This is the presentation made on May 24, 2016. One case in 2015 was found to not meet the case definition for neural tube defect. This was not a case of anencephaly. This case is represented in Slides 3, 4 and 5 of this presentation but has been removed from our case list.

Washington State Department of Health

Anencephaly Investigation

Central Washington, 2010-2016

Advisory Committee Meeting
May 24, 2016

Cathy Wasserman, PhD MPH, State Epidemiologist for Non-Infectious Conditions

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND HEALTHIER COMMUNITY

Surveillance Update

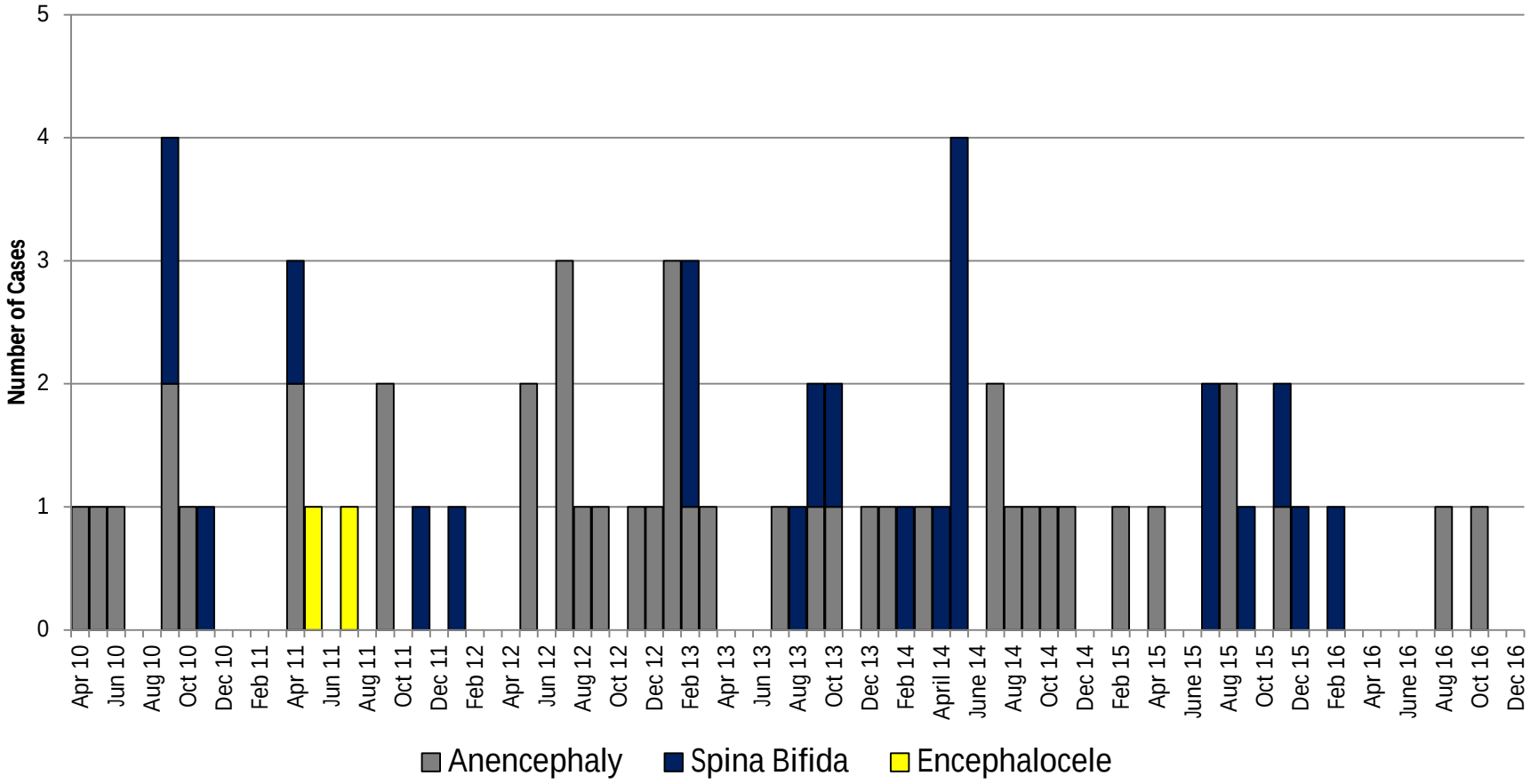
Neural Tube Defects by Year of Delivery or Estimated Year of Delivery[1]

	Number	Total births	Rate per 10,000 births	95% CI
All Neural Tube Defects				
2010	9	8565	10.5	(4.8, 19.9)
2011	8	8528	9.4	(4.0, 18.5)
2012	10	8352	12.0	(5.7, 22.0)
2013	14	8084	17.3	(9.5, 29.1)
2014	14	8432	16.6	(9.1, 27.9)
2015	10	8314	12.0	(5.8, 22.1)
2016	3	na		
Total to date[2]	68	na		
Anencephaly				
2010	6	8565	7.0	(2.6, 15.2)
2011	4	8528	4.7	(1.3, 12.0)
2012	9	8352	10.8	(4.9, 20.5)
2013	9	8084	11.1	(5.1, 21.1)
2014	8	8432	9.5	(4.1, 18.7)
2015	5	8314	6.0	(2.0, 14.0)
2016	2	na		
Total to date [2]	43	na		

[1]Estimated year of delivery is used for cases terminated or delivered before 37 weeks gestation.

[2]Total to date reflects cases confirmed by, May 6, 2016 with a delivery or estimated date of delivery in 2010-2016.

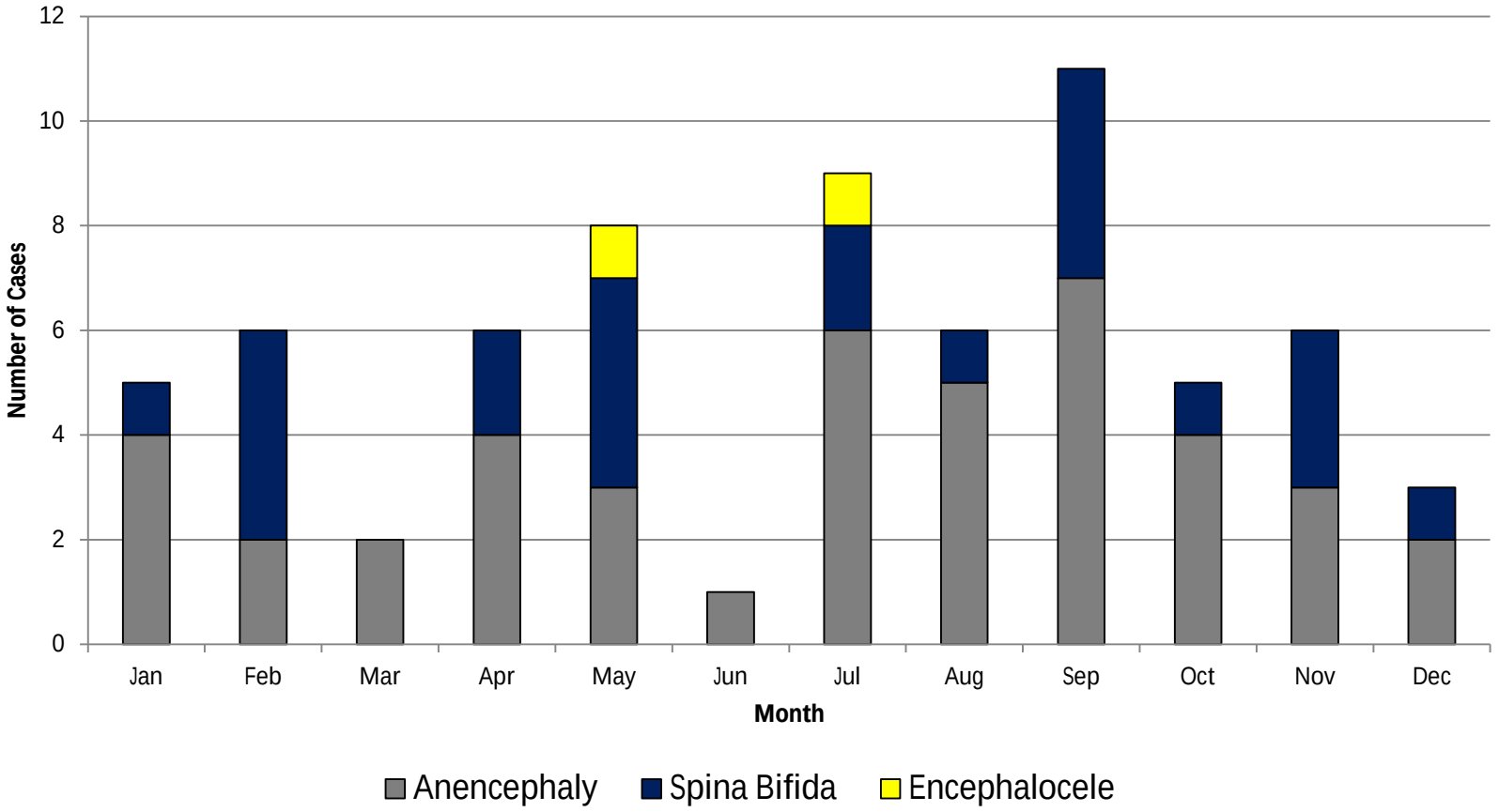
Neural Tube Defects by Month of Estimated Delivery Date[1]



[1]Estimated delivery date uses delivery date for gestational age ≥ 37 weeks and estimated delivery date for gestational age <37 weeks at delivery. Cases were confirmed through May 6, 2016.

Washington State Department of Health

Neural Tube Defects by Month of Estimated Delivery Date 2010-2016 Combined[1]



[1]Estimated delivery date uses delivery date for gestational age ≥ 37 weeks and estimated delivery date for gestational age <37 weeks at delivery. Cases were confirmed through May 6, 2016.

Washington State Department of Health

Population Sub Group Area Analyses

- Explored three population subgroup areas to look for differences – Yakima City, Lower Yakima Valley, Tri-Cities

- Explored:
  - Anencephaly to Spina Bifida ratio
  - Cases by month and year
  - Seasonality
  - Water source

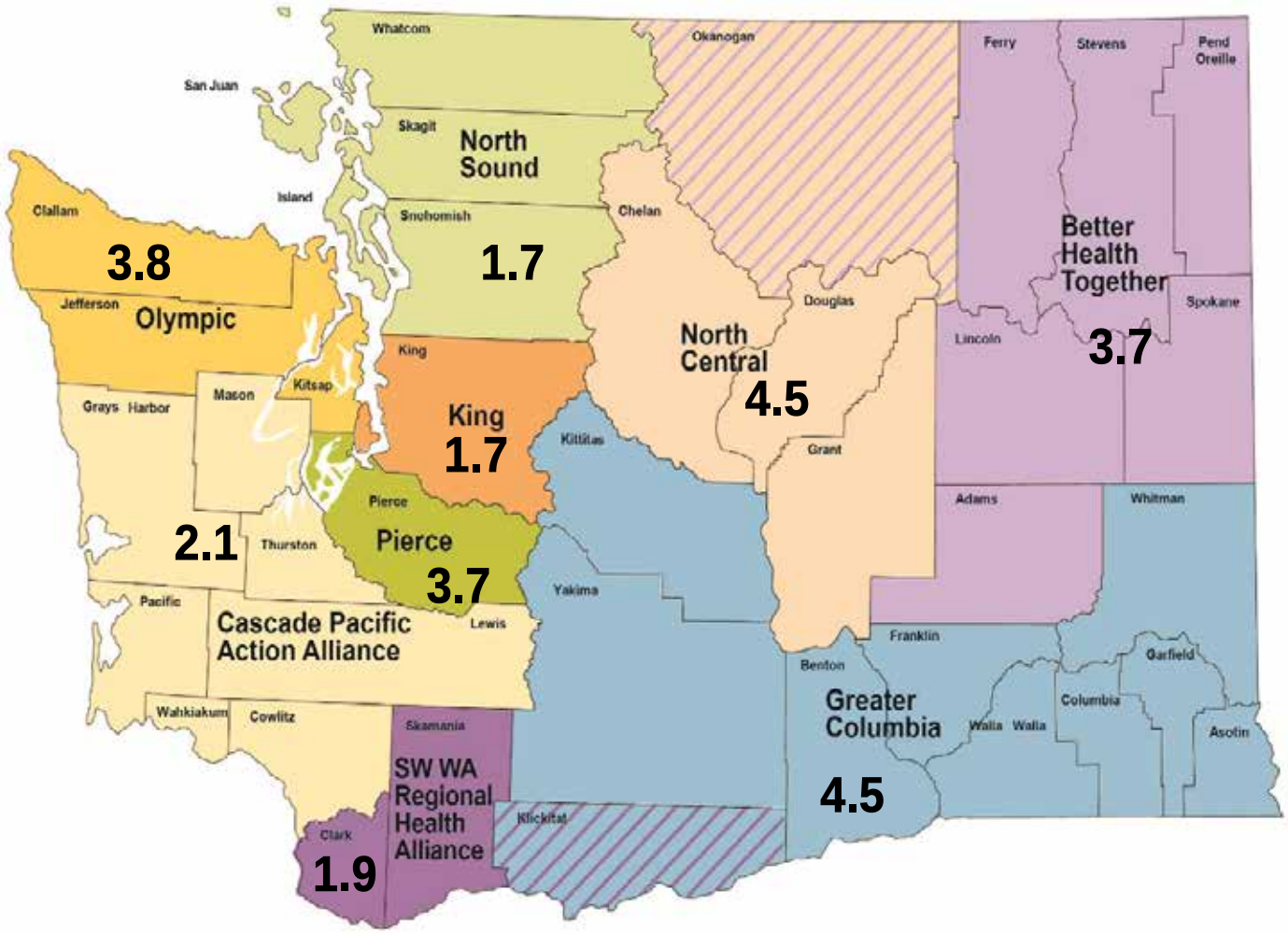
- Findings: (note numbers are quite small)
  - Anencephaly to Spina Bifida ratio varied across three areas. In no instance did we see more spina bifida than anencephaly.
  - Cases occur across the time frame in all three locations
  - No strong seasonality in any location
  - Some variation in the proportion of cases on public water supplies. In all three areas, 69% or more of the cases were on public water supplies.

Washington Rates of Anencephaly [1,2,3]
Vital Statistics and Hospitalization data (unconfirmed cases) by Accountable Commuity of Health Regions 2005-2015

	Number 2005-2015	Births 2005-2015	Rate per 10,000 births	95% CI
Anencephaly				
Washington State	260	961,251	2.7	(2.4, 3.1)
Better Health Together	29	78,061	3.7	(2.5, 5.3)
Cascade Pacific	16	75,273	2.1	(1.2, 3.5)
Greater Columbia	51	113,940	4.5	(3.3, 5.9)
King	45	271,959	1.7	(1.2, 2.2)
North Central	18	39,697	4.5	(2.7, 7.2)
Olympic	16	41,995	3.8	(2.2, 6.2)
Pierce	46	123,635	3.7	(2.7, 5.0)
North Sound	27	154,624	1.7	(1.2, 2.5)
SW Washington	12	62,070	1.9	(1.0, 3.4)

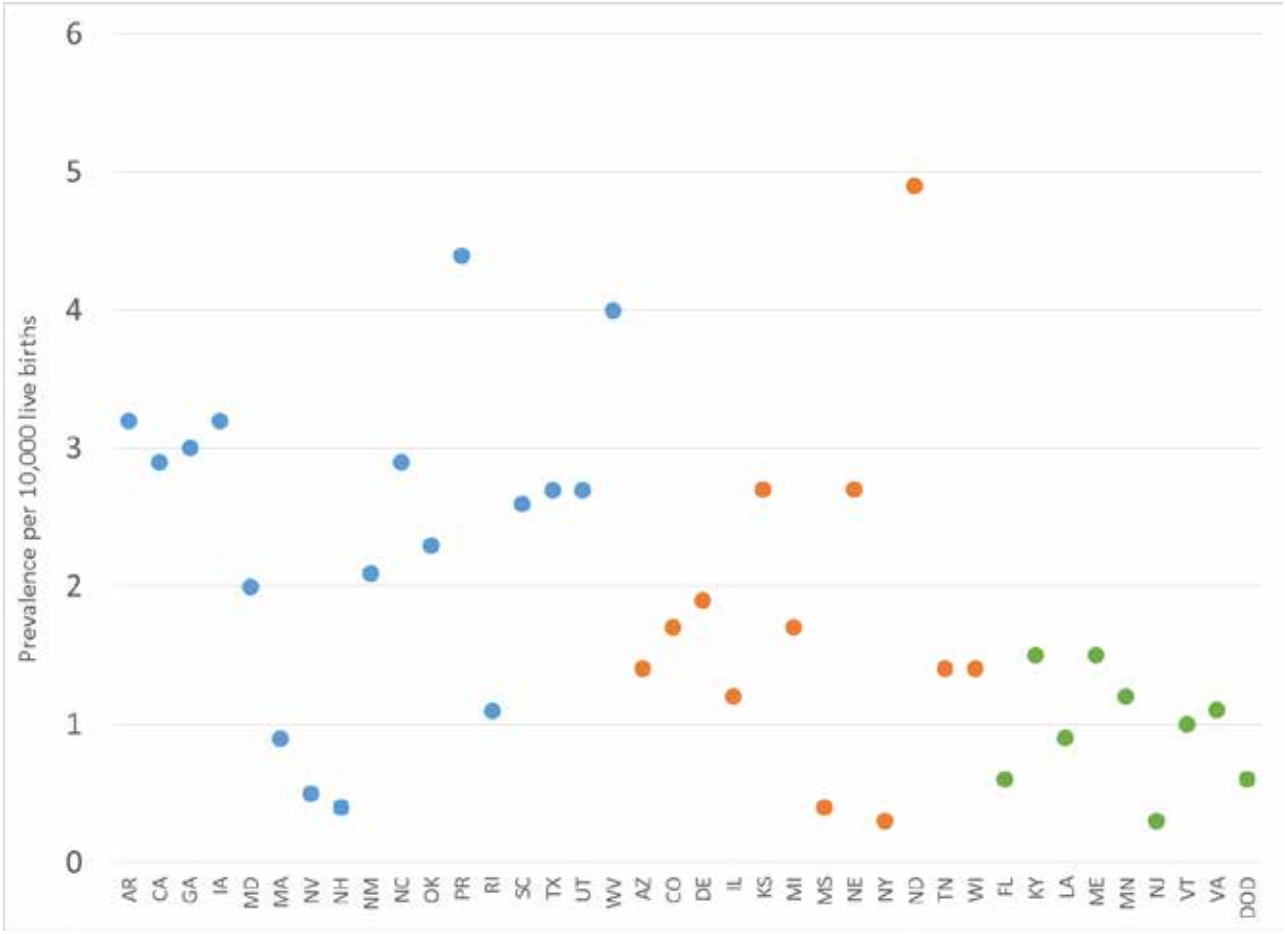
[1]Based on ascertainment from birth certificates, fetal death certificates and hospital discharge data, 2005-2013.
[2]Based on ascertainment from birth certificates and fetal death certificates only, 2014-2015.
[3]Limited to preliminary 2015 birth data file through March 2016

Washington Rates of Anencephaly [1,2,3]
Vital Statistics and Hospitalization data (unconfirmed cases) by Accountable Community of Health Regions, 2005-2015



[1]Based on ascertainment from birth certificates, fetal death certificates and hospital discharge data, 2005-2013.
[2]Based on ascertainment from birth certificates and fetal death certificates only, 2014-2015.
[3]Limited to preliminary 2015 birth data file through March 2016

Prevalence of Anencephaly, 2007-2011 National Birth Defects Prevention Network



Live births, terminations and stillbirths

Live births and stillbirths

Live births only

Washington State Department of Health

Ascertainment of NTD Cases, 2010-2015

	NTD	Anencephaly
Live birth	28 (43%)	9 (22%)
Fetal death	17 (26%)	13 (32%)
< 20 wks gestation	20 (31%)	19 (46%)
Total	65	41

NTD rate 2010-2015 is 12.9 per 10,000

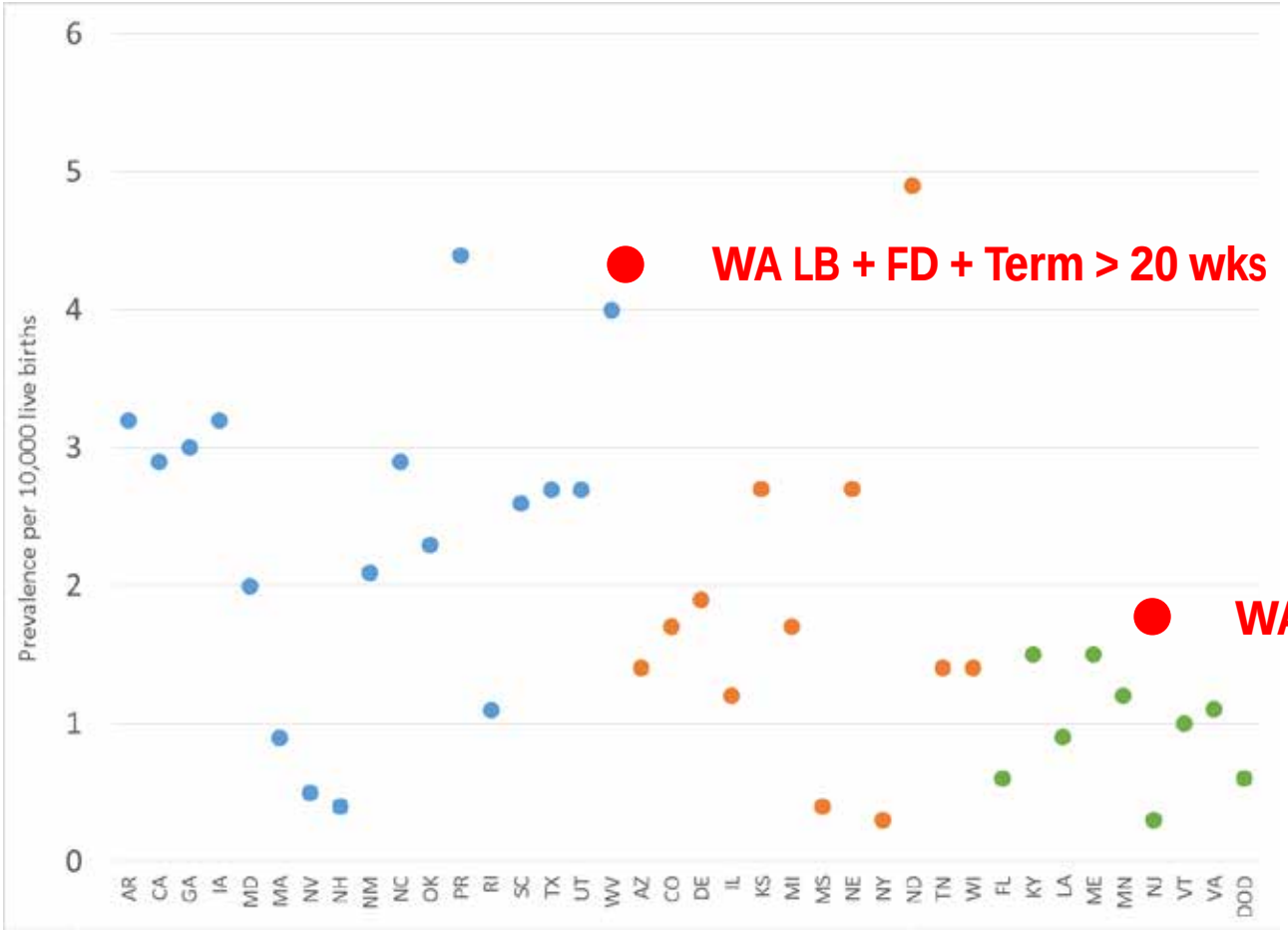
- If consider only cases that were live born or fetal deaths, rate would be 9.0 per 10,000
- If consider only cases that were live born, rate would be 5.6 per 10,000

Anencephaly rate 2010-2015 is 8.2 per 10,000

- If consider only cases that were live born or fetal deaths, rate would be 4.4 per 10,000
- If consider only cases that were live born, rate would be 1.8 per 10,000

WA Total = 8.2

Prevalence of Anencephaly, 2007-2011 National Birth Defects Prevention Network



Live births, terminations and stillbirths

Live births and stillbirths

Live births only

Washington State Department of Health

Surveillance Summary

- Cases have occurred across all years with no strongly defined peak in time, both overall and in sub-population areas
- No seasonality overall or in sub-population areas
- Continued predominance of anencephaly among NTDs
- Variability in rates across states, as well as by ascertainment method and whether fetal deaths and terminations are included.
- Rates from the three county area appear on the high end of state rates across the country.

Interview Update

Interview Response

Women Approached for Interview

	NTD	Anencephaly
Phase I	26	18
Phase 2	8	4
Phase 3	4	2
Total to date	38	24

Phase 1 and 2 Response

	NTD	Anencephaly
Interviewed	17 (50%)	12 (55%)
Partial	1 (3%)	0
Initial Consent	3 (9%)	1 (5%)
Mom ill, no f/u	2 (6%)	2 (9%)
No response	7 (21%)	4 (18%)
Declined	4 (12%)	3 (14%)
Total Phase 1 & 2	34	22

Ascertainment of Women Interviewed

	NTD	Anencephaly
Live birth	6 (35%)	3 (25%)
Fetal death	4 (24%)	3 (25%)
< 20 wks gestation	7 (41%)	6 (50%)
Total Interviewed	17	12

Folic Acid Supplement Use

	Mothers of Infants with any NTD	Mothers of infants with anencephaly
Total Number[1]	64	41
Number Approached	34	22
Number Interviewed	17 (50% of Approached	12(55% of Approached)
Prenatal Vitamin Use at some point in pregnancy	17 (100%)	12 (100%)
Prenatal Vitamin Use month before pregnancy through first month of pregnancy	10 (59%)	8 (75%)
Folic Acid as single vitamin at some point in pregnancy	7 (41%)	5 (42%)
Folic Acid as single vitamin in month before through first month of pregnancy	3 (18%)	3 (25%)

All women who reported folic acid use as single vitamin in month before through first month of pregnancy also took prenatal vitamins at this time.

[1]Confirmed by October 10, 2015

Interview Results – Dietary Folate

	Mothers of Infants with any NTD	Mothers of infants with anencephaly
Total Number[1]	64	41
Number approached	34	22
Number Interviewed	17 (50% of Approached)	12(55% of Approached)
Mean Dietary Folate	347 mcg	317 mcg
Median Dietary Folate	359 mcg	363 mcg
Range Dietary Folate	50-775 mcg	50-496 mcg
< 100 mcg	1 (6%)	1 (8%)
100-199 mcg	3 (18%)	1 (8%)
200-299 mcg	3 (18%)	2 (17%)
300-399 mcg	5 (29%)	5 (42%)
≥400 mcg	5 (29%)	3 (25%)

[1]confirmed by October 10, 2015

Interview Results – Drinking Water

	Mothers of Infants with any NTD	Mothers of infants with anencephaly
Total Number[1]	64	41
Number approached	34	22
Number Interviewed	17 (50% of Approached)	12(55% of Approached)
Public Water Supply	14 (82%)	11 (92%)
Private Well	3 (18%)	1 (8%)
Tap Water Away from Home		
1 glass/day	12(71%)	9 (75%)
4 glasses/week	4 (24%)	0
2 glasses/month	1 (6%)	0
Don't know	3 (18%)	3 (25%)

[1]confirmed by October 10, 2015

Interview Results – Occupational Exposures

	Mothers of Infants with any NTD	Mothers of infants with anencephaly
Total Number[1]	64	41
Number approached	34	22
Number Interviewed	17 (27% of Total)	12(29% of Total)
Mother worked	11 (65%)	9 (75%)
Multiple jobs	2 (12%)	2 (8%)
Solvent exposure	1 (6%)	0
Polycyclic Aromatic Hydrocarbons	2 (12%)	1 (8%)
Pesticides	5 (29%)	4 (33%)
High Physical Demands	3 (18%)	3 (25%)

[1]confirmed by October 10, 2015

Interview Results – Pesticide Exposure

	Mothers of Infants with any NTD	Mothers of infants with anencephaly
Total Number[1]	64	41
Number approached	34	22
Number Interviewed	17 (50% of Approached)	12(55% of Approached)
Occupational pesticide exposure	5 (29%)	4 (33%)
Insecticide	1 (6%)	0
Fungicide	2 (12%)	1 (8%)
Herbicide	5 (29%)	4 (33%)
Exposed through farm work	3 (18%)	3 (25%)
Pesticides applied around home	6 (35%)	4 (33%)
Treat insects	4 (24%)	2 (17%)
Treat pets	0	0
Treat houseplants, lawn, garden	3 (18%)	2 (17%)
Treat head lice	1 (6%)	1 (8%)

[1]confirmed by October 10, 2015

Interview Results - Summary

- Interviewed women slightly older than all birth mothers
- Interviewed women were less likely to be Hispanic than all cases
- Interviewed women were more likely to report prenatal and folic acid vitamin use than birth mothers, and did not appear to be folate deficient
- Many interviewed women experienced risk factors for NTDs
- About one third of interviewed mothers were assessed to have occupational exposures to pesticides, predominantly herbicides, not all through farm work.

Interview Follow Up

We've re-contacted all of the interviewed mothers:

- Contacted both English and Spanish speaking mothers
- Verified mothers have information about our investigation and are receiving updates if desired
- Determined if mothers would like information about research studies they may be eligible, and provided that information as requested.

Proximity to Agriculture

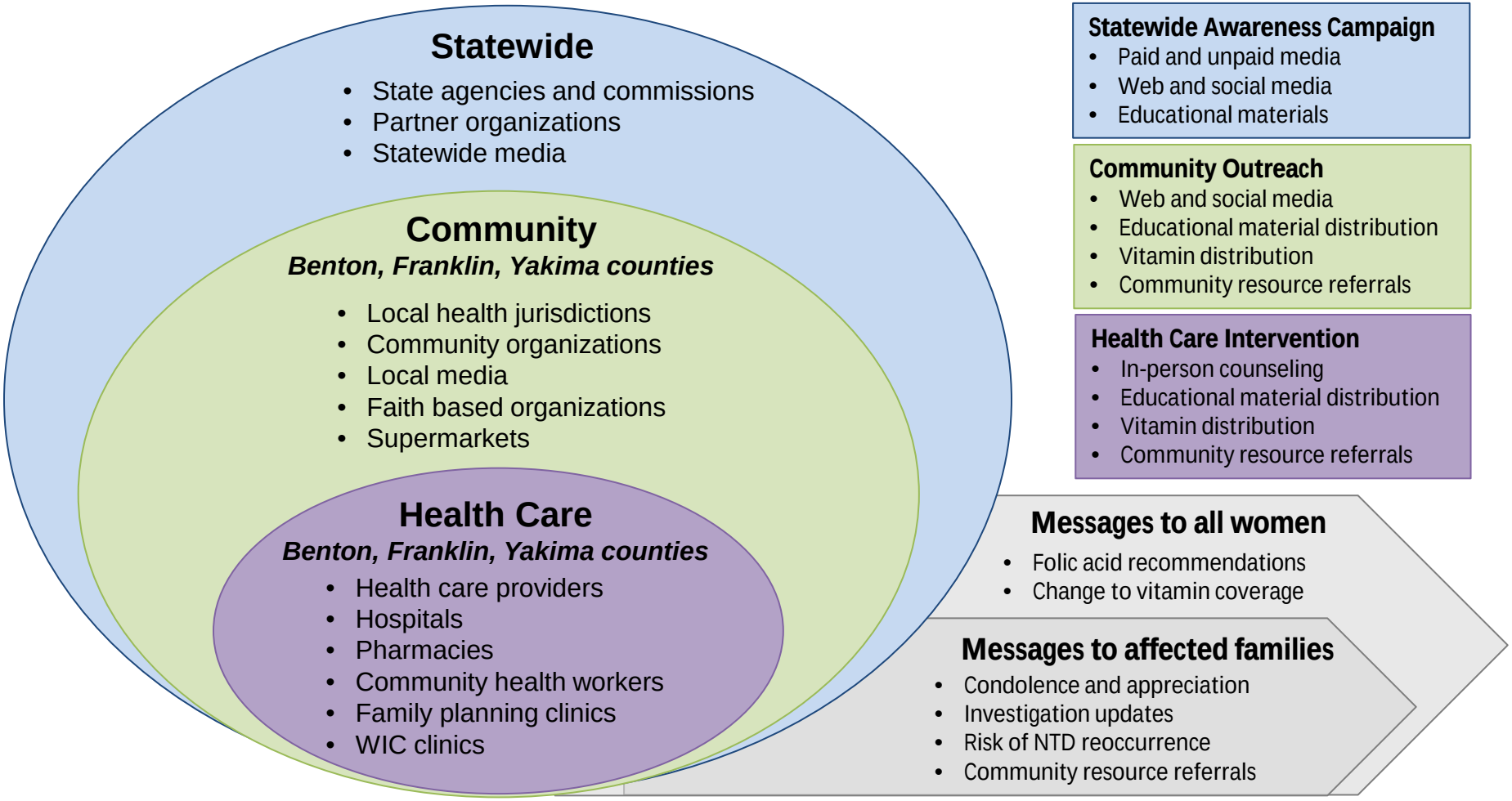
- Concern is pesticide exposure
- Prior analyses assessed agriculture using database that identified lands for tax purposes.
- It includes lands that are both actively in production as well as lands not in production, and potentially range lands as well
- Exploring other databases – we don't have a way to assess pesticides used on crops or orchards, but we can possibly look at specific crops.
- Assessing the level of effort required to analyze crop maps, as well as how informative such analyses might be

Prevention Update

Folic Acid Fortification of Corn Masa Flour

- US FDA approved fortification of corn masa with folic acid in mid-April.
- Nationwide, fortification is expected to prevent neural tube defects among 40 Hispanic babies each year.
- This is wonderful news and will supplement state and local efforts raising awareness of the importance of all women getting 400 mcg of folic acid daily.

Folic Acid Outreach Plan



Communication channels

Statewide Awareness Campaign
- Paid and unpaid media
- Web and social media
- Educational materials

Community Outreach
- Web and social media
- Educational material distribution
- Vitamin distribution
- Community resource referrals

Health Care Intervention
- In-person counseling
- Educational material distribution
- Vitamin distribution
- Community resource referrals

Washington State Department of Health

Folic Acid Outreach

Statewide

- Anencephaly webpage is available in Spanish and English
- Press release with information about prenatal vitamin availability through Apple Health.

Community

- Interviews with new mothers in Central Washington about folic acid and birth defects information needs
- Folic Acid Message Digital Ads on Facebook and Google
- Bilingual information about folic acid, anencephaly and Apple Health coverage of prenatal vitamins on social media

Folic Acid Outreach

Health Care

- Developing a training module for community health workers around prenatal nutrition.

What's Next

- Continue surveillance in three county area
- Continue to interview new case mothers
- Continue work with local health and other partners on folic acid outreach and communication
- Continue to learn more about information needs and best ways to communicate with women
- Complete community health worker training and make available

Questions/Comments?

To provide comments or questions, please contact:

Cathy Wasserman, PhD MPH
State Epidemiologist for Non-Infectious Conditions
Washington State Department of Health
PO Box 47890
Olympia, WA 98504-7890
cathy.wasserman@doh.wa.gov