal anemia (25-30%)

Cases accompanied by these signs should be managed in consultation with obstetric specialists. No specific regimens.
Manifestations of congenital syphilis

- **Early** manifestations
  - <2 years of age
  - Due to hematogenous spread (via blood) of *T. Pallidum* and resultant inflammatory response in various organs and tissues
  - Immune-mediated

- **Late** manifestations
  - >2 years of age
  - Scarring or stigmata from early disease
  - Reaction to persistent inflammation
  - Noninfectious
Early Manifestations (Birth – 8 weeks, but up to 2 years)

- **Hepatomegaly** (enlarged liver)
- **Splenomegaly** (enlarged spleen)
- **Snuffles** (copious nasal secretions – infectious!)
- **Mucocutaneous lesions** (infectious!)
- **Pneumonia Alba**
- **Osteochondritis**
- **Pseudoparalysis**
- **Edema**
- **Rash**
- **Hemolytic anemia or thrombocytopenia.**

![Snuffles](image1)
![Cutaneous lesion](image2)
![Mucous patches](image3)
![Pneumonia Alba](image4)
![Umbilical lesion](image5)

Courtesy CDC Public Health Image Library
Late Manifestations (2 years +)

- **Ophthalmic and Neurologic**
  - **Interstitial keratitis** (5–20 years; corneal scarring due to chronic inflammation of the stroma)
  - **Eighth cranial nerve deafness** (10–40 years)

- **Dental**
  - **Hutchinson teeth** (peg-shaped, notched central incisors)
  - **Mulberry molars**

- **Skeletal**
  - **Anterior bowing of the shins**
  - **Frontal bossing**
  - **Clutton joints** (symmetric, painless swelling of the knees)

- **Facial**
  - **Saddle nose**
  - **Rhagades** (perioral fissures)

---

**Citation:** L. Pessoa and V. Galvao, “Unusual presentation of more common disease/injury: clinical aspects of congenital syphilis with Hutchinson’s triad,” BMJ Case Reports, vol. 2011, pp. 1–3, 2011.
CS Mortality, 1999-2013

• 6383 cases of CS – defined by surveillance
  • (decrease from 14,627 cases in 1992-1998; 56% decline)

• Neonatal mortality: 11.6/1000 live births

• 418 deaths, 342 (82%) stillbirths

• Case fatality rate: 6.5% (stable)

• 89% of deaths: untreated (73%) or inadequately treated during pregnancy
  Less prenatal care: ↑ risk of death

• 59% of deaths occurred by 31 weeks of gestation

Mortality of Congenital Syphilis: Case Fatality Rate

- Of 191 Confirmed CS Cases,….
  - Mortality was found to be 35% (67/191)
    - Stillbirths: 79% of deaths (53/67)
      - The majority of stillbirths were <28 weeks’ gestation (74%, 39/53)
Meta-analysis:

Prenatal Treatment Dramatically Reduces the Risk CS Stillbirth

Adjusted Risk Ratio = 0.18
(95% CI 0.10-0.33)

Mathematical model: Early Rx = Fewer CS Infant Deaths

% CS deaths preventable by treating pregnant women with syphilis at a given gestational age.

(Around 70% of CS stillbirths were likely avoidable if treatment was given by 21 weeks’ gestation)

Prenatal Screening & Maternal Treatment
Serology: Nontreponemal Tests – RPR/VDRL

- **Antigen:** detects an antibody against cardiolipin (e.g. NOT specific to T. Pallidum), present in blood of patients with syphilis

- **Quantitative:** Useful to assess burden of disease, adequacy of treatment, and detect maternal reinfection (fourfold difference, e.g. 1:8 vs. 1:32)

- **RPR more sensitive** than VDRL; preferred for screening of pregnant women

*Fun fact: VDRL and RPR use beef heart extract*
Serology: Treponemal Tests – TP-PA, FTA-ABS, EIA/CIA

- Detect antibody (IgG) to *T. pallidum*, Confirm reactive non-treponemal test result
  - TP-PA: hemagglutination test (lysate of *T. pallidum*)
  - FTA-ABS: (uses lyophilized – AKA freeze dried – *T. pallidum*)
  - EIA/CIA: Enzyme / chemi luminescence immunoassays
Screening for syphilis: Traditional vs. Reverse Screening

**TRADITIONAL**

- **Quantitative RPR**
  - **RPR+**
    - TP-PA or other trep. test
      - **TP-PA+** Syphilis (past or present)
      - **TP-PA-** Syphilis unlikely
  - **RPR-**

**Reverse Screening Algorithm**

- **EIA or CIA**
  - **EIA/CIA+**
    - Quantitative RPR
      - **RPR+** Syphilis (past or present)
        - TP-PA
      - **RPR-**
        - TP-PA
  - **EIA/CIA-**

Evaluate clinically, determine if treated for syphilis in the past, assess risk of infection, and administer therapy according to guidelines if not previously treated.

If incubating or primary syphilis is suspected, treat with benzathine penicillin G 2.4 million units IM x 1 and/or repeat in 2-4 weeks.

If at risk for syphilis, repeat RPR in 2 to 4 weeks.
How to interpret non-treponemal (VDRL/RPR) titers?

- Higher numbers correspond to higher level of antibodies in patient’s serum
- **Two-fold change** Generally considered within margin of test error
- **Four-fold change** Sustained for at least 2 weeks considered to be significant
- Compare titer using **same** serologic test: RPR often higher than VDRL

<table>
<thead>
<tr>
<th>Titer</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1024</td>
<td></td>
</tr>
<tr>
<td>1:512</td>
<td></td>
</tr>
<tr>
<td>1:256</td>
<td></td>
</tr>
<tr>
<td>1:128</td>
<td></td>
</tr>
<tr>
<td>1:64</td>
<td>2-fold</td>
</tr>
<tr>
<td>1:32</td>
<td></td>
</tr>
<tr>
<td>1:16</td>
<td>4-fold</td>
</tr>
<tr>
<td>1:8</td>
<td></td>
</tr>
<tr>
<td>1:4</td>
<td></td>
</tr>
<tr>
<td>1:2</td>
<td></td>
</tr>
<tr>
<td>1:1</td>
<td></td>
</tr>
</tbody>
</table>
Diagnostic Challenges

**False negatives**
- Early primary and late latent stages
  - Serology may be negative in up to 25% of primary syphilis cases
- Prozone reaction (RPR/VDRL)

**Biologic False Positives**
- RPR or VDRL test positive with confirmatory Treponemal test negative
- Viral illnesses including HIV, recent immunizations, autoimmune and chronic diseases

**Discordant serology**
- EIA or CIA + and RPR –

Syphilis Screening During Pregnancy: CDC recommendations

- Screen all pregnant women at the **first prenatal visit**, ideally during the first trimester
  - When access to prenatal care is not optimal, screen with RPR (and treat if reactive) at the time pregnancy is confirmed

- Screen again at **third trimester (28-32 weeks’ gestation)** AND at delivery if patient is:
  - At high individual risk for infection
  - Living in communities with a high prevalence of syphilis

- Screen all **women who have a still birth** (fetal death after 20 weeks’ gestation)

“No mother or neonate should leave the hospital without maternal serologic status having been determined at least once during pregnancy, and again at delivery, if at high risk”

CDC 2015 STD Treatment Guidelines
First prenatal care visit, mothers of CS infants
California, 2016-2017 (n=499)

- No prenatal care: 39%
- 3rd trimester: 12%
- 2nd trimester: 14%
- 1st trimester: 18%
- Unknown/other: 16%

32% started to prenatal care in the first two trimesters

Source: 2016-2017 surveillance data
Who should be tested at third trimester and delivery?

- Have signs and symptoms of syphilis infection
- Were diagnosed with any STD during pregnancy
- Have a history of syphilis infection
- Receive late, limited, or no prenatal care
- Use methamphetamine, IV drugs, or other illicit drugs
- Are homeless or have unstable housing
- Have history of incarceration or partners with history of incarceration
- Have partners that may have other partners, or partners who are MSM
- Exchange sex for money, housing, drugs, etc.
- **Live in areas with high rates of syphilis, particularly among females**
- **Live in areas of high rates of congenital syphilis**
CA counties w/third trimester screening recommendation, 2018

- Shasta
- Butte
- San Joaquin
- Stanislaus
- Sacramento
- San Benito
- Fresno
- Kings
- Tulare
- Kern
- Los Angeles
- San Bernardino
- Riverside
Benefits of *routine* third trimester screening, regardless of risk?

- In California 2017, only 25% of mothers of CS cases had a positive syphilis screen in the first or second trimester, suggesting 75% might have benefited from 3rd trimester screening.

- 6% of mothers of CA CS cases had a *negative* initial first or second trimester screening, suggesting *seroconversion* during pregnancy.

- May identify syphilis in pregnant patients who:
  - Did not receive first/second trimester screening
  - Tested at first prenatal screening but treatment was not completed

- Routinized screening is *not* dependent on:
  - Provider to assess risk
  - Patient to disclose potentially stigmatized risk factors
  - Patient to be aware of risk (of partners)
Additional opportunities for screening outside of prenatal settings:

- **Emergency Departments** can consider confirming the syphilis status of all pregnant patients prior to discharge, either:
  - Via documented test results in pregnancy
  - Screening in the ED if documentation is unavailable
  - A CDPH review of 62 mothers who delivered CS infants in a high-CS morbidity county found: 16% (10/62) were seen in an emergency department (ED) during their pregnancies, 90% (9/10) of whom lacked any prenatal care.

- Screen **people who could become pregnant**
  - At the time of each HIV test
  - When entering a correctional facility at intake
Expanded Syphilis Screening Recommendations for the Prevention of Congenital Syphilis

Guidelines for California Medical Providers

2019

These guidelines were developed by the California Department of Public Health (CDPH) Sexually Transmitted Diseases (STD) Control Branch in conjunction with the California STD/HIV Controllers Association, and the California Prevention Training Center.

Pending CDPH Approval
Treatment of Syphilis in Pregnancy

- The only treatment of syphilis in pregnancy is penicillin.

- Pregnant women should be treated with the penicillin regimen appropriate for their stage of infection.

- Pregnant women with a type-1 penicillin allergy should be desensitized in collaboration with an allergist in the hospital and treated with penicillin.
  - Type-1 allergy can be confirmed with skin testing; consult an allergist.

- Women treated during second half of pregnancy are at risk for premature labor and/or fetal distress as part of Jarisch-Herxheimer reaction.
  - In these cases, some providers will consider administering treatment on L&D
  - Concern for this complication should not delay treatment.
Prenatal Syphilis Treatment

**PRIMARY**
- Chancre

**SECONDARY**
- Rash, condyloma lata, etc.

**EARLY LATENT** (< 1 year)
- Benzathine penicillin 2.4 million units IM x 1

**LATE LATENT**
- None

Some experts recommend a 2\textsuperscript{nd} dose of benzathine penicillin G be given a week after the initial dose in early syphilis.

Benzathine penicillin 2.4 million units IM every week x 3 7 days apart

A 6-8 day interval may be acceptable; consult your local STD controller.
Overall, maternal treatment is **highly effective (98.2%)** in the prevention of CS.

### Table 3. Success of Maternal Treatment to Prevent Congenital Syphilis by Stage of Infection

<table>
<thead>
<tr>
<th>Stage</th>
<th>Success/Total treated</th>
<th>Percentage (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>27/27</td>
<td>100 (87.2, 100)</td>
</tr>
<tr>
<td>Secondary</td>
<td>71/75*</td>
<td>94.7 (86.9, 98.5)</td>
</tr>
<tr>
<td>Early latent</td>
<td>100/102</td>
<td>98 (93.1, 99.8)</td>
</tr>
<tr>
<td>Late latent</td>
<td>136/136</td>
<td>100 (97.3, 100)</td>
</tr>
<tr>
<td>Total</td>
<td>334/340</td>
<td>98.2 (96.2, 99.3)</td>
</tr>
</tbody>
</table>

CI = confidence interval.
*P = .03 compared with other groups, $\chi^2$.

### Table 4. Success of Maternal Treatment in Preventing Congenital Syphilis by Gestational Age

<table>
<thead>
<tr>
<th>Gestational age</th>
<th>Success/Total treated</th>
<th>Percentage (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤20 wk</td>
<td>152/153</td>
<td>99.4 (96.4, 100)</td>
</tr>
<tr>
<td>21–25 wk</td>
<td>51/51</td>
<td>100 (93.0, 100)</td>
</tr>
<tr>
<td>26–30 wk</td>
<td>58/59</td>
<td>98.3 (90.9, 100)</td>
</tr>
<tr>
<td>31–35 wk</td>
<td>44/46</td>
<td>95.6 (85.2, 99.5)</td>
</tr>
<tr>
<td>36–40 wk</td>
<td>26/28</td>
<td>92.9 (76.5, 99.1)</td>
</tr>
<tr>
<td>41–42 wk</td>
<td>3/3</td>
<td>100 (29.2, 100)</td>
</tr>
<tr>
<td>Total</td>
<td>334/340</td>
<td>98.2 (96.2, 99.3)</td>
</tr>
</tbody>
</table>

CI = confidence interval.
*P = not significant, $\chi^2$.

Higher risk of treatment failure during early syphilis and later in pregnancy.
Treatment of syphilis in pregnancy: Follow-up (All stages)

- Repeat follow-up titers at 28-32 weeks and delivery
  - Consider monthly titers until delivery if at high risk for reinfection.
  - Baby should obtain (same) non-trep test at delivery

- Post-treatment serologic response during pregnancy varies widely.
  - Many women do not experience a fourfold decline by delivery.

- If sustained fourfold increase occurs after treatment completion, evaluate for reinfection and neurosyphilis.

---

Maternal Titer Decline After Adequate Syphilotherapy, by Stage

---

Additional Management Considerations

- Patients should receive a neurologic exam including ophthalmic and otic
  - Lumbar puncture is recommended if signs/symptoms present
- All patients with syphilis should be tested for HIV
- Presumptively treat partners
- If diagnosed during the second half of pregnancy, perform obstetric ultrasound
- Repeat HIV, Chlamydia, and Gonorrhea screen in 3rd trimester
Management of Infants Born to Mothers Who Had Syphilis During Pregnancy
Serology for Infants

- **Non-treponemal (RPR/VDRL)**
  - Need both mother and infant titers at delivery
  - Perform the **same test** on the infant that was performed on the mother (e.g. compare RPR with RPR)

- **Treponemal (FTA-ABS/TP-PA EIA)**
  - Maternal TP-PA can stay positive in Infant serum for up to 15 months.
  - **NOT NEEDED IN INFANT SCREENING**
Which specimen? Umbilical Cord or Serum?

- AAP: Serum
  - UCB: false $\oplus$ (5-10%) and false-neg (5-20%) results can occur
- CDC: Serum
  - UCB: contamination with maternal blood may yield a false $\oplus$ result
CONGENITAL SYPHILIS (CS)
Evaluation and treatment of infants (<30 days old) born to women with syphilis during pregnancy*
ALL INFANTS AND MOTHERS SHOULD HAVE SERUM RPR OR VDRL TITER DRAWN AT DELIVERY

* Scenario 4 – in which an infant at delivery has a normal physical exam and titer < 4 fold mother’s titer, AND the mother was adequately treated prior to becoming pregnant and sustains RPR titers <1:4 or VDRL<1:2 throughout pregnancy – is not included.
† Benzathine Penicillin G (BPG or Bicillin-LA), administered according to stage of disease and initiated at least 4 weeks prior to delivery is the only adequate treatment for syphilis during pregnancy.
‡ Alternative: Procaine penicillin G 50,000 units/kg/dose IM in a single daily dose for 10 days
§ CSF test results obtained during the neonatal period can be difficult to interpret; normal values differ by gestational age and are higher in preterm infants.
II All neonates with reactive nontreponemal tests should receive careful follow-up examinations and serologic testing (i.e., a nontreponemal test) every 2–3 months until the test becomes nonreactive. Neonates with a negative nontreponemal test at birth whose mothers were seroreactive at delivery should be retested at 3 months to rule out serologically negative incubating congenital syphilis at the time of birth.
† Alternative: Aqueous crystalline penicillin G 100,000–150,000 units/kg/day, administered as 50,000 units/kg/dose IV every 12 hours during the first 7 days of life and every 8 hours thereafter for a total of 10 days
FOR MORE INFORMATION ABOUT SCENARIO 4 MANAGEMENT, TREATMENT OF SYphilIS IN PREGNANCY, NEONATAL CSF INTERPRETATION, AND CS INFANT FOLLOW-UP, PLEASE REFER TO THE 2015 CDC STD TREATMENT GUIDELINES.
Laboratory criteria for diagnosis: T. pallidum

Demonstration of *Treponema pallidum* by one of the following:

- **Darkfield microscopy**
  lesions, body fluids, or neonatal discharge

- **Polymerase chain reaction (PCR)** or other equivalent direct molecular methods
  lesions, neonatal nasal discharge, placenta, umbilical cord, or autopsy material

- **Immunohistochemistry (IHC)**, or special stains
  lesions, placenta, umbilical cord, or autopsy material.

https://www.cdc.gov/std/stats16/appendix-c.htm
Laboratory criteria for diagnosis: Placental pathology

- **Histopathology**: necrotizing funisitis, villous enlargement, acute villitis, possible chorioamnionitis
- **Increased detection** of congenital syphilis from 67% to 89% in live-born infants, and 91% to 97% in stillborns (Obstet Gynecol 2002:100:126)
Long-bone radiographs

Osteochondritis

Periostitis

Courtesy of Pablo Sanchez, MD
CSF evaluation
76 CS INFANTS, CSF RIT: 17 (22%) POS, 59 NEG

<table>
<thead>
<tr>
<th>CSF Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDRL</td>
<td>53%</td>
<td>90%</td>
</tr>
<tr>
<td>Elevated WBC</td>
<td>38%</td>
<td>88%</td>
</tr>
<tr>
<td>Elevated Protein</td>
<td>56%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Michelow et al. NEJM, 2002
courtesy of Pablo Sanchez, MD
Scenario 4: “Congenital Syphilis Unlikely”
Normal physical exam, Nontrep Titer = or < 4-Fold Maternal Titer AND...

Maternal factors:
- Treated adequately before pregnancy AND
- Low stable nontrep titers before and during pregnancy and at delivery
  - (VDRL < 1:2, RPR < 1:4)

Work-up/Rx:
- No evaluation needed
- No Rx required
- Some experts would give single dose benzathine PCN G 50,000 U/KG IM, particularly if follow-up uncertain

Courtesy of Jessica Kim, MD UCSF
Congenital Syphilis Treatment: IV Penicillin

- **Aqueous crystalline penicillin G**
  100,000–150,000 units/kg/day,
  administered as 50,000 units/kg/dose IV
  - Every 12 hours during the first 7 days of life
  - Every 8 hours thereafter for a total of 10 days

- **Alternative**: Procaine penicillin G 50,000 units/kg/dose IM in a single daily dose for 10 days, only for neonates; Current drug shortage

Appropriate for:
- Scenario 1
- Scenario 2 with any abnormalities, results not available, or follow-up uncertain
Benzathine penicillin G
50,000 units/kg/dose IM in a single dose

Appropriate for:
- Scenario 2 who do not meet criteria for IV aqueous crystalline penicillin G
- Scenario 3 with either:
  - Mother with *early* syphilis who did **not** achieve ≥4fold decrease in titer post-treatment
  - Mother with *latent* syphilis who did **not** have a stable low titer (RPR < 1:4 or VDRL<1:2) throughout pregnancy
Evaluation and treatment of infants and children $\geq 1$ month

**Get an RPR!**

**If RPR positive**
- CSF analysis
- CBC, differential
- HIV screen
- Other tests as indicated (long bone xray, CXR, LFT, Abd U/S, etc).

**Treatment:**
Aqueous crystalline penicillin G $200,000-300,000$ units/kg/day IV, administered as $50,000$ units/kg IV q4-6 hours x 10 days

If all tests normal, can consider BPG $50,000$ U/kg IM x 3 in weekly intervals
CONGRATULATIONS!
WHEN ARE YOU DUE?..

Thank you

Rosalyn.Plotzker@cdph.ca.gov
Acknowledgements: Sharon Adler, MD, MPH. Nicole Burghardt, MPH. Ashley Dockter, MPH. Jessica Frasure-Williams, MPH. Jennifer Harmon, MPH. Sergio Morales, MPA. Ryan Murphy, PhD. Kelly Nguyen, MPH. Romni Neiman. Ina Park, MD, MS. Raquel Paz. Phil Peters, MD. Sarah Rudman, MD, MPH. Leila Sadaat, MPH. Pablo Sanchez, MD. Denise Smith, PHN, NPA. Eric Tang, MD, MPH. James Watt MD, MPH. Erin Whitney, MPH.