Autism and Seasonality

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Autism Spectrum Disorder (ASD)

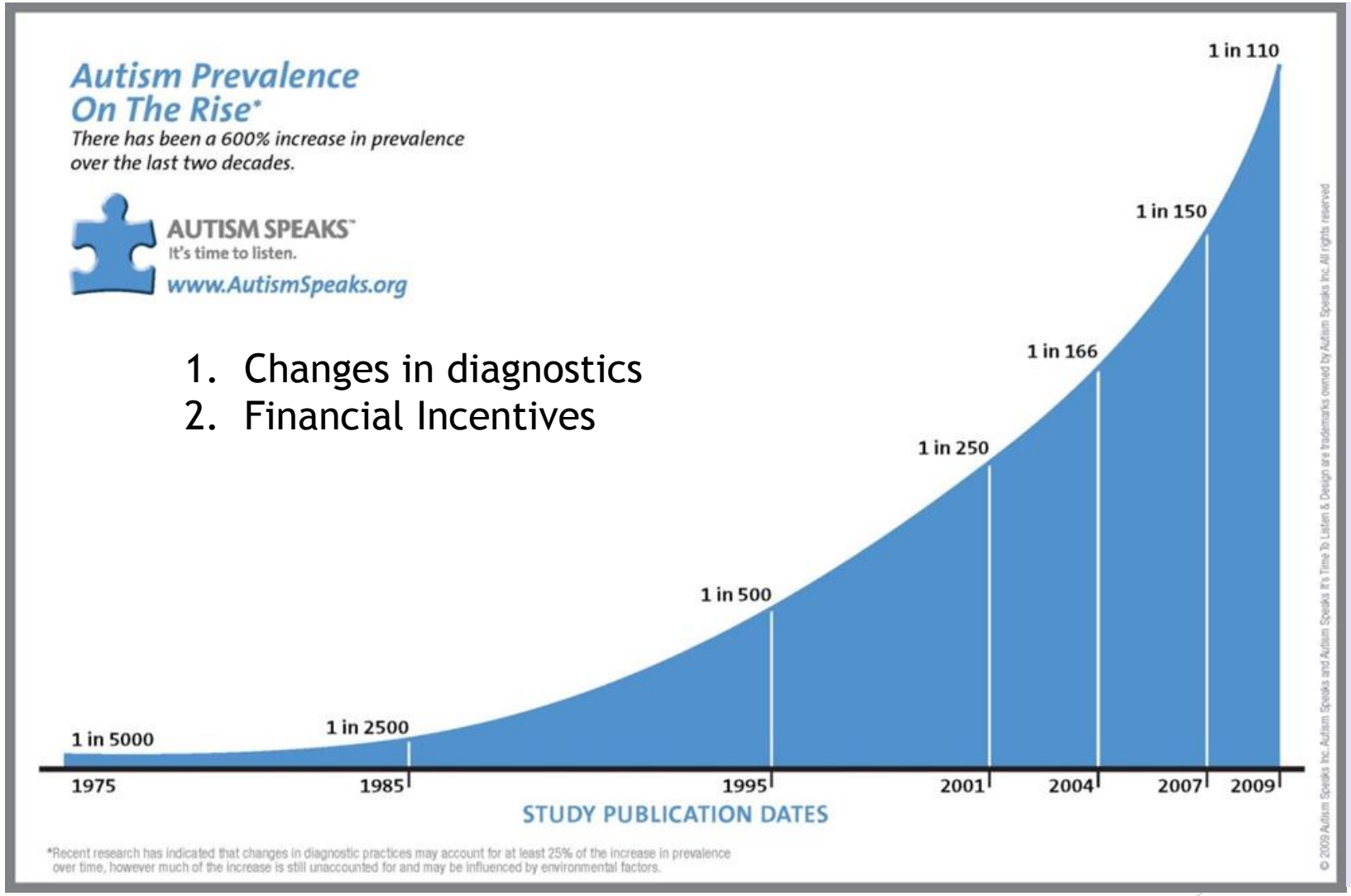
- Neurodevelopmental disorder
- Characterized by Impairments in social interaction, communication, and imaginative play.
- Apparent before age 3.
- Includes stereotyped behaviors, interests, and activities.


Inability to relate to children or adults
Poor speech or lack of speech
Oversensitivity or undersensitivity to noises
Inappropriate toy play
Difficulty dealing with changes in routine
Inappropriate laughter or crying
Lack of awareness of danger
Hyperactivity or passiveness
Oversensitivity or undersensitivity to touch
Strange attachment to objects
Lack of eye contact

Epidimilogy

- Globally, autism is estimated to affect 24.8 million people (2015)
- It occurs four to five times more often in boys than girls.
- The rate of autism among adults is about 1%.

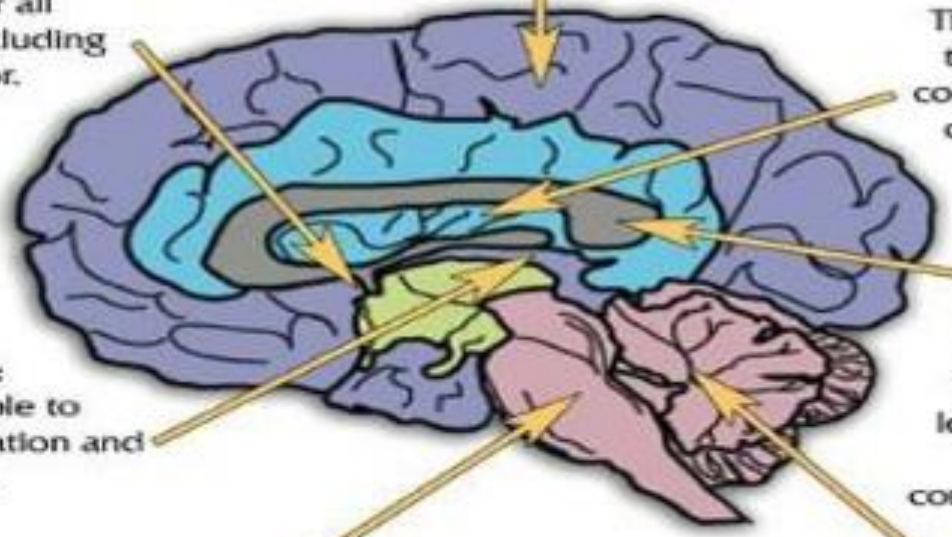
Dramatic growth



Parts of the Brain Affected by Autism

Cerebral Cortex:
A thin layer of gray matter on the surface of the cerebral hemispheres. Two thirds of this area is deep in the tissues and folds. This area of the brain is responsible for higher mental functions, general movement, perception and behavioral reactions.

Amygdala:
This is responsible for all emotional responses including aggressive behavior.



Basal Ganglia:
This is gray masses deep witin the cerebral hemisphere that connectes the cerebrum and the cerebellum. It helps regulate automatic movement.

Corpus Callosum:
This consists of closely packed bundles of fibers that connect the right and left hemispheres of the brain and allows them to communicate with one another.

Hippocampus:
This makes it possible to remember new information and recent events.

Brain Stem:
The Brain Stem is located in front of the cerebellum and serves as a relay station, passing messages between various parts of the body and the cerebral cortex. It controls the primitive funtions of the body essential to survival including breathing and heartt rate.

Cerebellum:
This is located at the back of the brain. It fine tunes motor activity, regulates balance, body movements, coordination and the muscles used for speaking.

The Puzzle of autism

What are the Causes?

- The puzzle of Autism is that there is no one cause
- Autism can occur as a result of:
  - Rare gene changes or genetic mutations

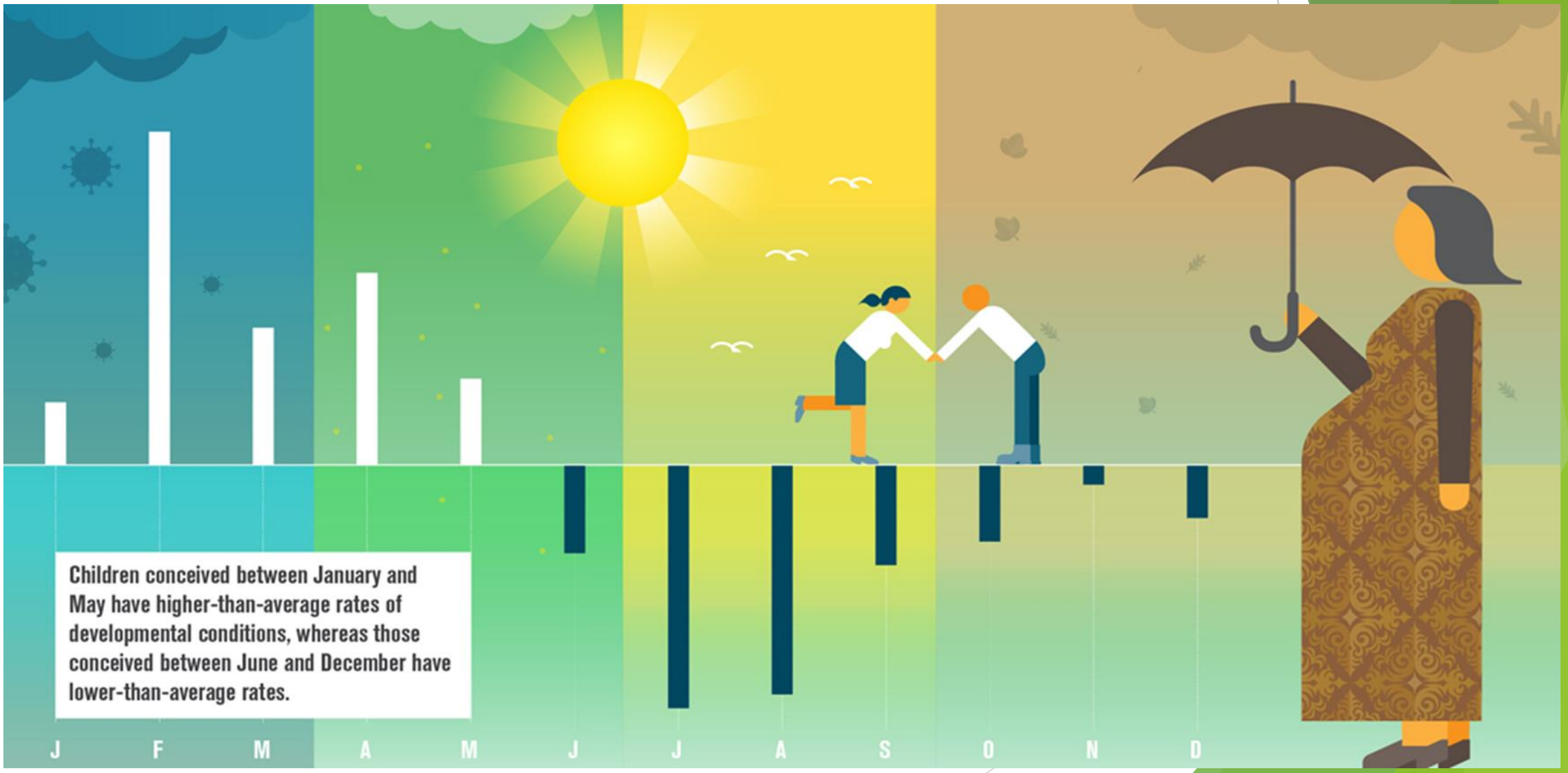
  - Environmental risk factors during or after pregnancy

For more information on the causes of Autism click here

Enviromental factors

- low Apgar score
- small for gestational age
- gestational age at birth of less than 37 weeks
- cesarean section
- congenital malformations
- prenatal exposure to valproic acid, thalidomide
- rubella
- alcohol

What are we doing?



Literature Review

Mixed Results

Denmark

- Mouridsen, Season of birth in infantile autism and other types of childhood psychoses, 1994
  - A significant increase in autism was recorded for March and November.
- Maimburg, Neonatal jaundice, autism, and other disorders of psychological development, 2010
  - Parity and season of birth seem to play important roles. Risk for infantile autism was higher if the child was conceived by a parous woman or was born between October and March

No ASSOCIATION

- Kolevzon, Effects of Season of Birth on Autism Spectrum Disorders: Fact or Fiction?
  - No seasonality detected.
- Landau, Season of birth in autism: A fiction revisited
  - No seasonality detected.

iCARE Database

- Established in 2010.
- 5.7 Million records of live births (31,000 autistic).
- 7 countries.

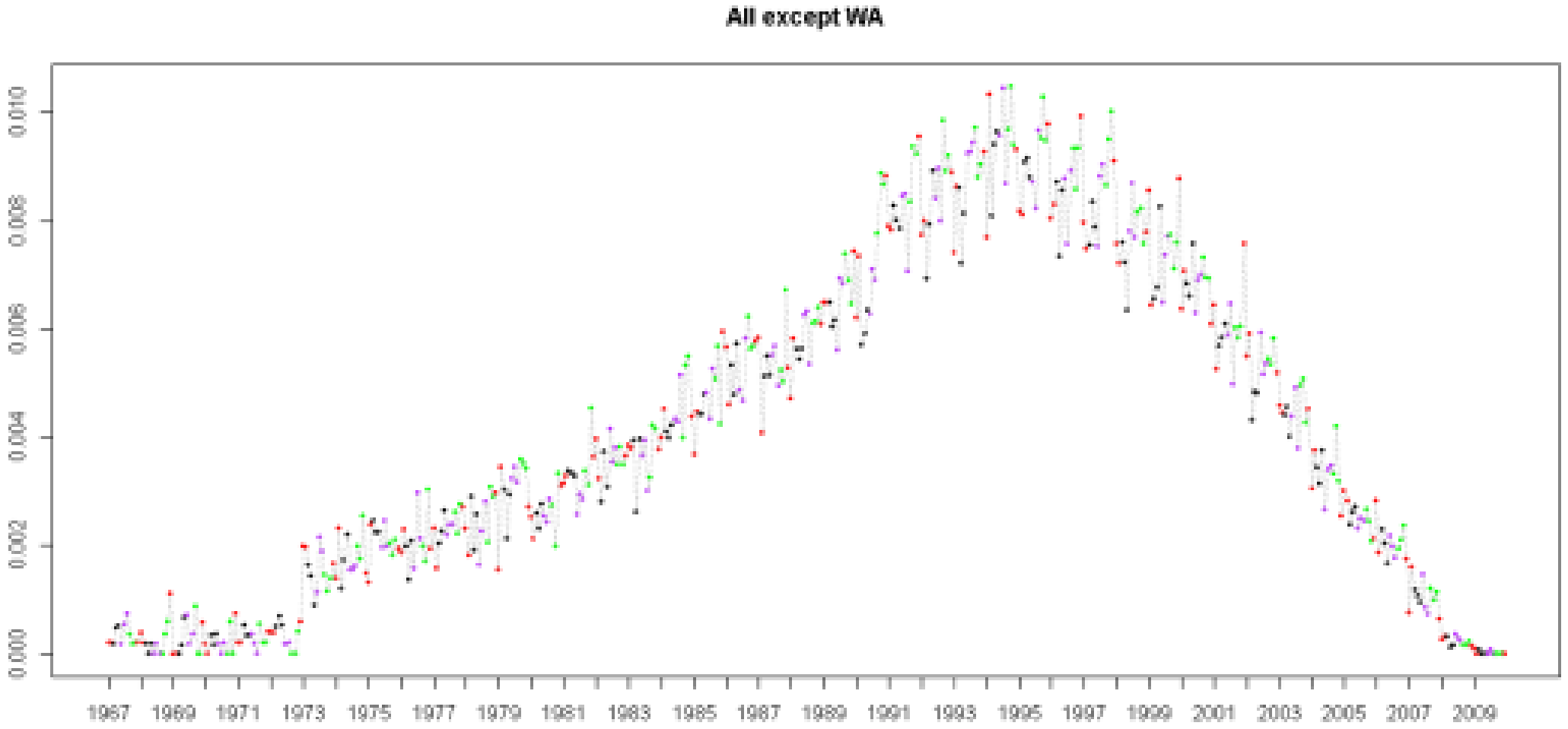
iCARE Sites and Roles

Site	Site Role				
	Data Contributor	IT Operations	Data Management Core	Project Lead	Founding Collaborator
Denmark					
Finland					
Israel					
Norway					
Spain					
Sweden					
USA/Columbia University					
USA/CDC					
Western Australia					

iCARE Consortium Characteristics

Site	Population Size	Birth Years	Births/Year	Coverage	Health Care Provision
Denmark	5.5 mill	1980-2007	62,000	Nation	Public
Finland	5.4 mill	1987-2008	60,000	Nation	Public
Israel	7.6 mill	1987-2006	125,000	Nation	Public
Norway	4.8 mill	1980-2005	55,000	Nation	Public
Sweden	9.4 mill	1980-2008	107,000	Nation	Public
Western Australia	1.9 mill	1983-1999	24,000	State	Public and private

Preliminary results



- Color code

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# Winter: Dec, Jan, Feb (red)
# Spring: Mar, Apr, May (black)
# Summer: Jun, Jul, Aug (purple)
# Fall: Sep, Oct, Nov (green)
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Linear regression: proportion ~ SEASON + year + country (all categorical)

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	7.970e-03	5.711e-04	13.955	< 2e-16	***
as.factor(season)Spring	-4.785e-04	1.366e-04	-3.503	0.000473	***
as.factor(season)Summer	-2.918e-04	1.366e-04	-2.136	0.032848	*
as.factor(season)Winter	-2.957e-04	1.366e-04	-2.165	0.030571	*
as.factor(year)1968	-6.617e-05	7.727e-04	-0.086	0.931763	
as.factor(year)1969	-3.585e-05	7.727e-04	-0.046	0.962998	
as.factor(year)1970	-9.797e-05	7.727e-04	-0.127	0.899123	
as.factor(year)1971	-4.128e-05	7.727e-04	-0.053	0.957398	
as.factor(year)1972	7.816e-06	7.727e-04	0.010	0.991931	
as.factor(year)1973	-1.574e-03	6.724e-04	-2.340	0.019394	*
as.factor(year)1974	-1.391e-03	6.724e-04	-2.069	0.038717	*
as.factor(year)1975	-1.107e-03	6.724e-04	-1.647	0.099812	.
as.factor(year)1976	-1.075e-03	6.724e-04	-1.599	0.110011	

Other years , countries not shown

Interpretation: born in FALL has higher risk than born in any other season (in other words, conceived in winter)

Future Work

- Complete data analysis.
- Explore potential interactions between month of birth and other factors.

THANK YOU