DATA-DRIVEN COLLABORATION

To Improve Dialysis Services in Arizona

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The Arizona Department of Health Services

History of Current Practice:

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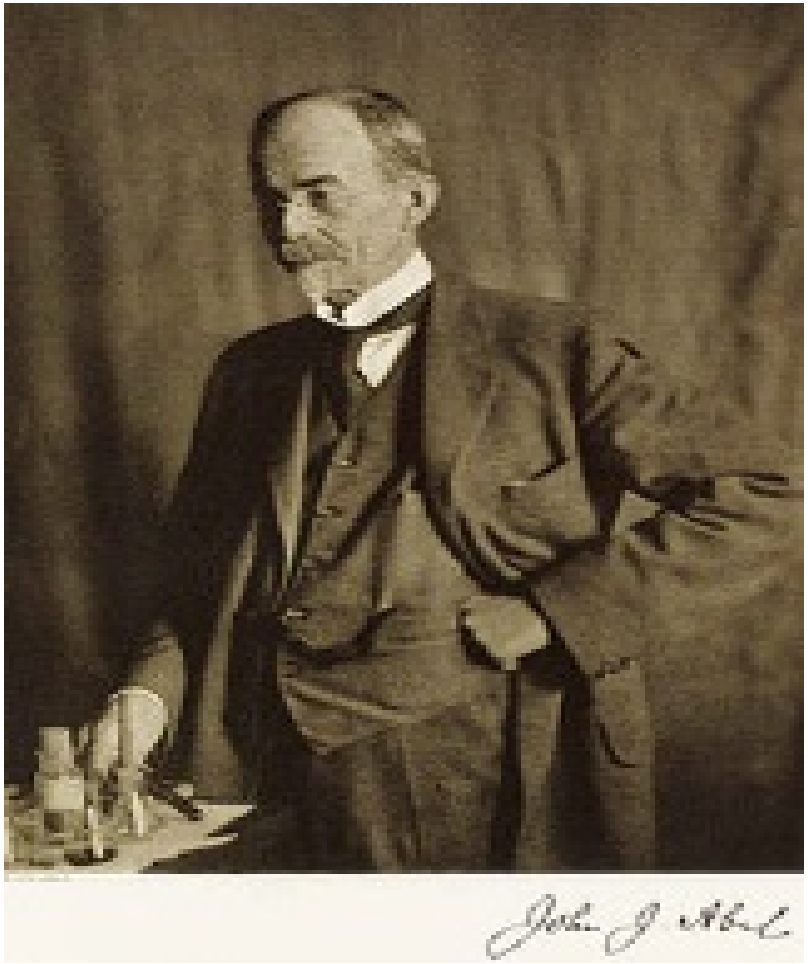
History of Current Practice:



History of Current Practice:

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- 1861 – Thomas Graham, professor of Chemistry at Anderson's University, Glasgow.
- 1913 – John J. Able, professor of Pharmacology, Johns Hopkins University, Baltimore.
- 1945 – Willem J. Kolff, resident physician at Groningen University, Netherlands

History of Current Practice:

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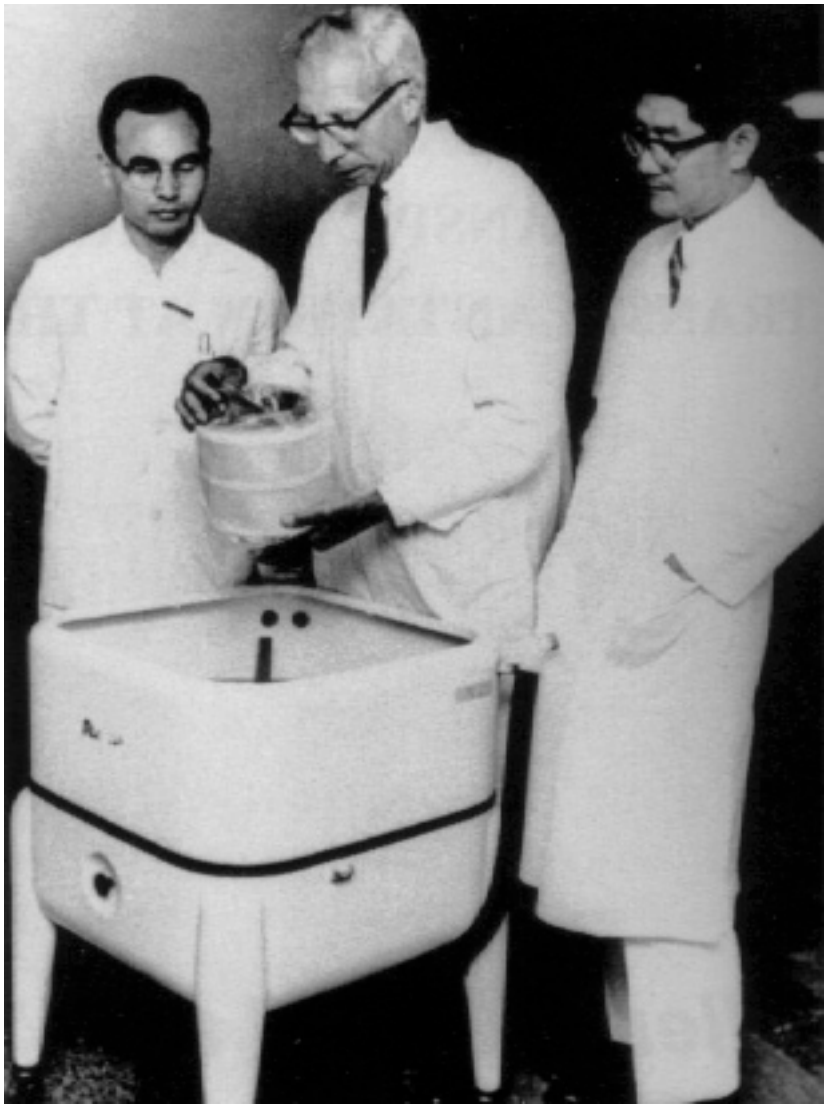

History of Current Practice:

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Take Home Messages:

- All it takes to make advances in quality of care is individuals who take the initiative to make improvement a part of their daily effort.
- Failure, and persistence are essential to the discovery of new knowledge, and the best path to success.

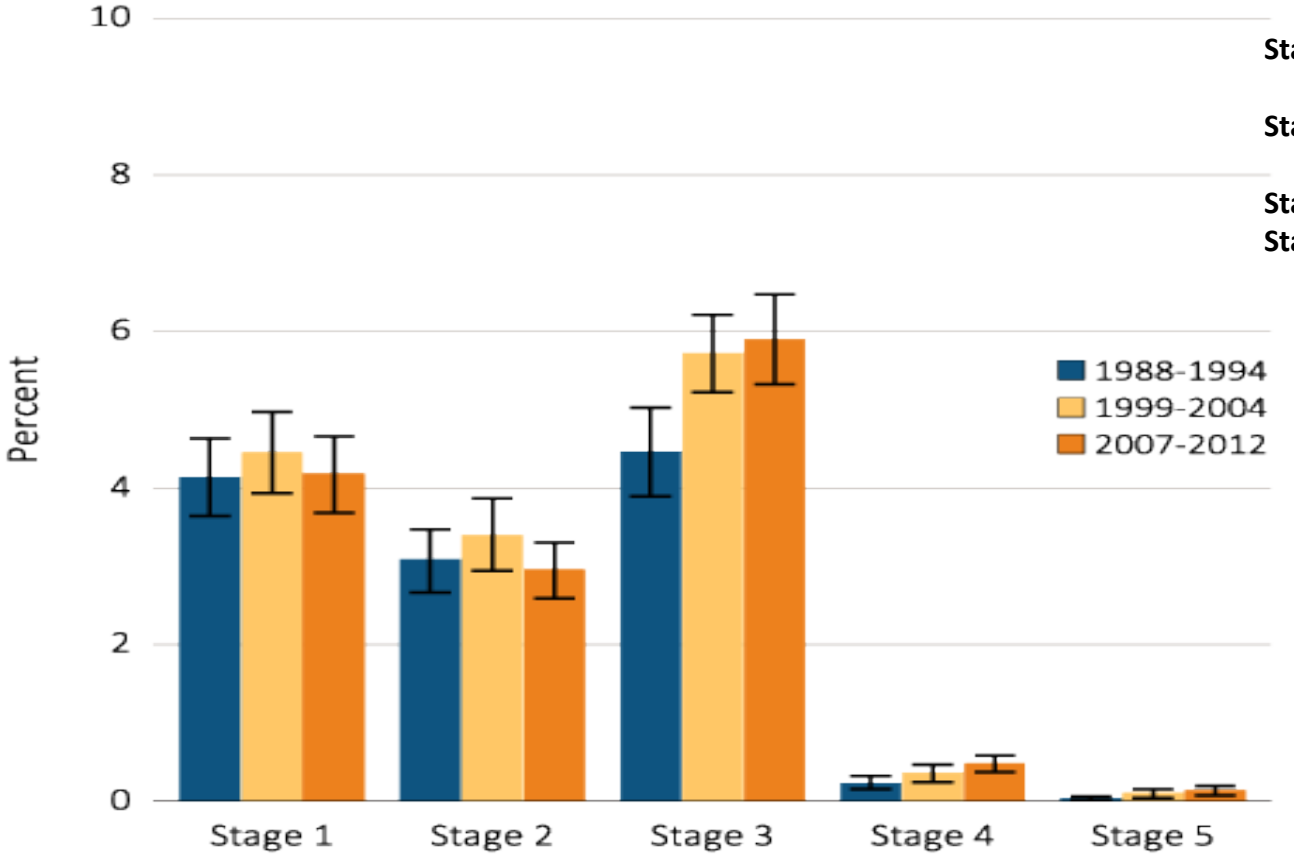
Primary Data Sources for Summary:

- 2014 Annual report US Renal Data System at http://www.usrds.org/adr.aspx
- InterMountain ESRD Network, Inc. Network 15 2013 Annual Report at http://www.esrdnet15.org/about-us/annual-reports.html
- Arizona Health Status and Vital Statistics Annual Reports at http://www.azdhs.gov/plan/index.php
- Community Health Survey, US Census Bureau population estimates.

National Data Summary

- Data from NHANES are a single point sample, and components covering Chronic Kidney Disease are administered to only a voluntary subset of respondents.
- Values found among NHANES participants for Chronic Kidney Disease are expected to be slightly higher than the actual numbers in the US general population.
- 5% reported only Diabetes
- 3.9% reported only Cardiovascular Disease
- 1% reported both Diabetes and Cardiovascular Disease
- 13.6% reported Chronic Kidney Disease

The Situation Today: Prevalence by Stage



Stage 1: dGFR≥90 ml/min/1.73m^2 and ACR ≥ 30mg/g
Stage 2: dGFR 60-89 ml/min/1.73m^2 and ACR ≥ 30mg/g
Stage 3: dGFR 30-59 ml/min/1.73m^2
Stage 4: dGFR 15-29 ml/min/1.73m^2

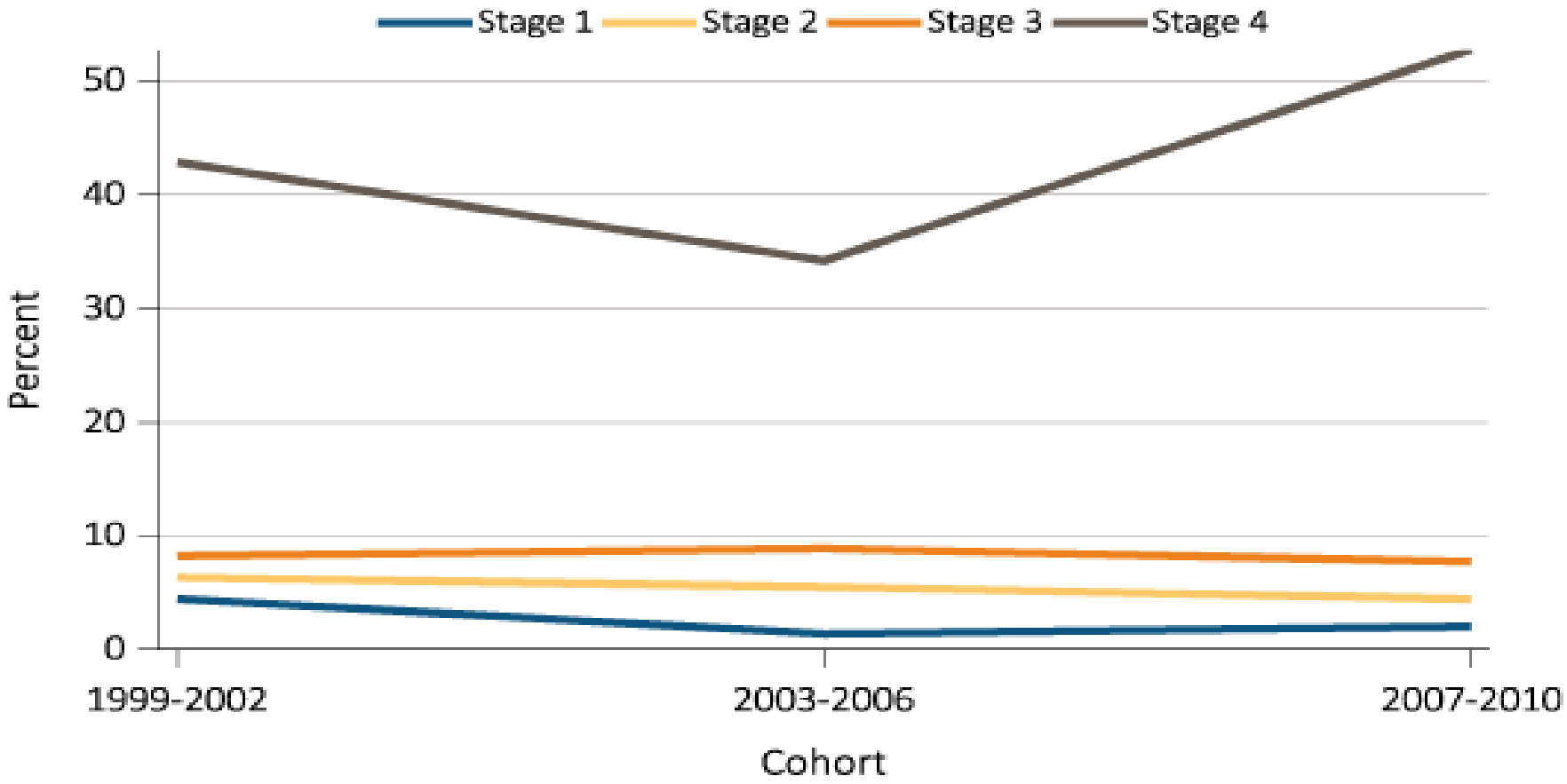
2014 US Renal Data System Annual Report - Chronic Kidney Disease Trends . Figure 1.1: Prevalence of Chronic Kidney Disease by Stage among NHANES participants 1988-2012

The Situation Today: Prevalence Percent

All Chronic Kidney Disease				
	1988-1994	1999-2004	2007-2012	Net Change
All	12.0	14.0	13.6	1.6
Age 20 - 39	5.1	5.9	5.7	0.6
Age 40-59	8.4	9.8	8.9	0.5
Age 60 +	32.2	37.5	33.2	1
Male	10.2	12.3	12.1	1.9
Female	14.2	15.7	15.1	0.9
White non-Hispanic	12.3	14.0	13.9	1.6
Black Non-Hispanic	14.5	14.9	15.9	1.4
All Others	10.5	13.5	11.7	1.2
Diabetes	43.1	42.0	39.2	-3.9
Hypertension	33.3	32.7	31.0	-2.3
Cardiovascular Disease	25.4	40.0	39.5	14.1
Obesity	16.6	16.8	16.6	0

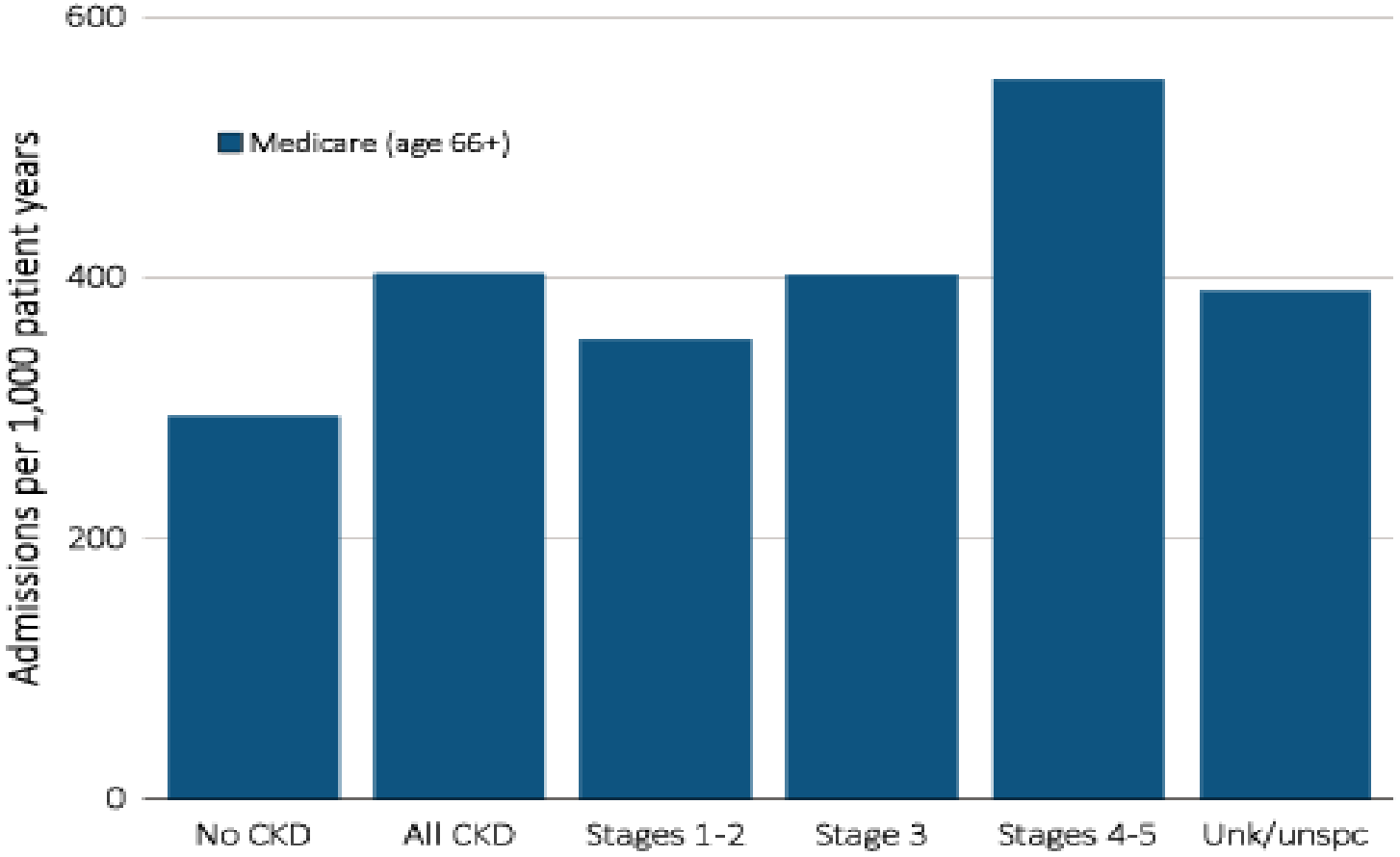
2014 US Renal Data System Annual Report
2014 US Renal Data System Annual Report
– Table 1.3 Prevalence of Chronic Kidney Disease by various characteristics

The Situation Today: Awareness of Disease



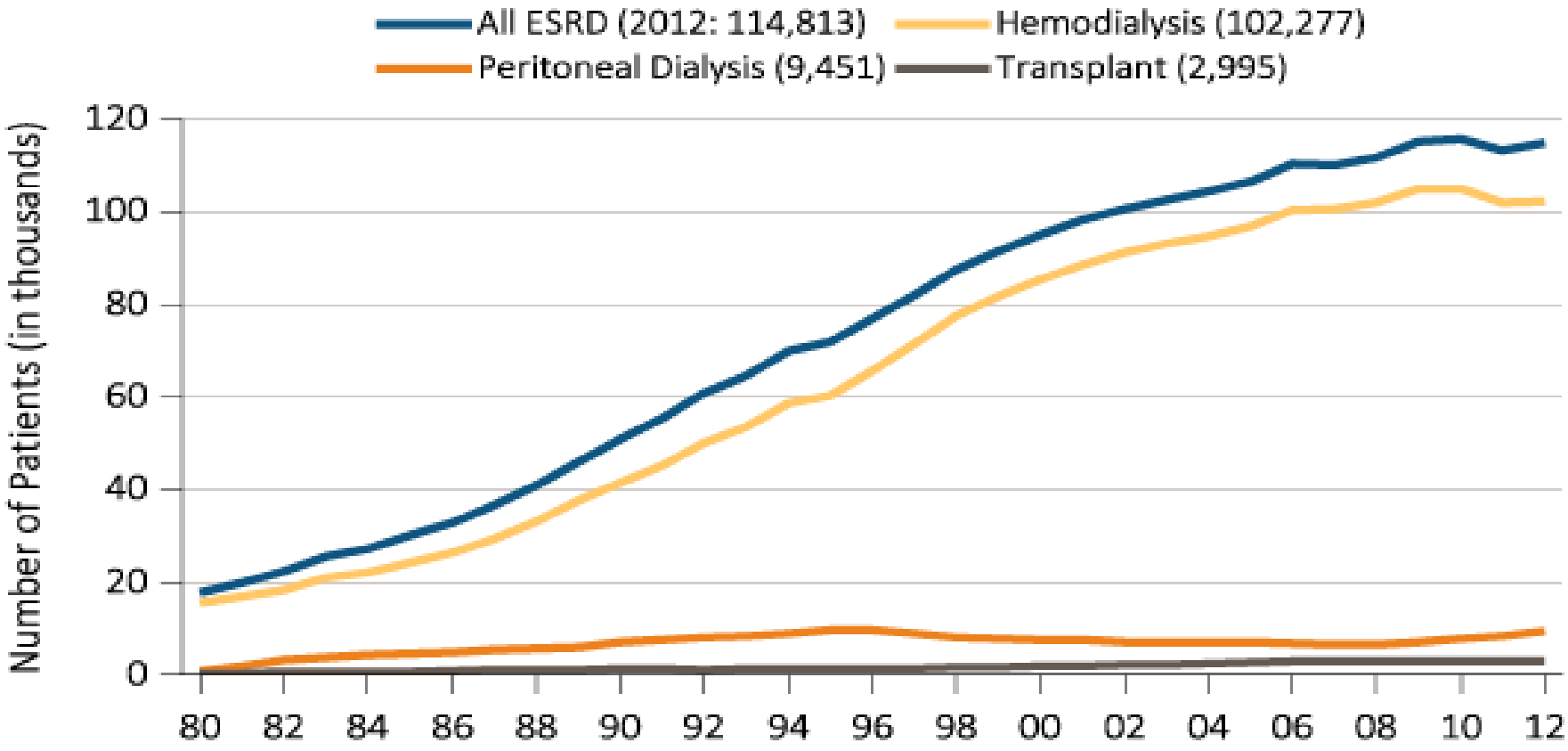
2014 US Renal Data System Annual Report - Chronic Kidney Disease Trends
Figure 1.11: Percentage of Survey Partticipants Aware of their Chronic Kidney Disease by stage of disease 1999-2010

The Situation Today: Hospitalization Rates



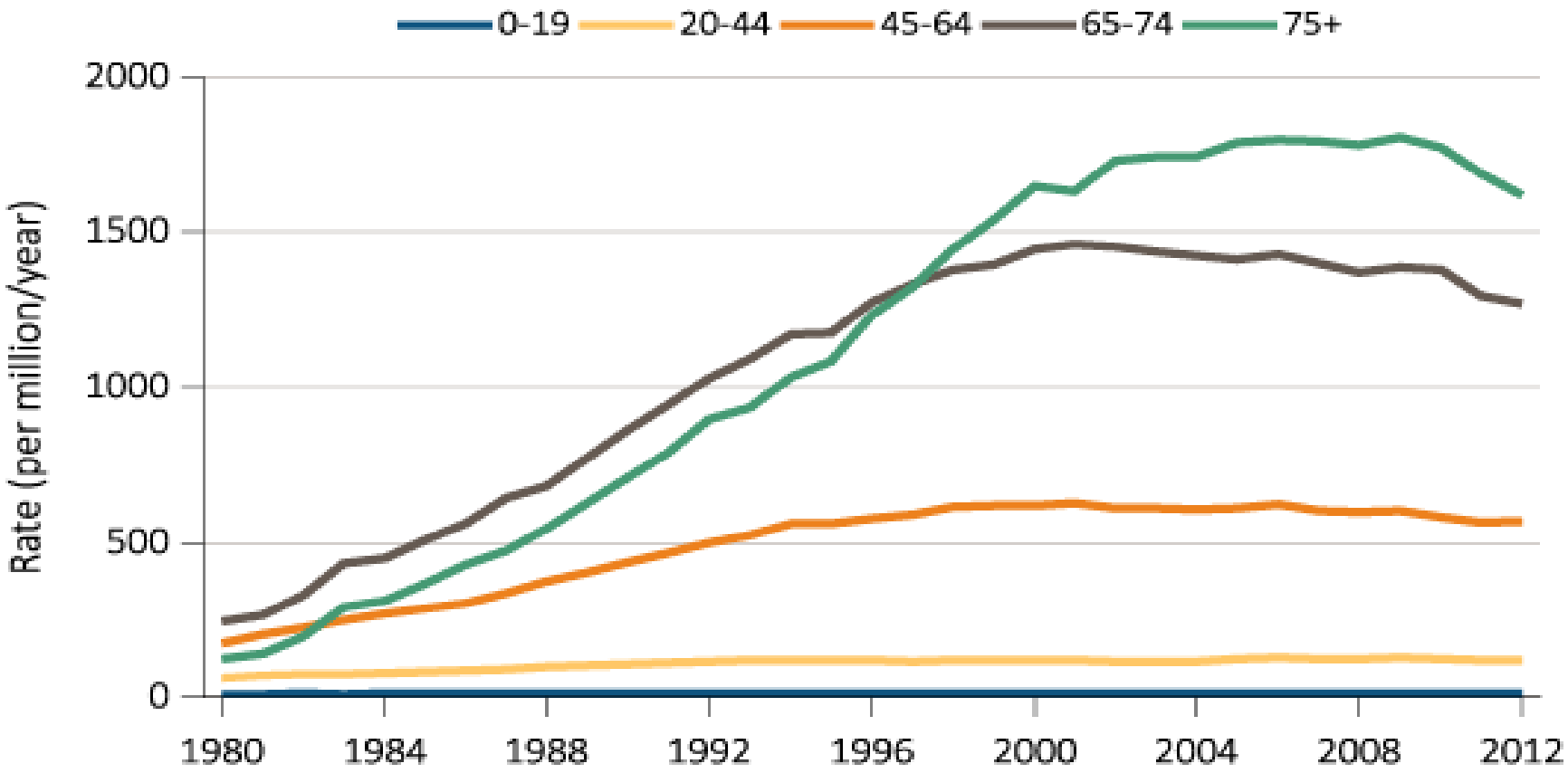
2014 US Renal Data System Annual Report - Chronic Kidney Disease Trends
Figure 3.5: Adjusted Hospitalization Rates per 1000 patient years at risk among Medicare Patients, aged 66 or older with Chronic Kidney Disease

The Situation Today: Incident Cases



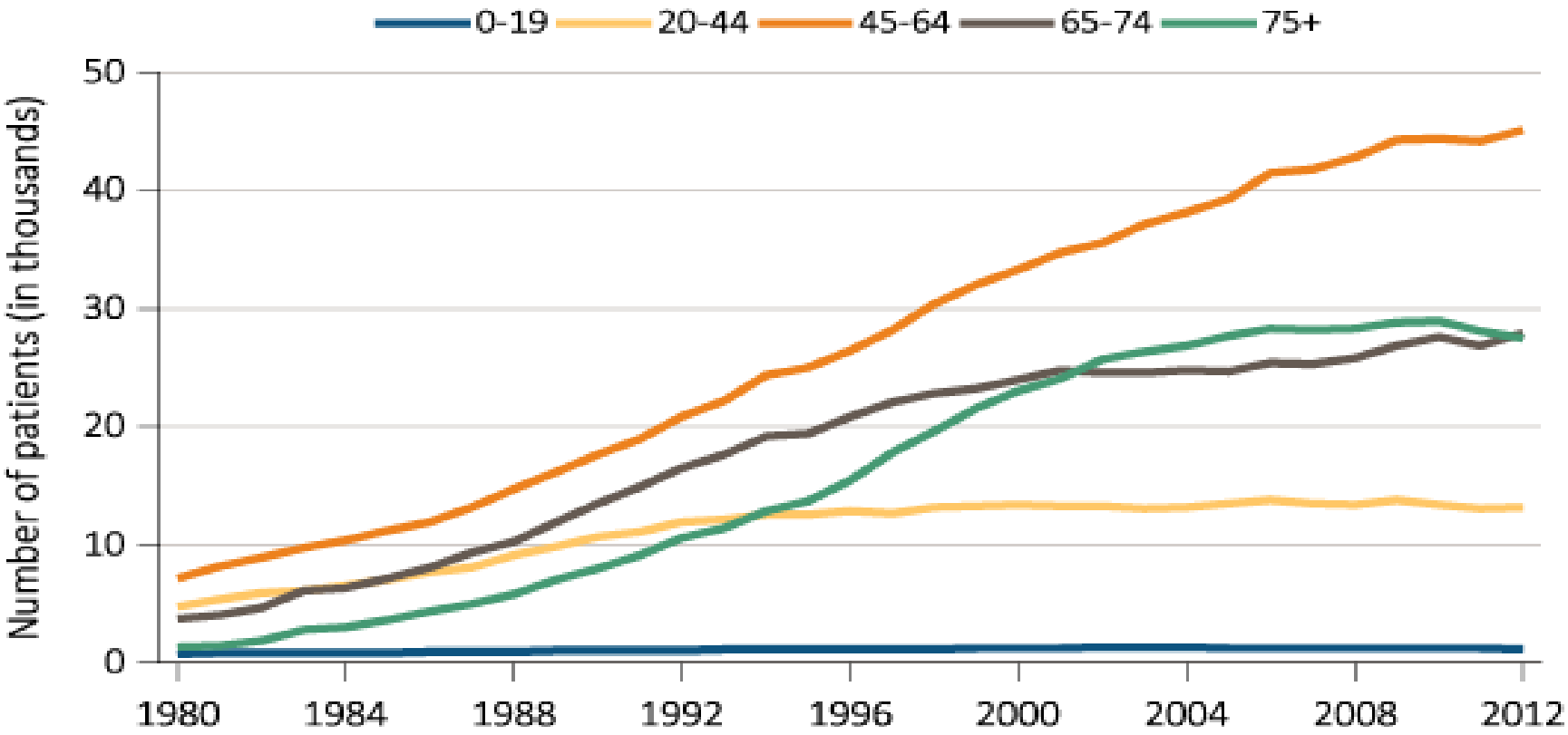
2014 US Renal Data System Annual Report – End Stage Renal Disease Trends in the number of incident cases , USA, 1980 - 2012

The Situation Today: Incidence Rates



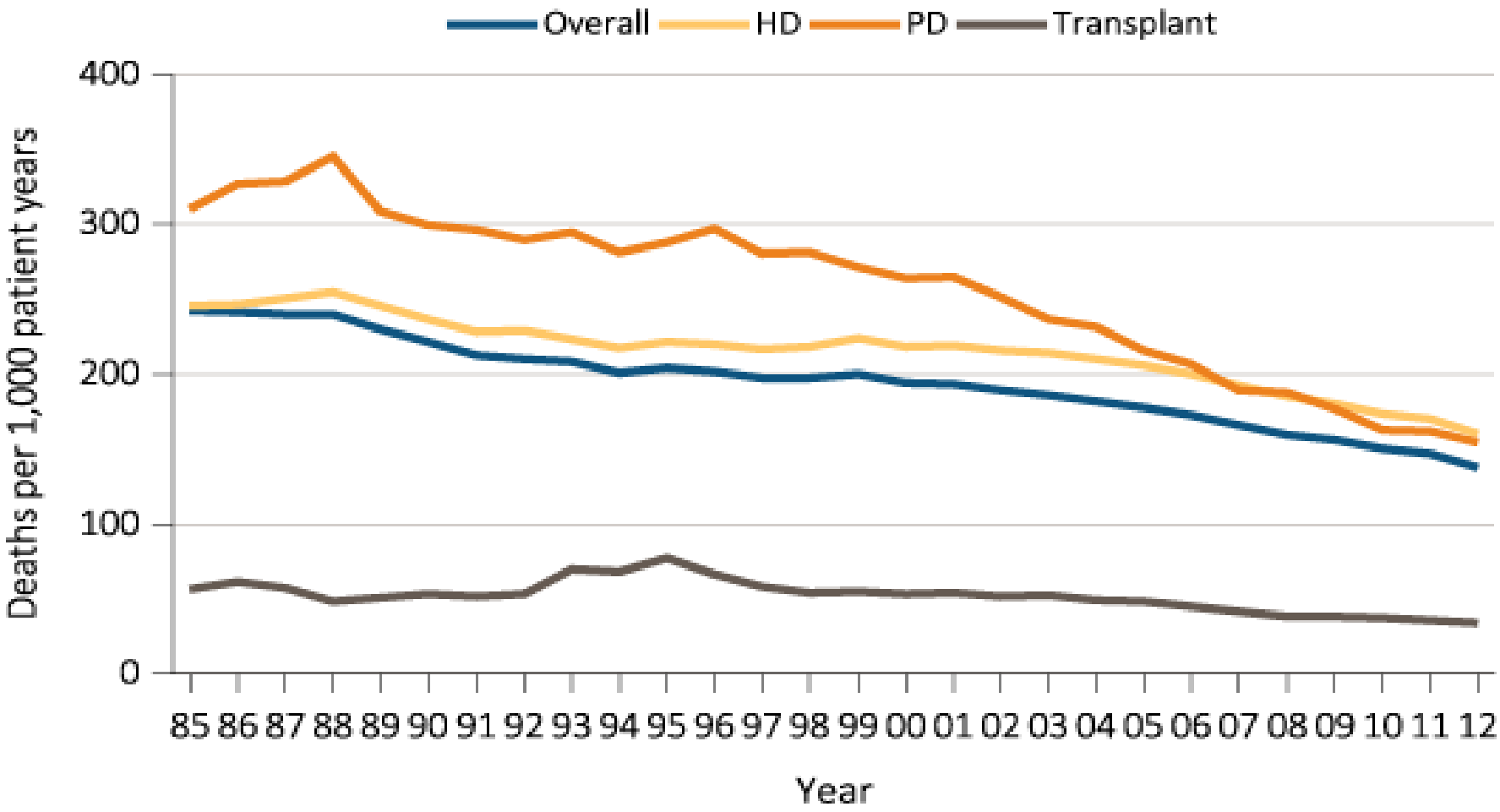
2014 US Renal Data System Annual Report
– End Stage Renal Disease Trends
Incidence rates in the US, by age category
1980 - 2012

The Situation Today: Incident Cases



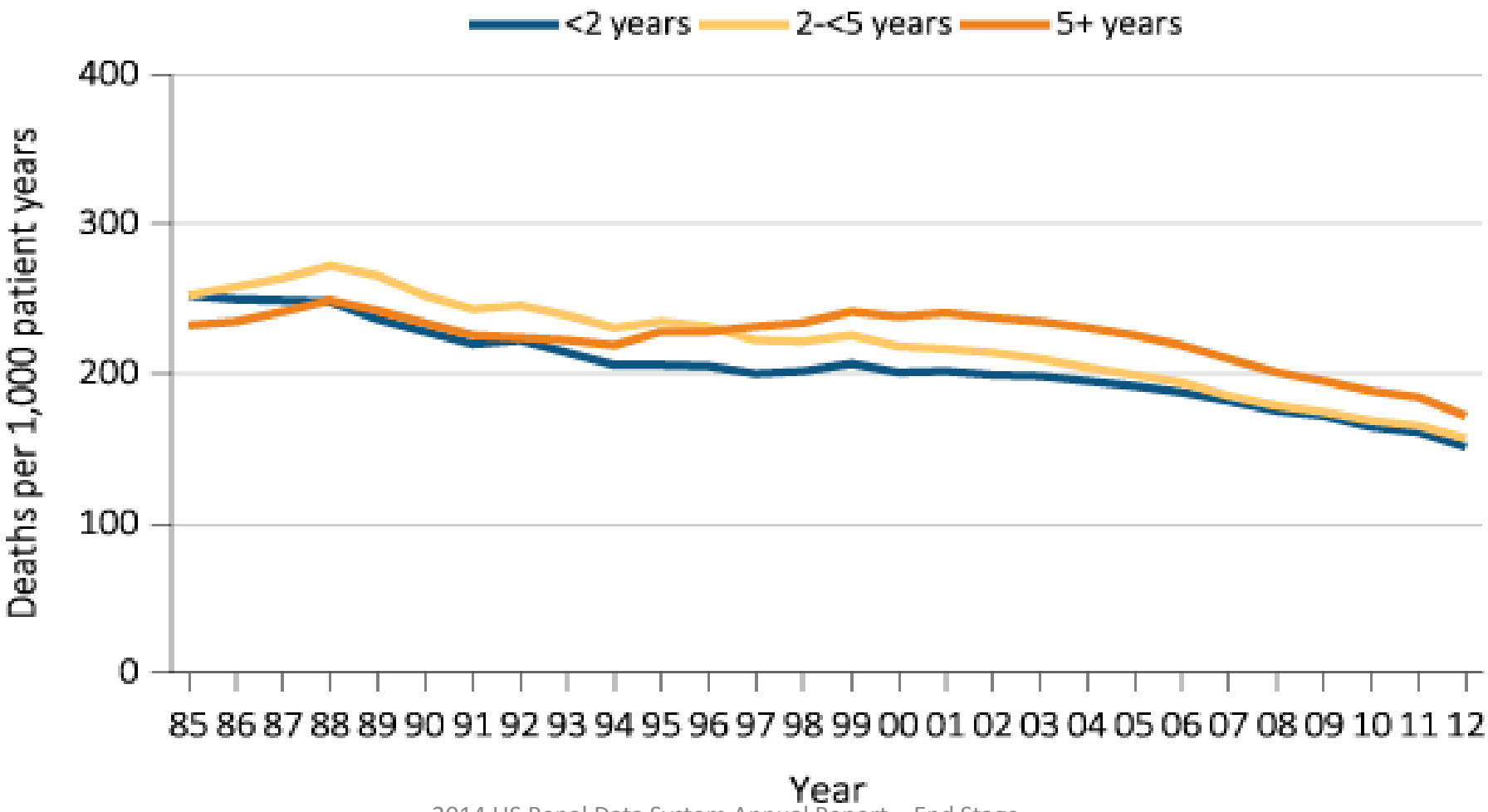
2014 US Renal Data System Annual Report
– End Stage Renal Disease Trends
Prevalence in the US,
1980 - 2012

The Situation Today: Death Rate - Mode



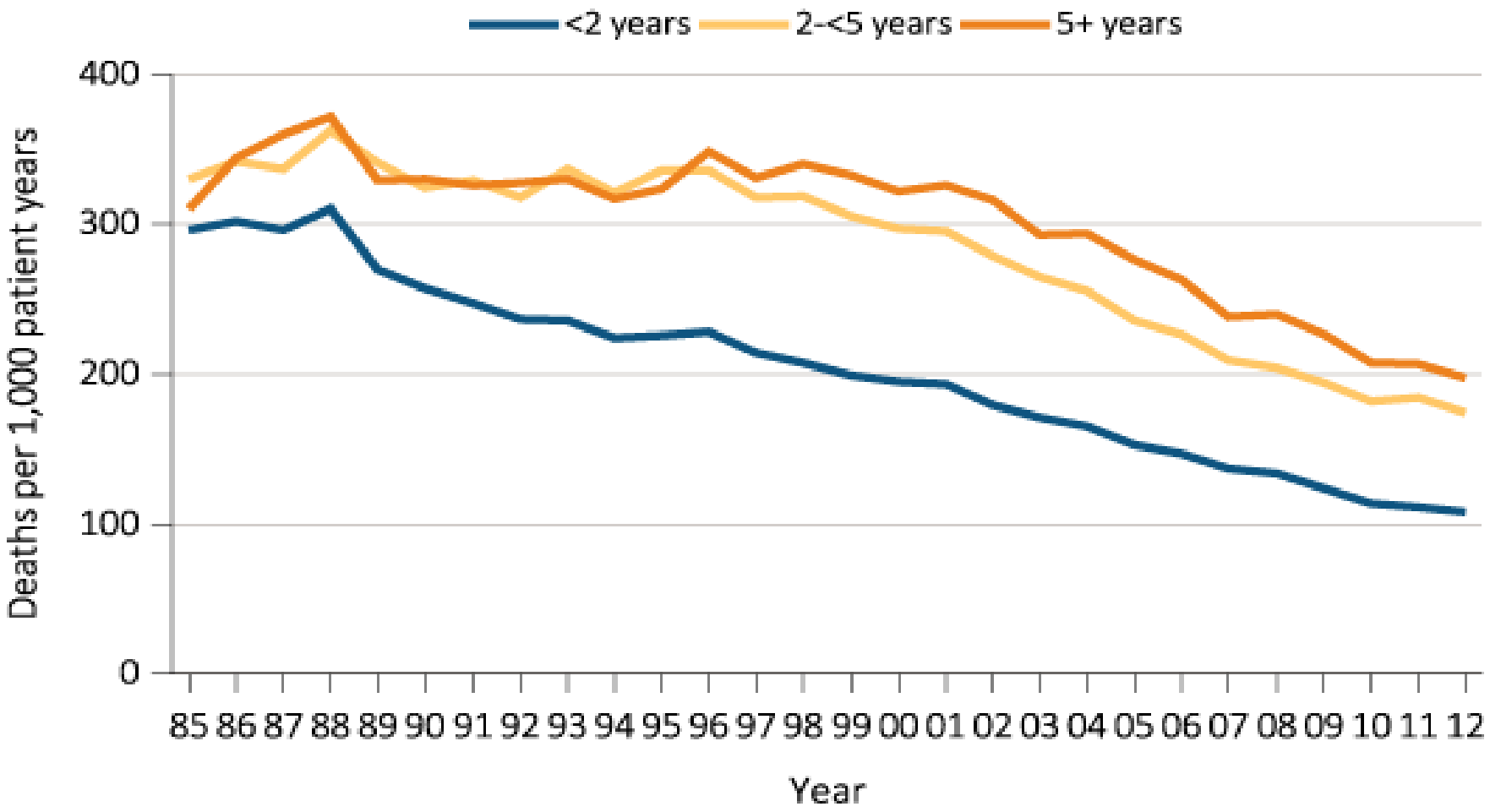
2014 US Renal Data System Annual Report – End Stage Renal Disease Trends Mortality rates, 1985 - 2012

The Situation Today: Death Rate - Hemodialysis



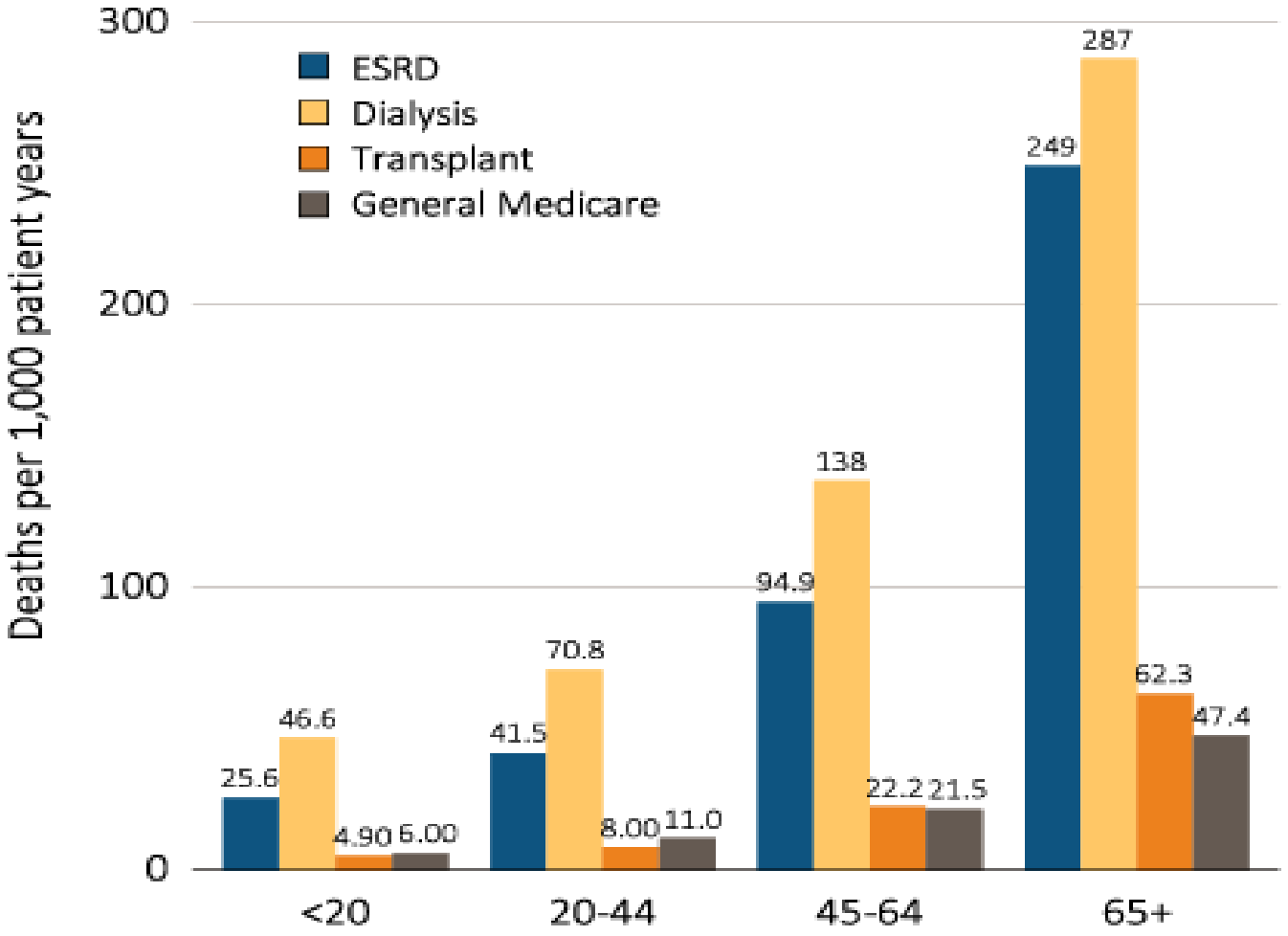
2014 US Renal Data System Annual Report – End Stage Renal Disease Trends, Mortality Rates for Hemodialysis by duration of dialysis, 1985 - 2012

The Situation Today: Death Rate - Peritoneal



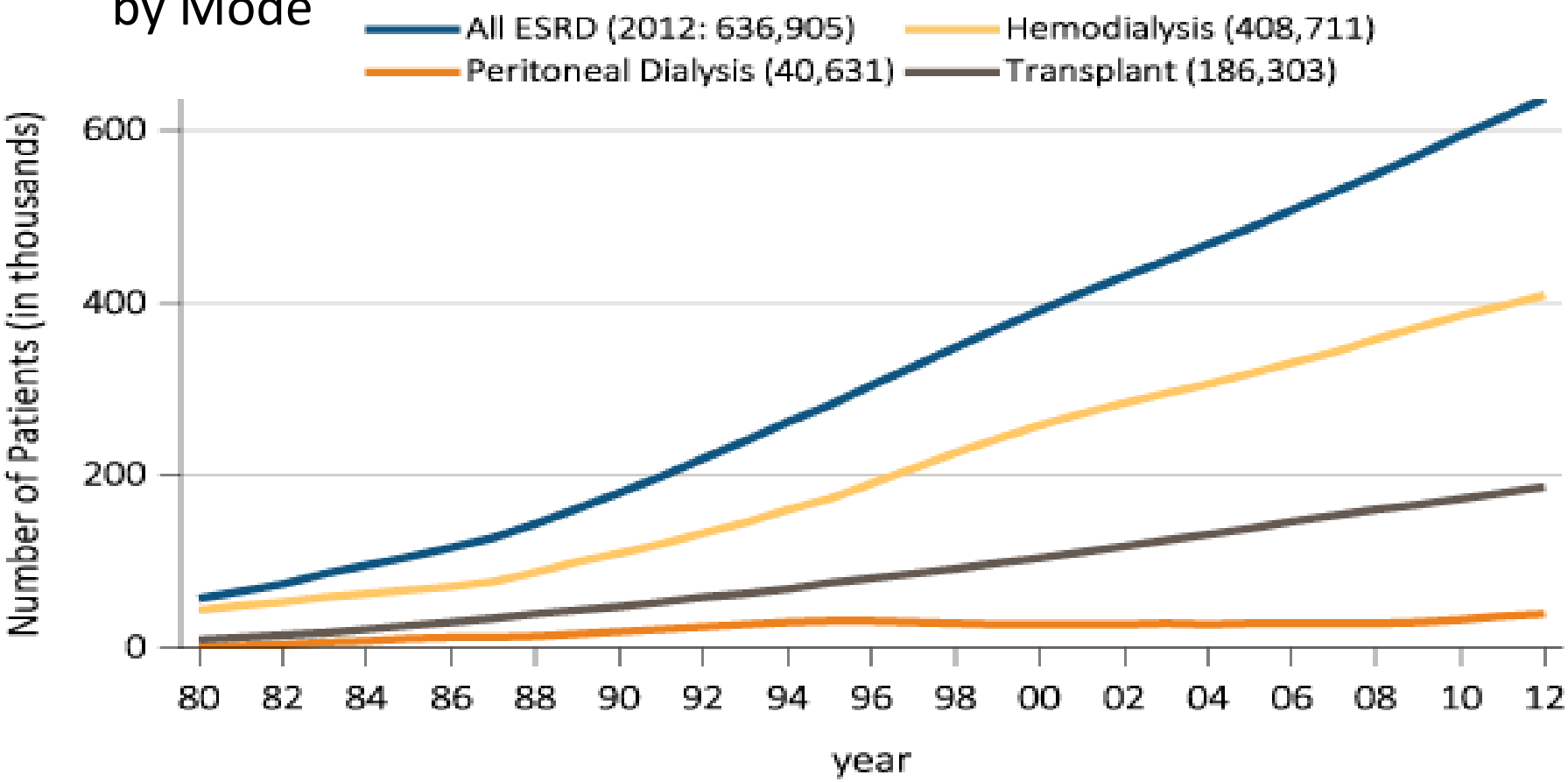
2014 US Renal Data System Annual Report – End Stage Renal Disease Trends, Mortality Rates for Peritoneal Dialysis by duration of dialysis, 1985 - 2012

The Situation Today: Death Rate – Mode, Age



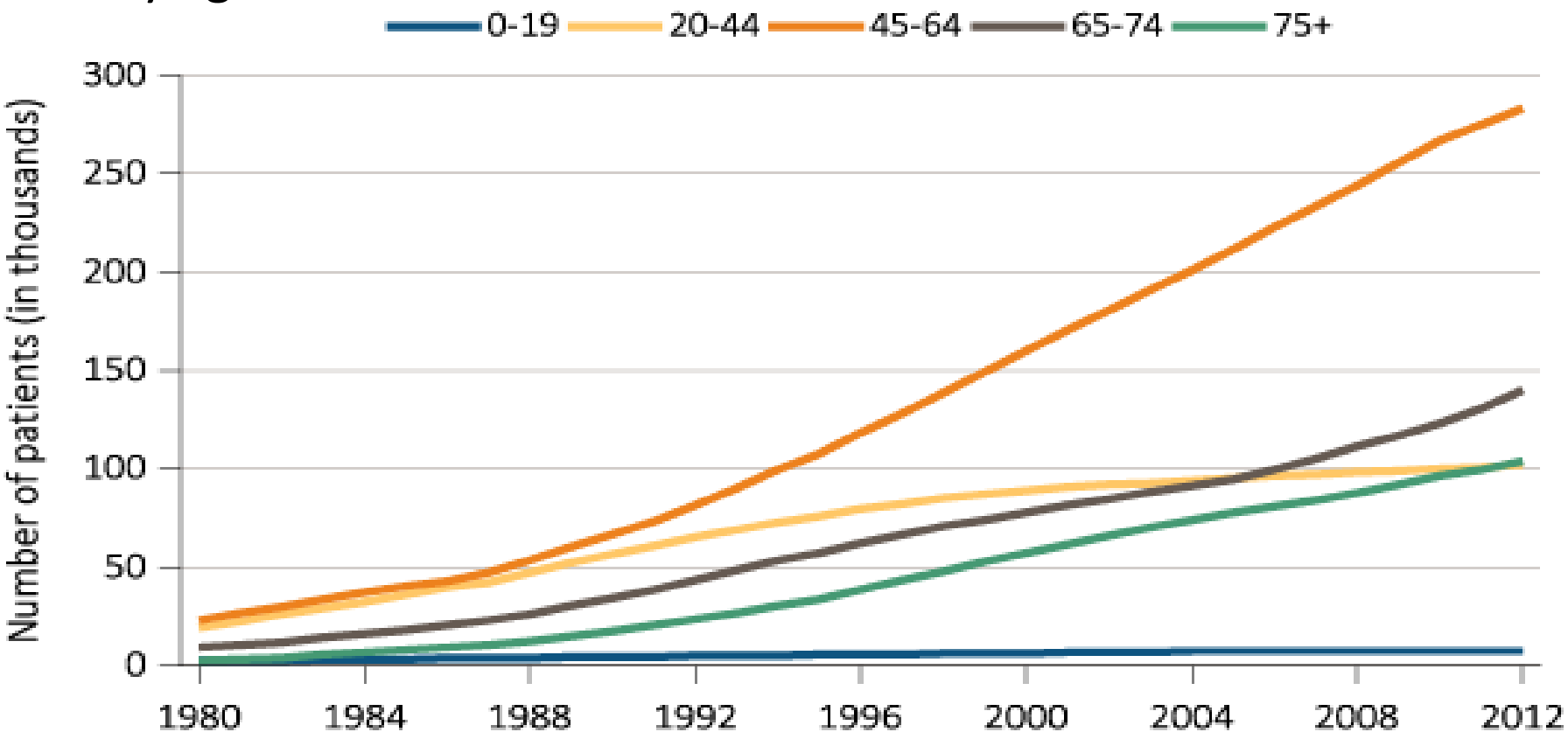
2014 US Renal Data System Annual Report - Chronic Kidney Disease Trends

The Situation Today: Prevalence counts – by Mode



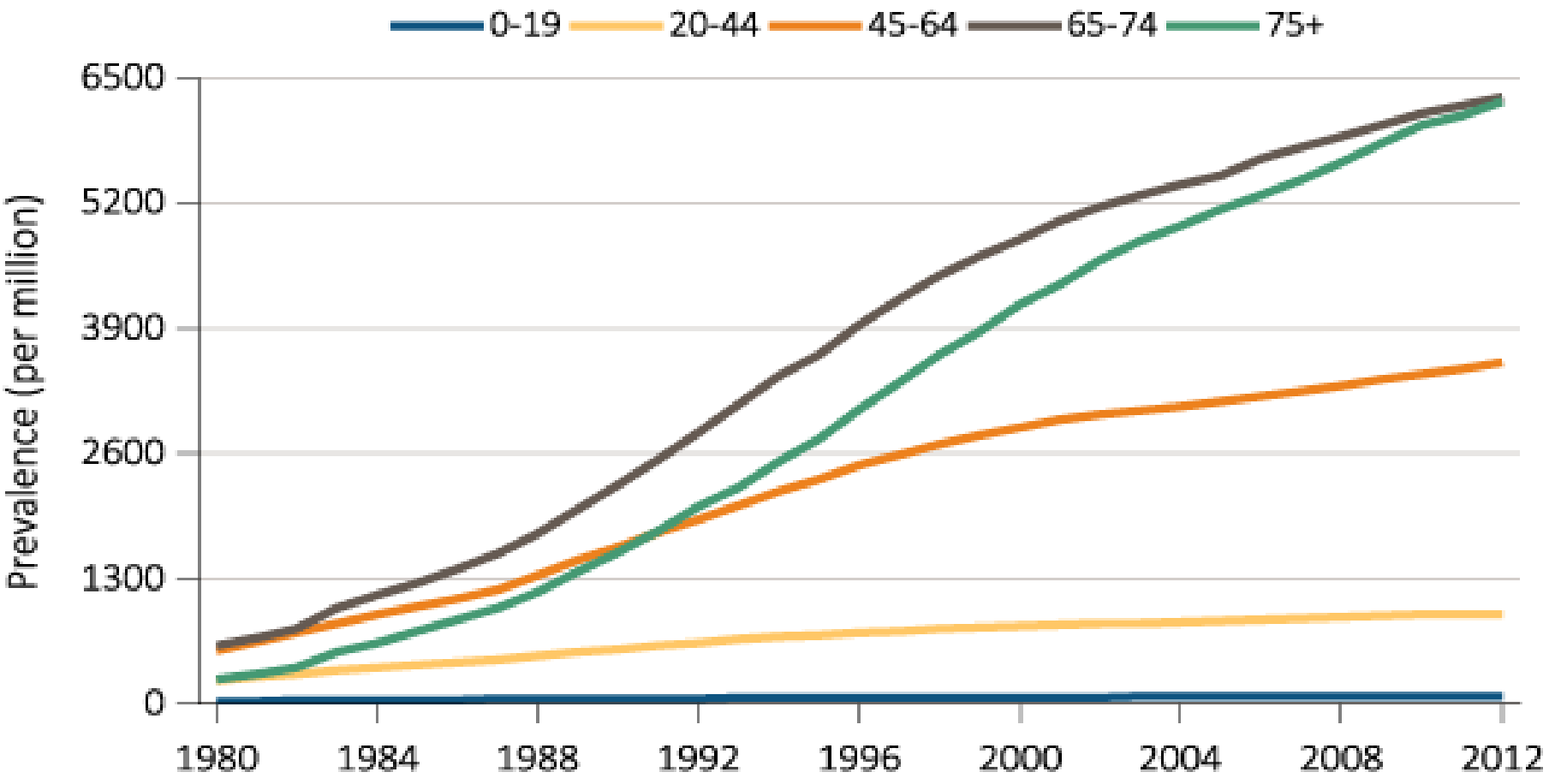
2014 US Renal Data System Annual Report
– End Stage Renal Disease Trends
Prevalence in the US, 1980- 2012

The Situation Today: Prevalence counts – by age



2014 US Renal Data System Annual Report
– End Stage Renal Disease Trends
Prevalence in the US, 1980- 2012

The Situation Today: Prevalence rates



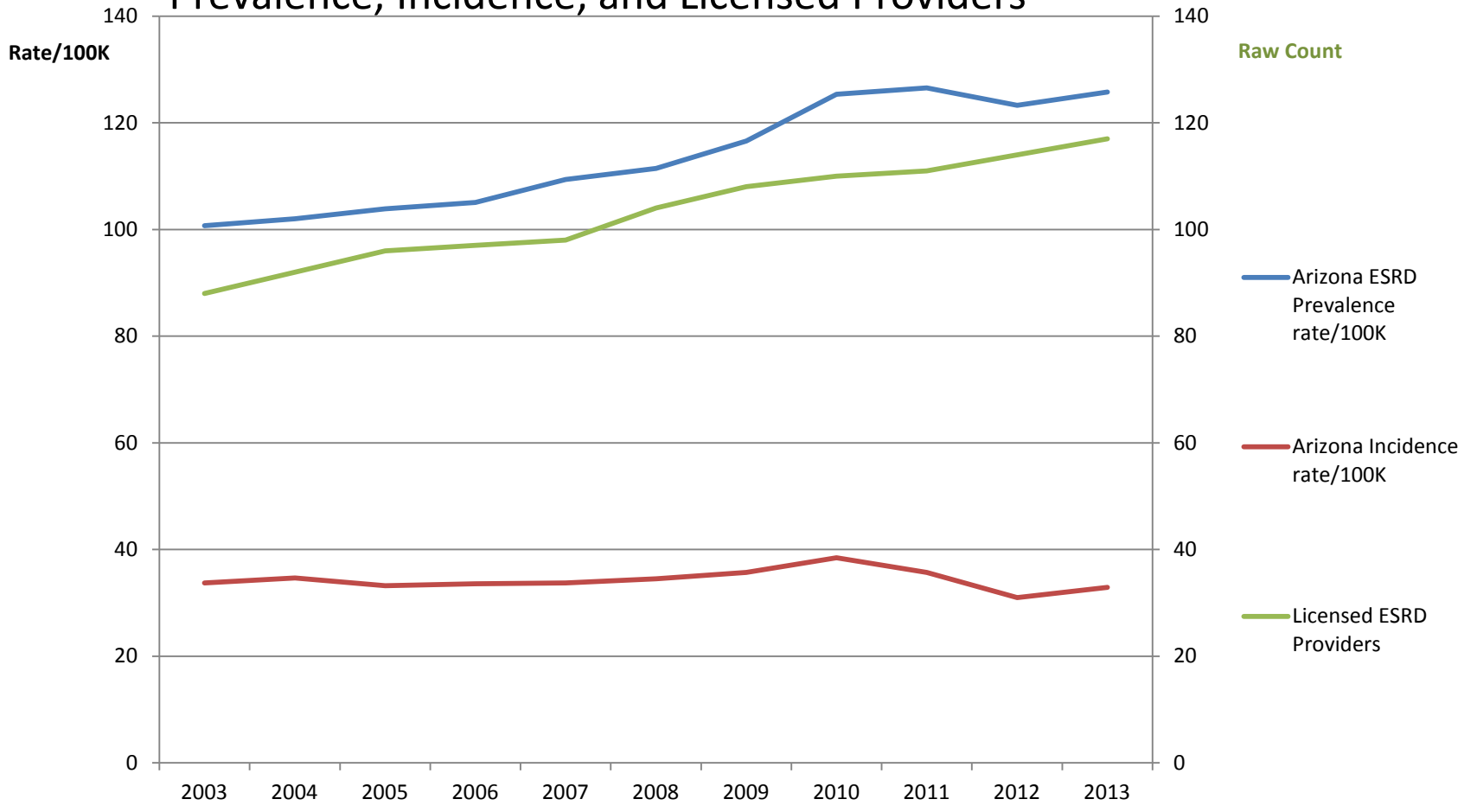
2014 US Renal Data System Annual Report
– End Stage Renal Disease Trends
Prevalence in the US, 1980- 2012

Take Home Messages:

- Death rates are declining, new diagnoses are rising, and the combined effect is a persistent increase in the number of persons who are living with ESRD
- Low levels of awareness (<10%) among persons with chronic kidney disease present an opportunity for expansion of early treatment and prevention/delay of ESRD.
- The primary drivers of ESRD are diabetes, hypertension, cardiovascular disease, and obesity

The Situation in Arizona:

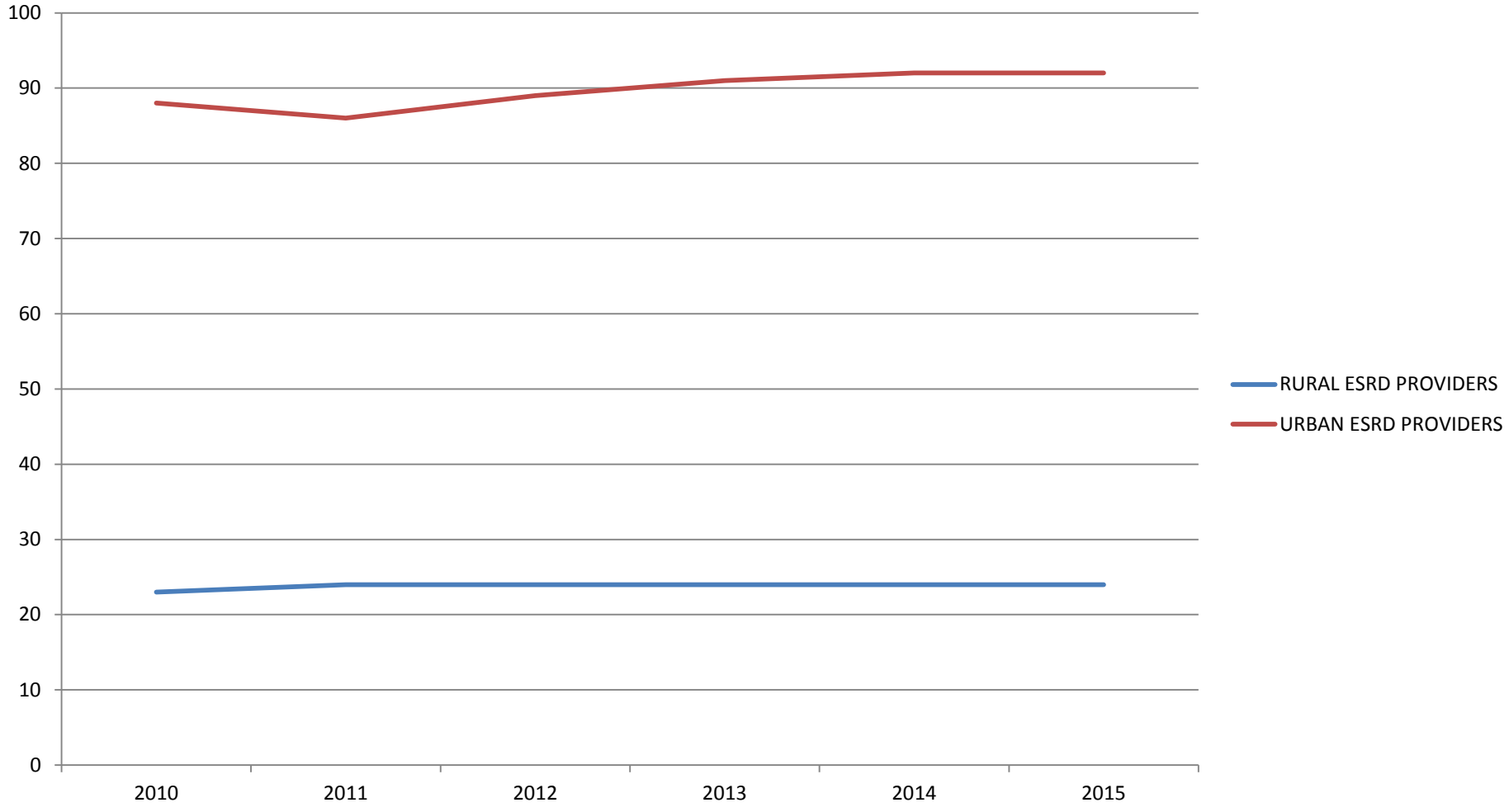
Prevalence, Incidence, and Licensed Providers



Data source: 2013 Intermountain ESRD Network, Network 15 Annual Report; US Census Population Estimates

The Situation in Arizona:

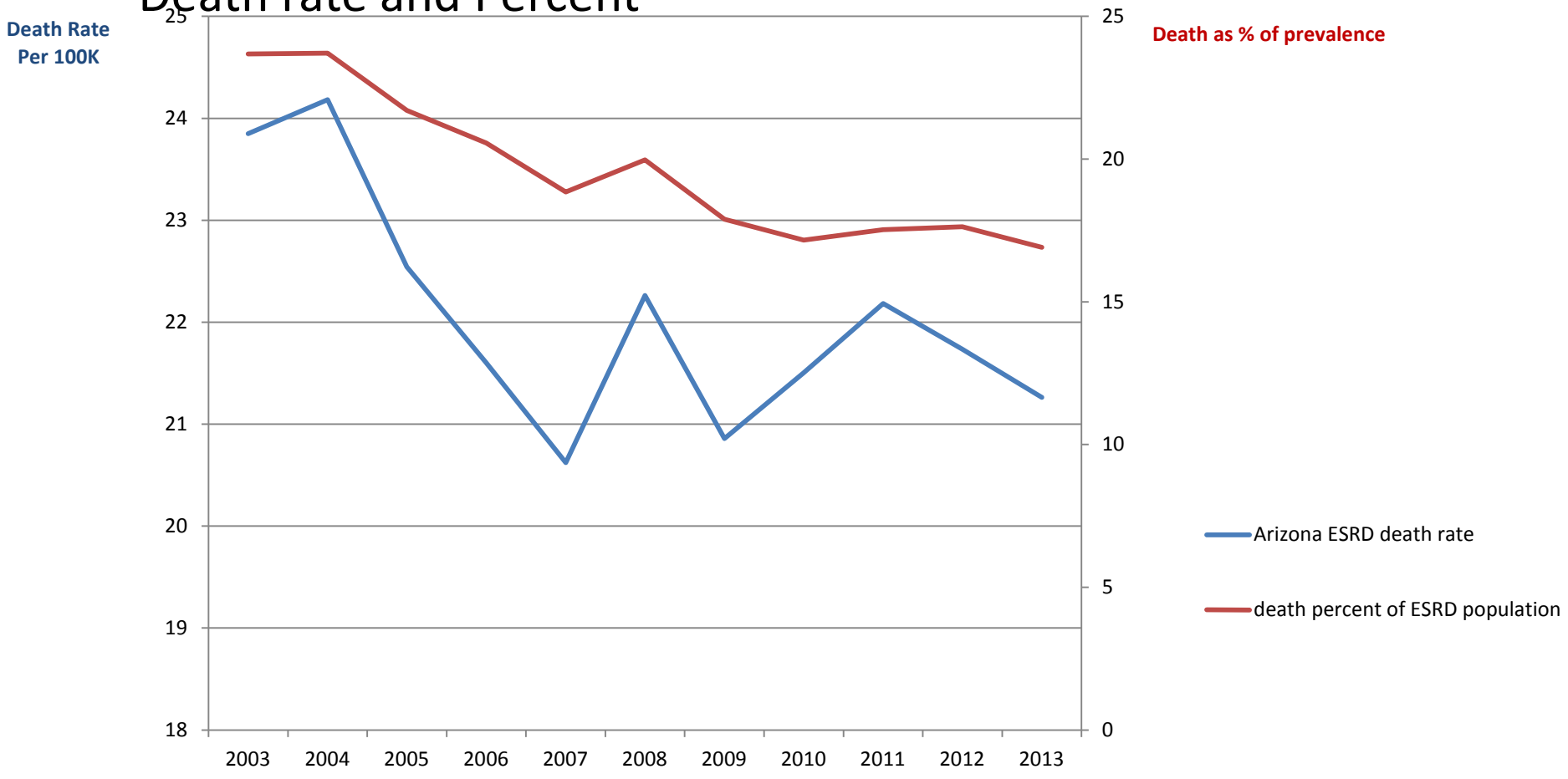
Licensed Providers by Region – Urban/Rural



Arizona ASPEN – Licensed Medical Facilities Data System

The Situation in Arizona:

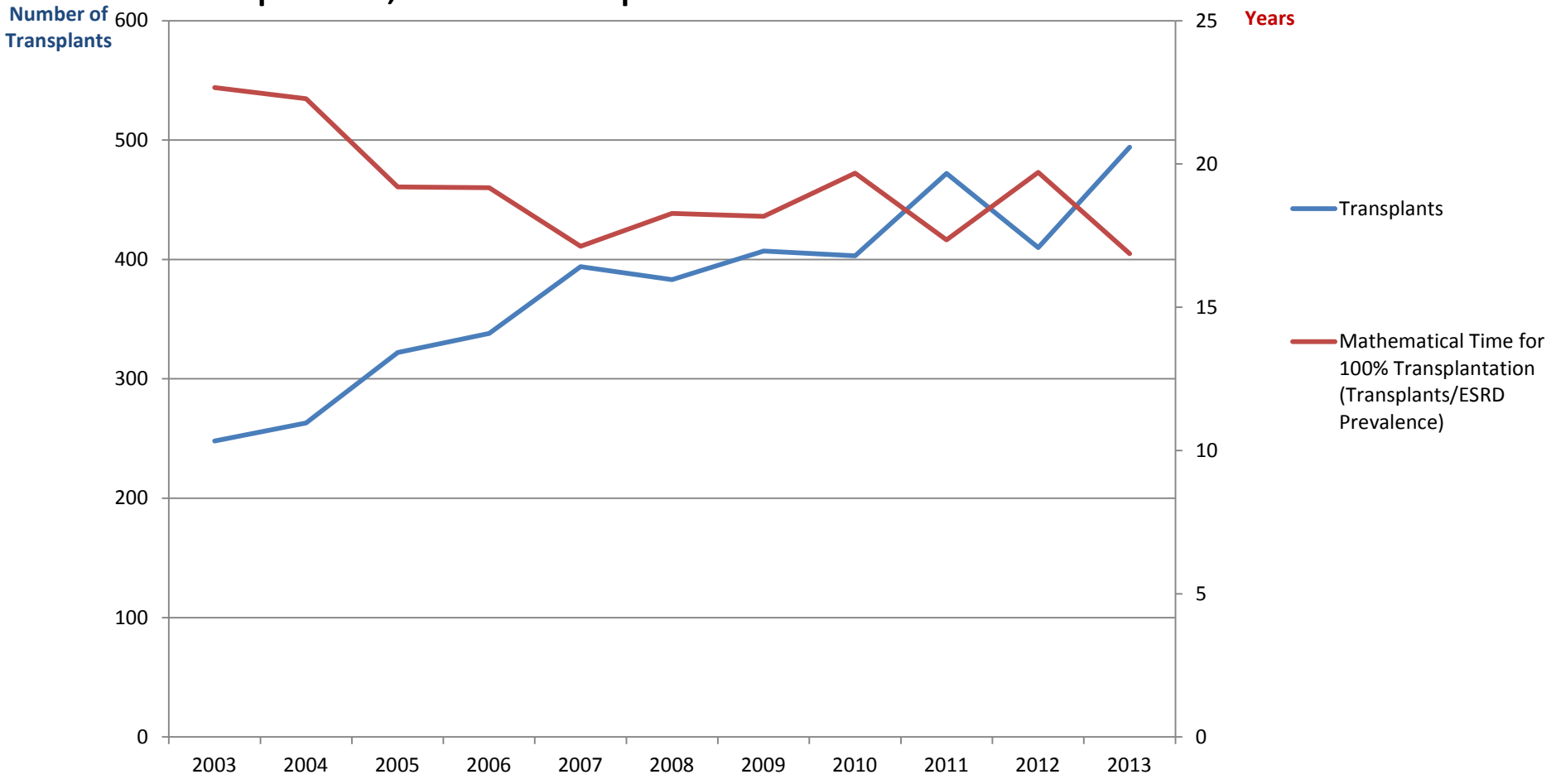
Death rate and Percent



Data source: 2013 Intermountain ESRD Network, Network 15 Annual Report; US Census Population Estimates

The Situation in Arizona:

Transplants, and Transplant Demand Time



Data source: 2013 Intermountain ESRD Network, Network 15 Annual Report; US Census Population Estimates

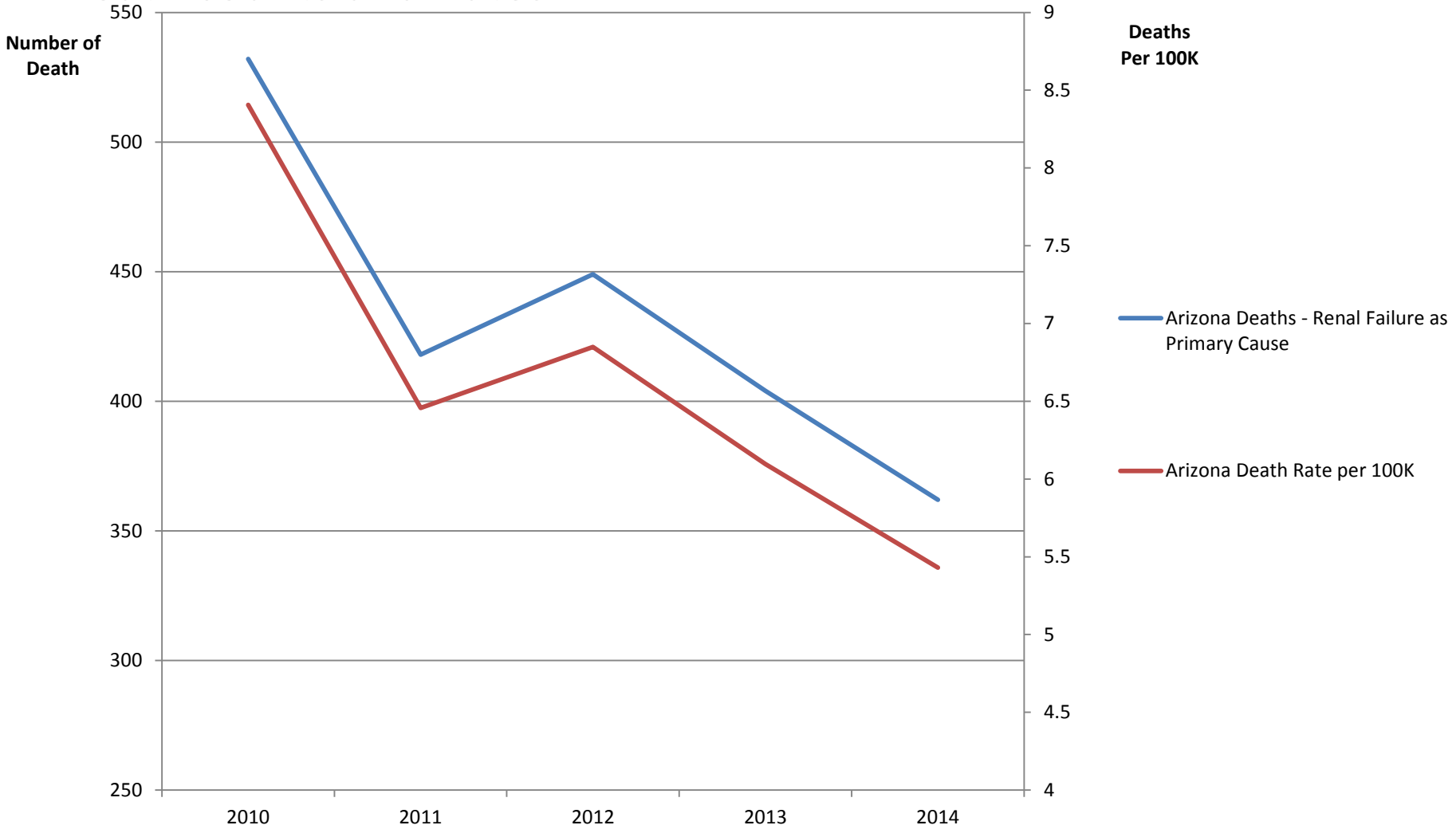
The Situation in Arizona:

- In Arizona, Native Americans among race/ethnicity groups as significantly more likely to have ESRD.
- Males are also at greater likelihood of having ESRD

2014 US Renal Data System Annual Report - Chronic Kidney Disease Trends

The Situation in Arizona: Renal Failure

Death counts and Rates

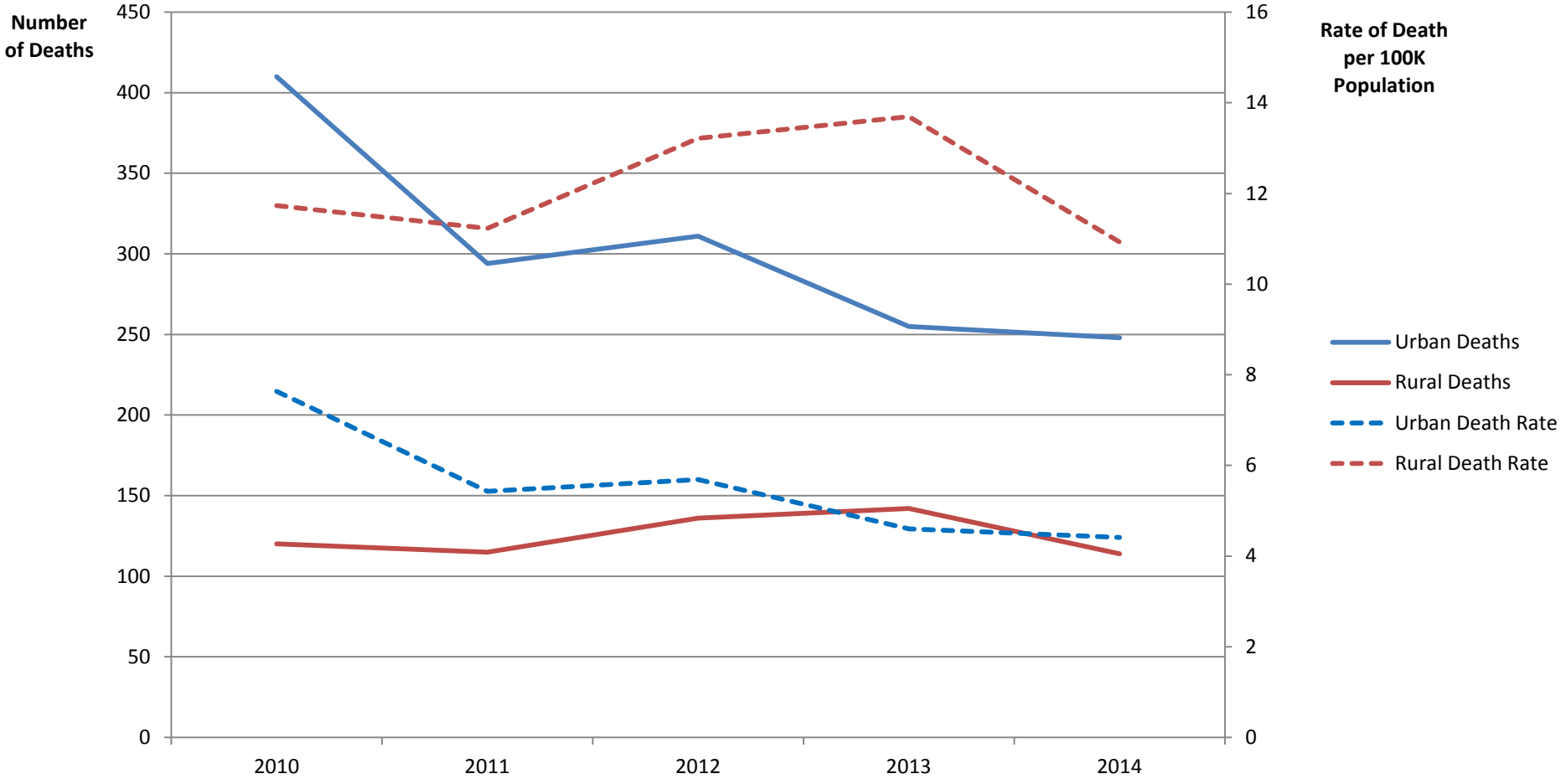


Arizona Death Certificates, 2010 - 2014

The Situation in Arizona: Arizona Renal Failure Deaths and Death Rates 2010 - 2014

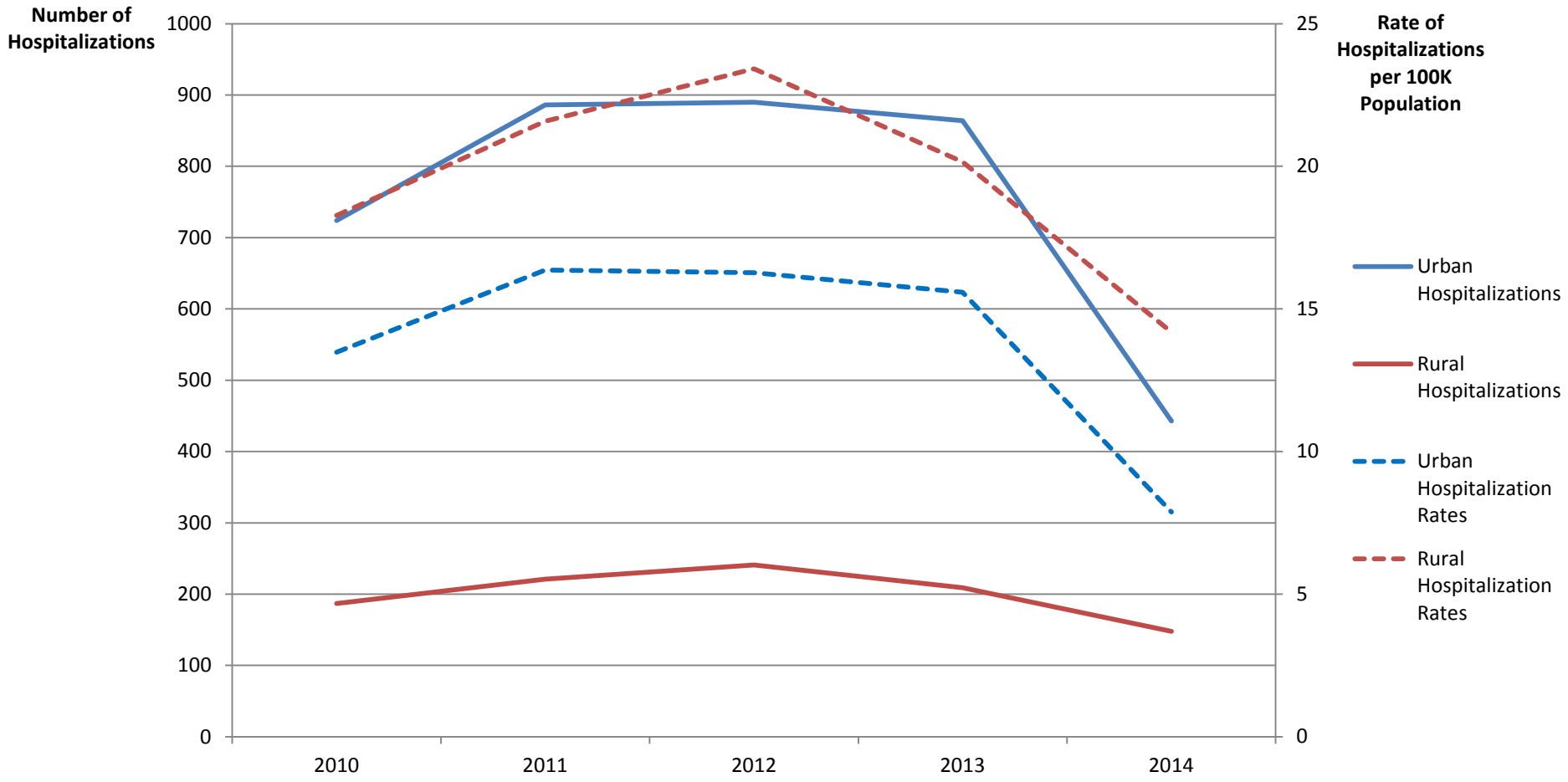
Arizona Death Certificates

The Situation in Arizona: Deaths and Death Rates in Urban and Rural Regions



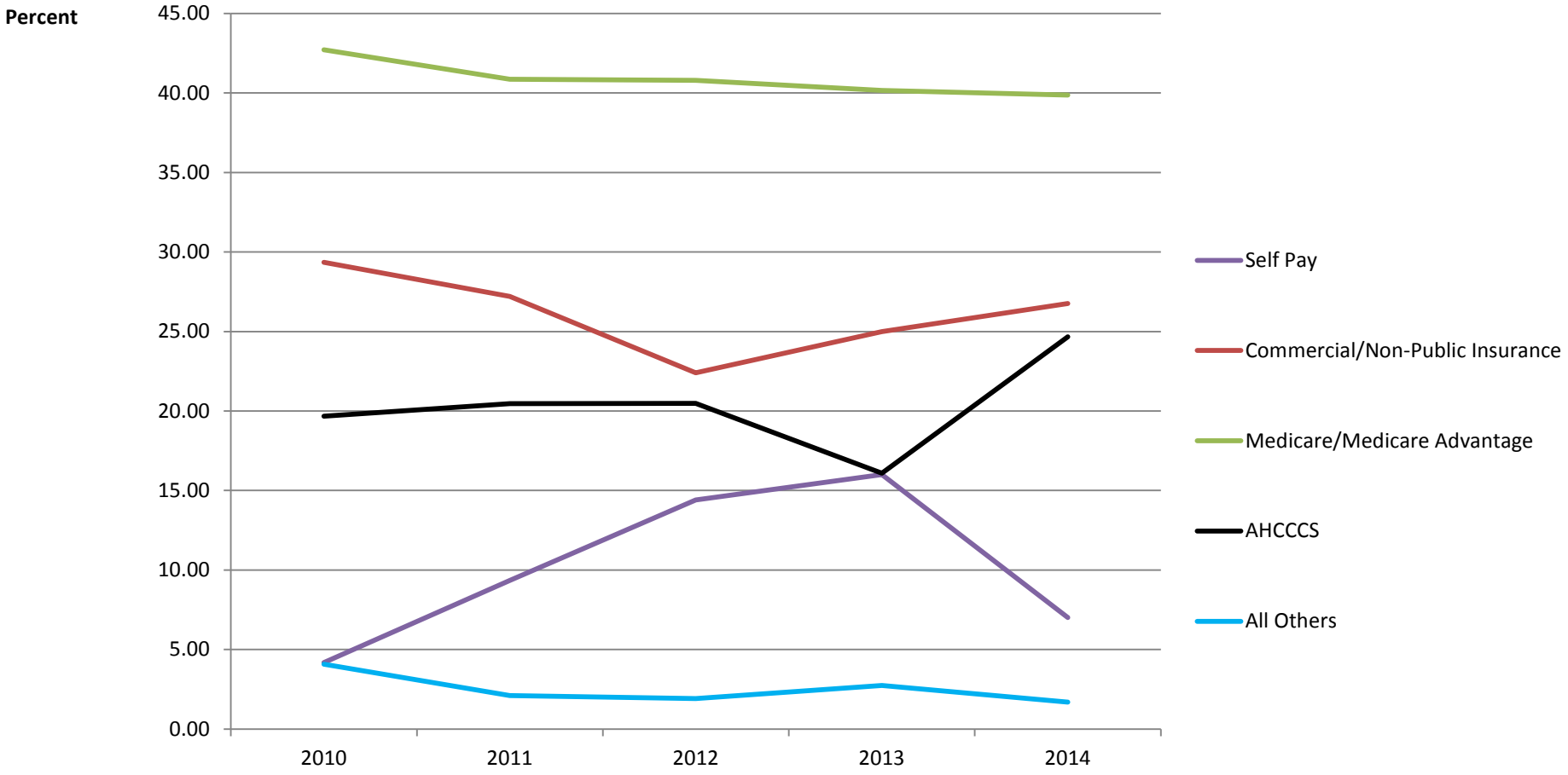
The Situation in Arizona: Arizona

Hospitalizations related to Chronic Kidney Disease – Urban/Rural



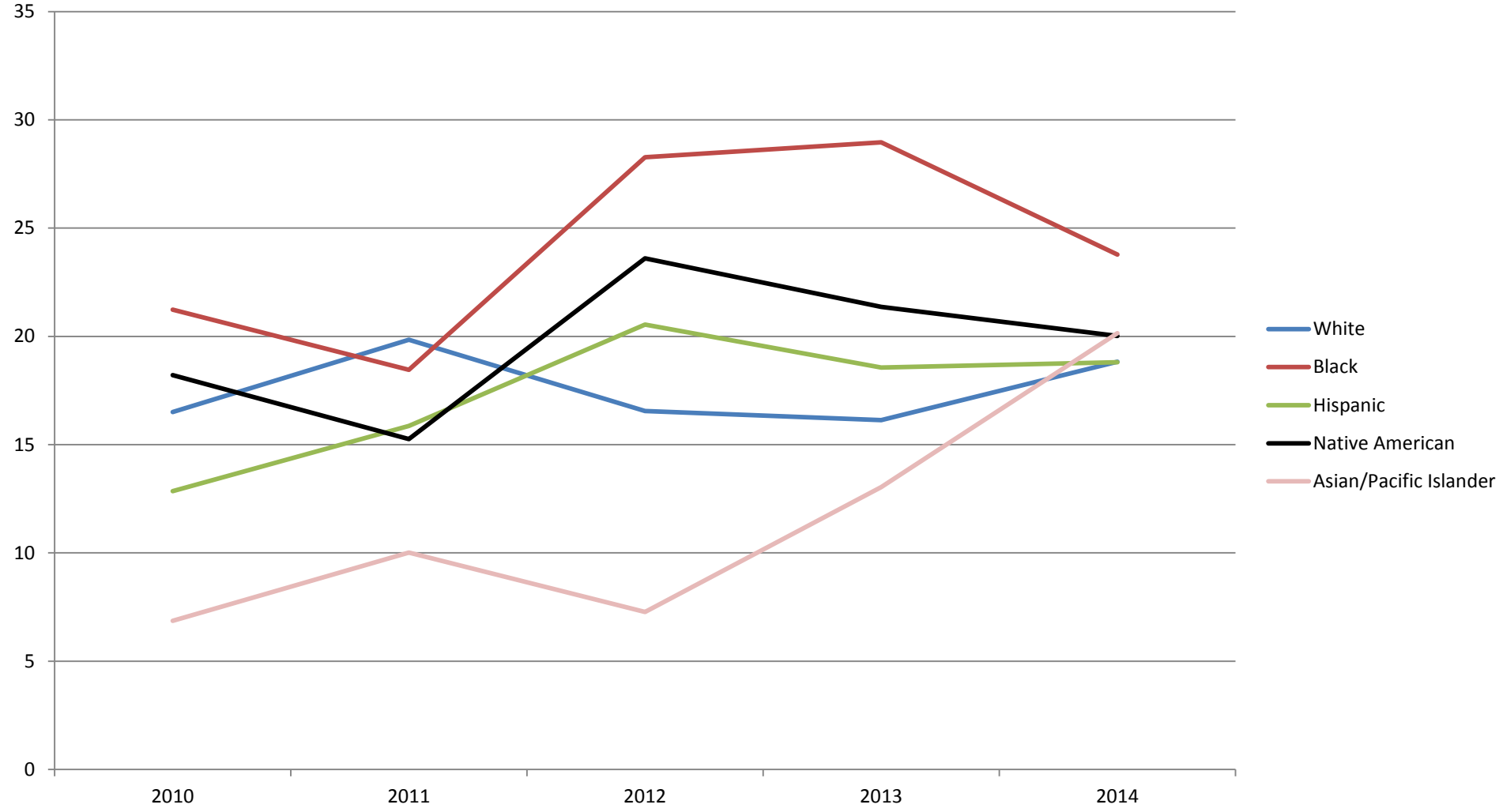
Arizona Hospital Discharge Data

The Situation in Arizona: Arizona Hospitalizations related to Chronic Kidney Disease – Payer Source



Arizona Hospital Discharge Data

The Situation in Arizona: Arizona Hospitalizations related to Chronic Kidney Disease – Race/Ethnicity

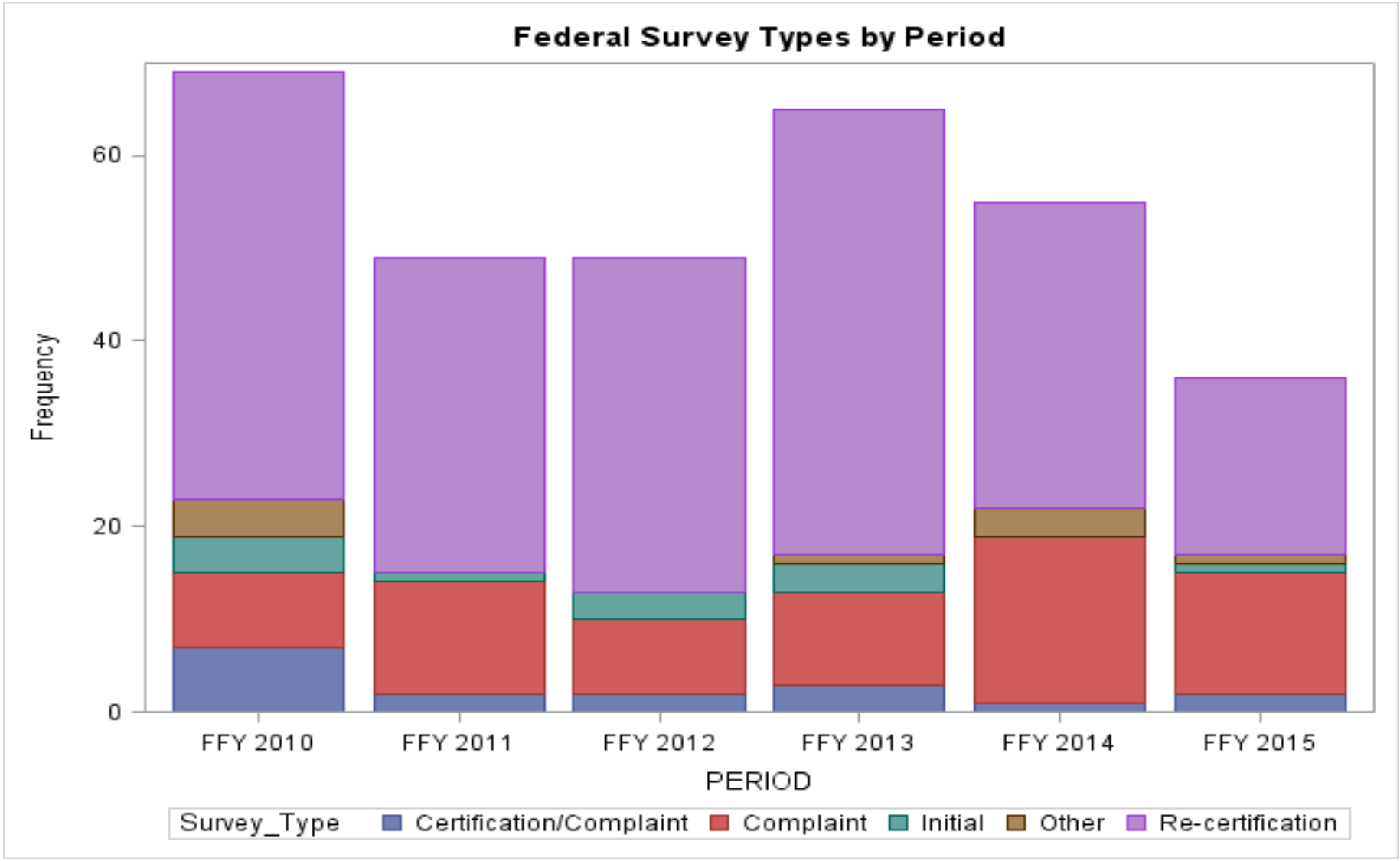


Arizona Hospital Discharge Data

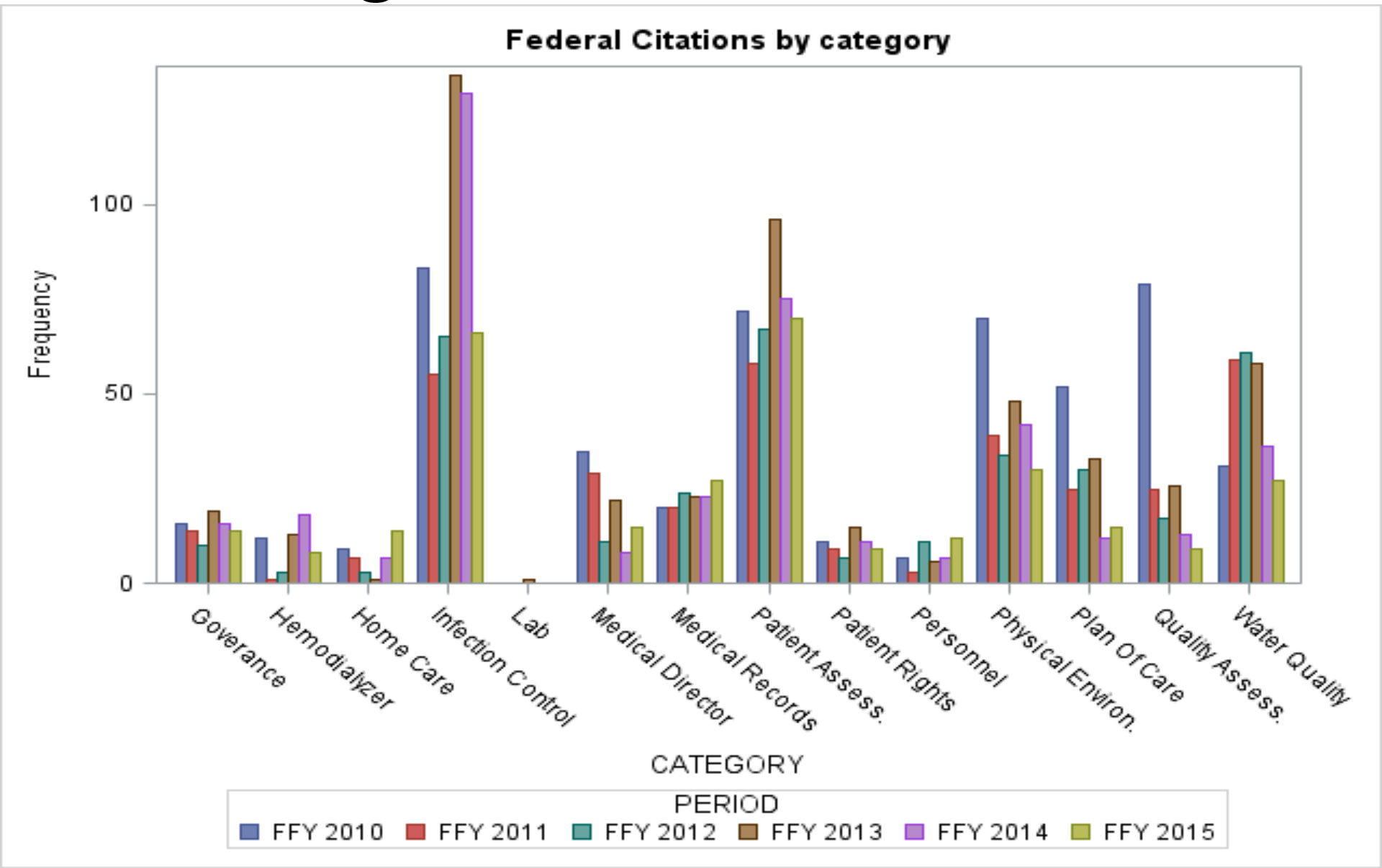
Take Home Messages:

- Arizona trends of declining death rates, rising prevalence of persons with ESRD, and increasing death rates by age mirror those of the nation.
- Males in Arizona are more likely to be living with ESRD, or newly diagnosed with ESRD than females, mirroring national trends.
- Native Americans with ESRD in Arizona are 3 times more likely to die than persons of other race/ethnicity groups.
- Rural regions of Arizona have significantly higher rates of death and hospitalization from renal disease, but no increase in licensed providers during recent years.

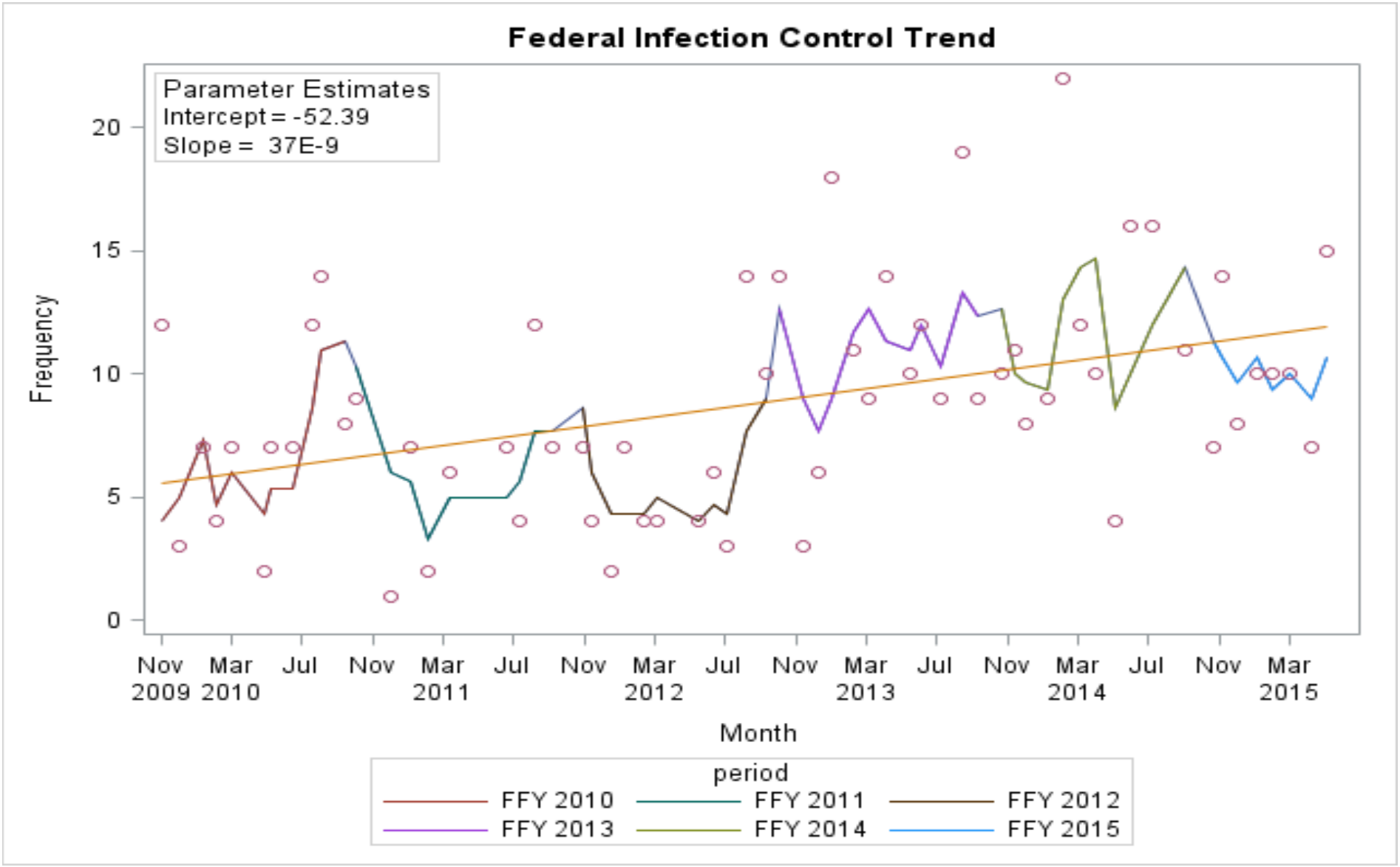
Licensing Data: Survey Numbers and Types



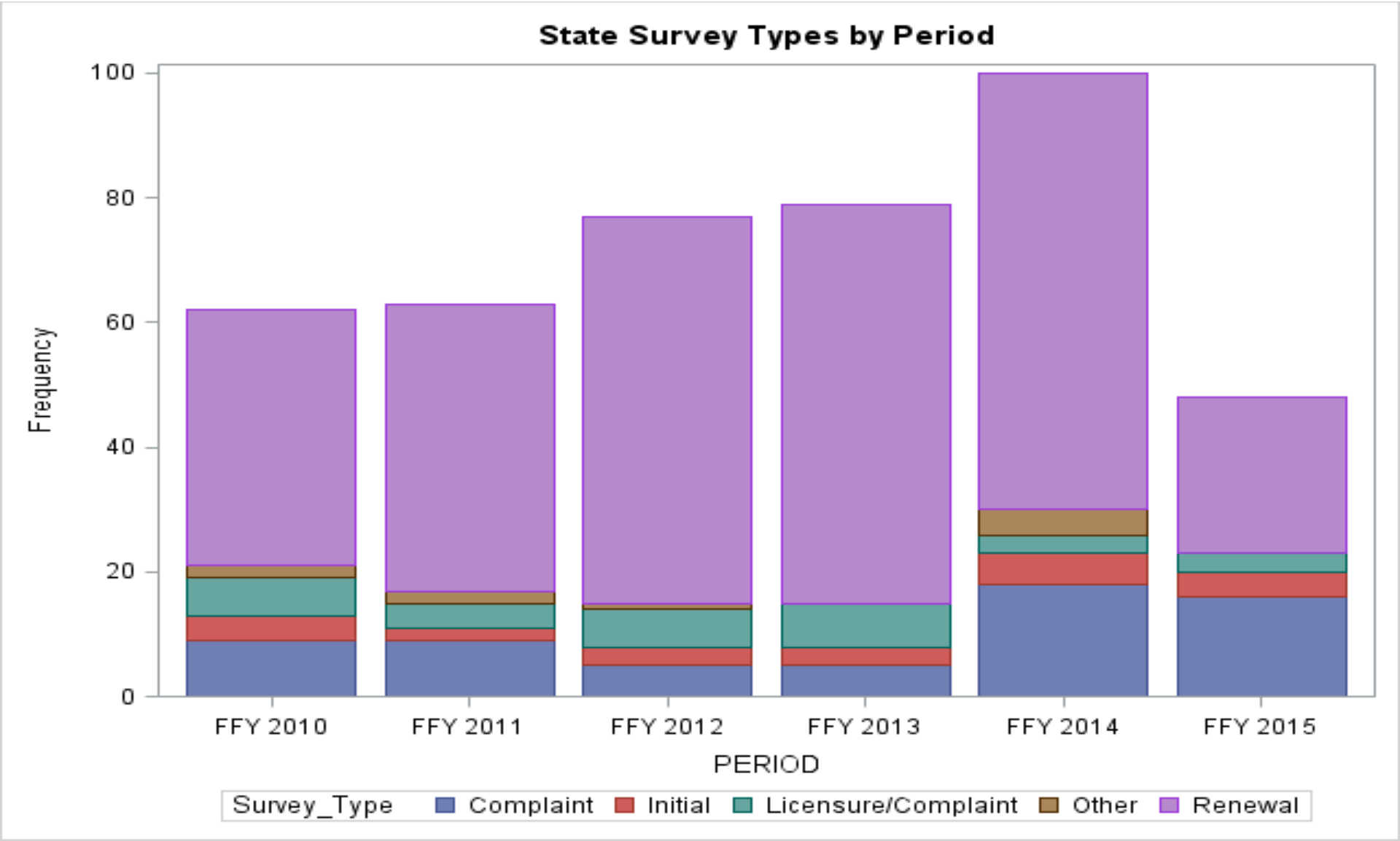
Licensing Data: Federal Citations by Year



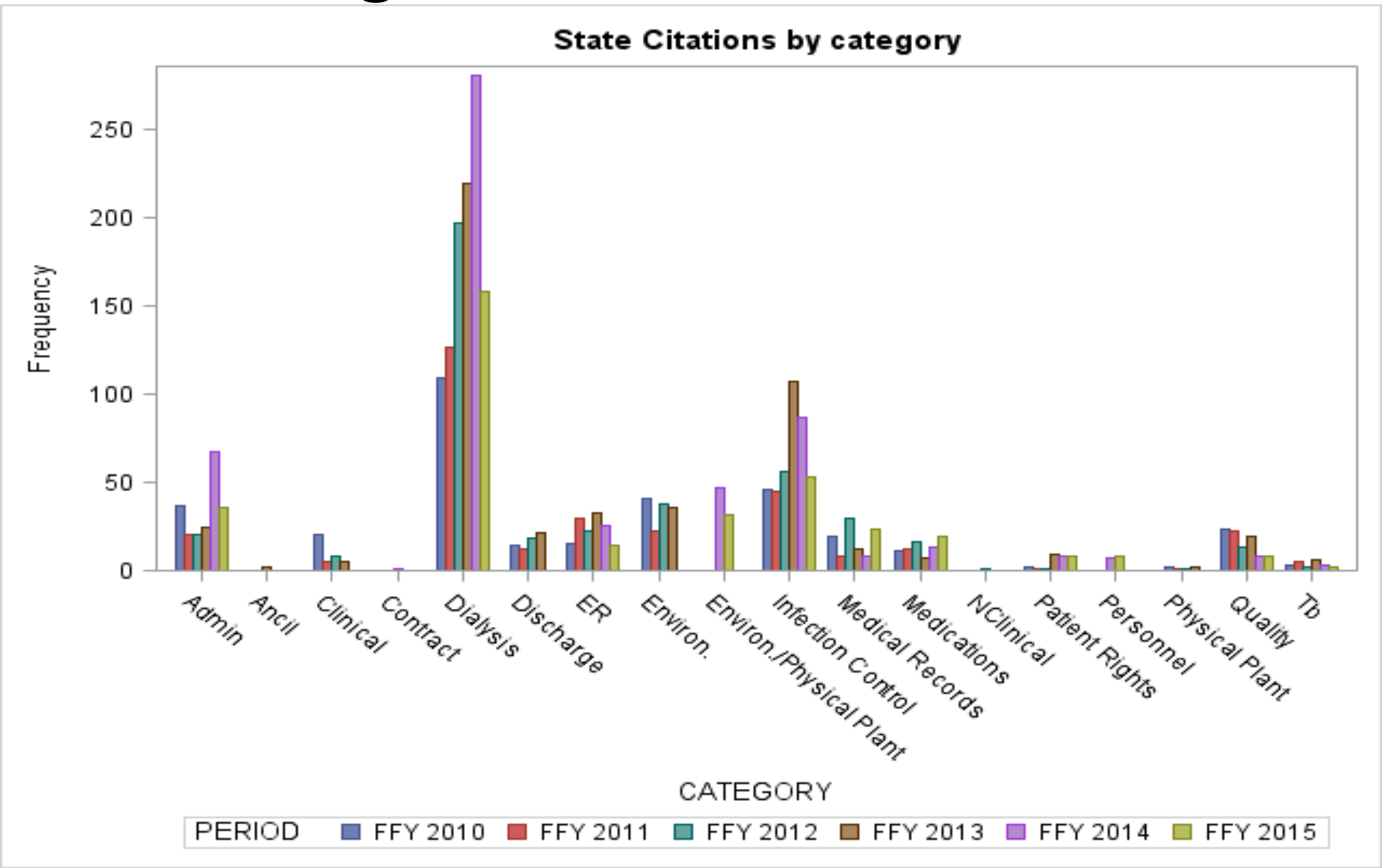
Licensing Data: Federal Infection Control Citation Trend



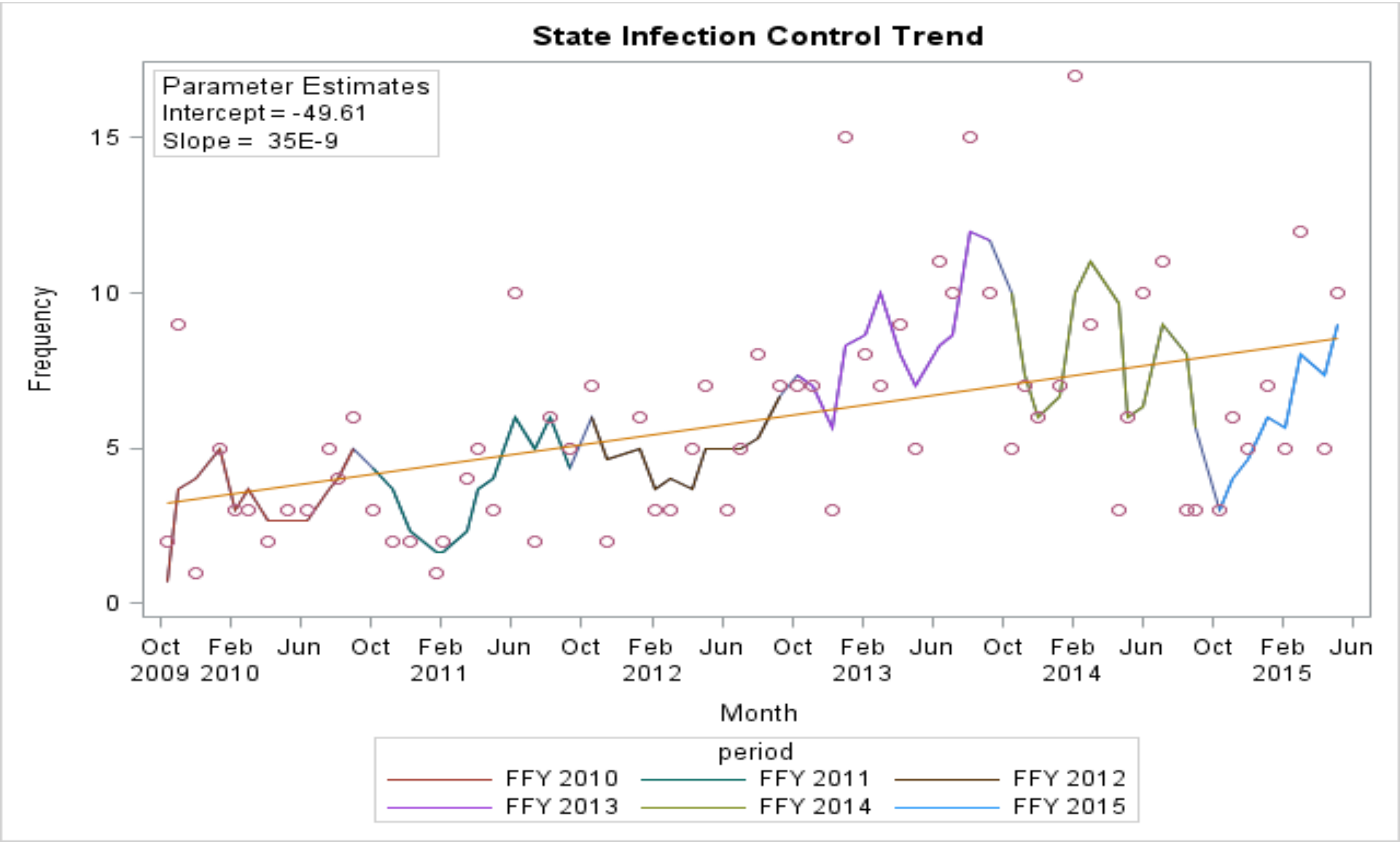
Licensing Data: State Surveys



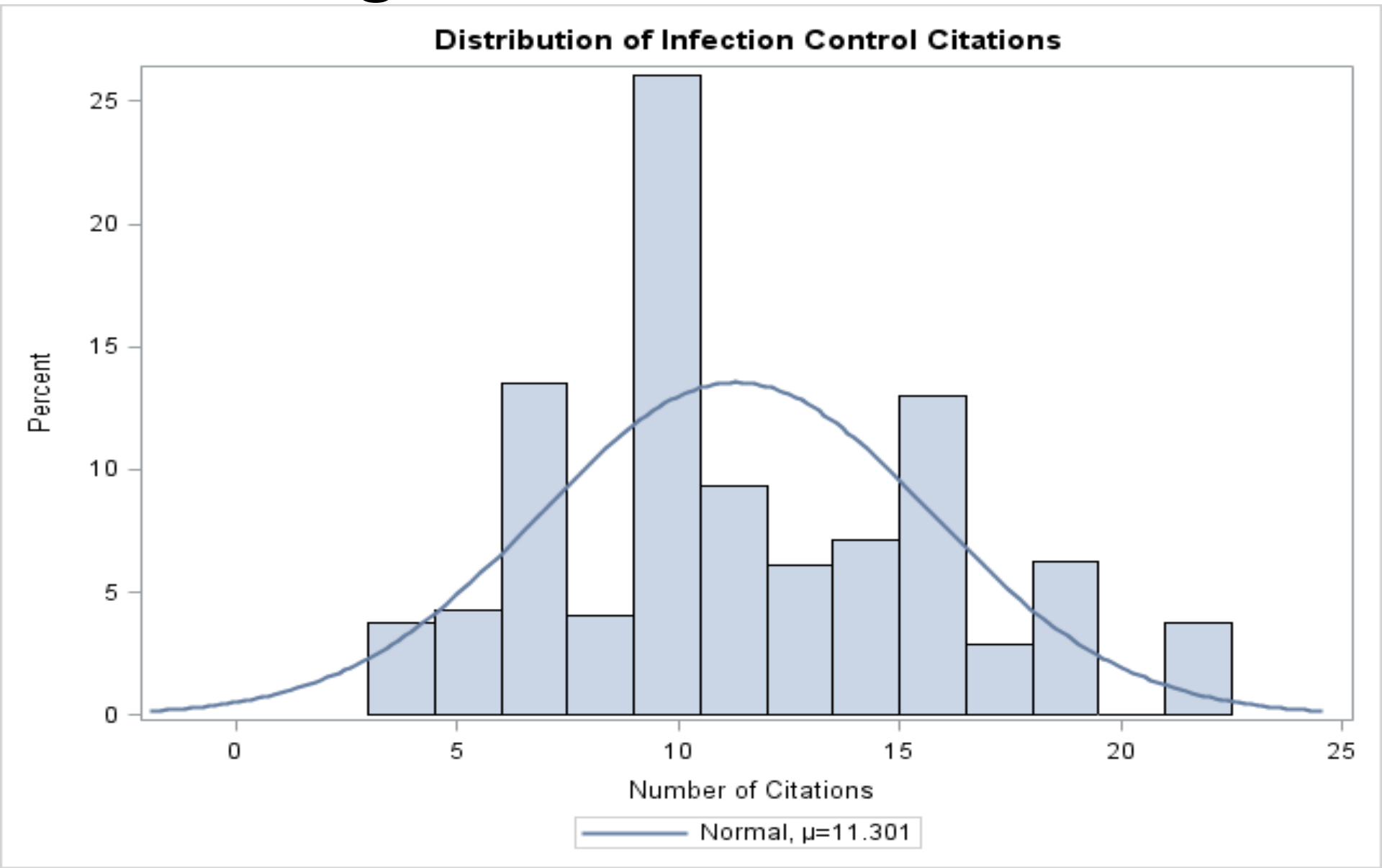
Licensing Data: State Citations by Category



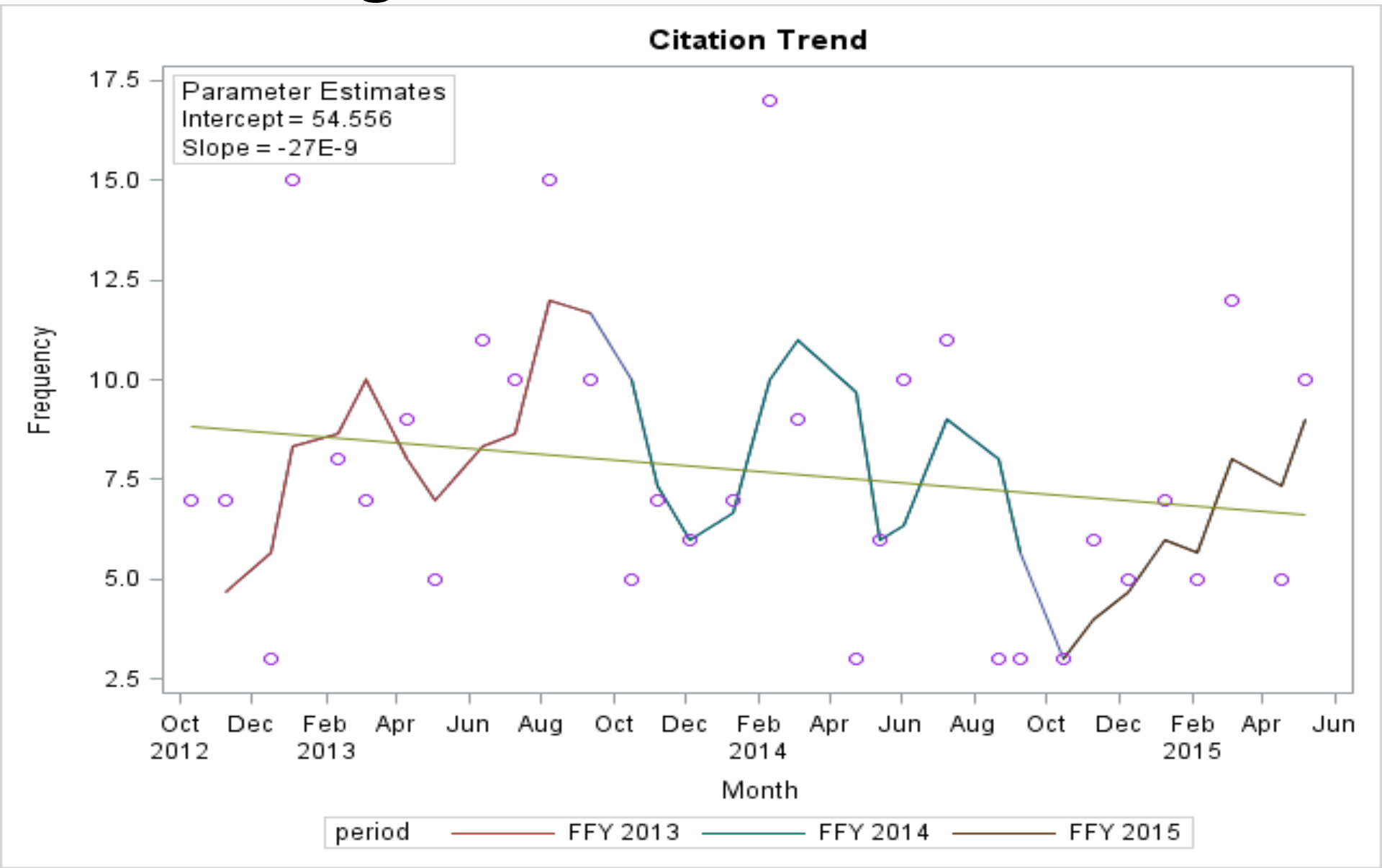
Licensing Data: State Infection Control Citation Trend



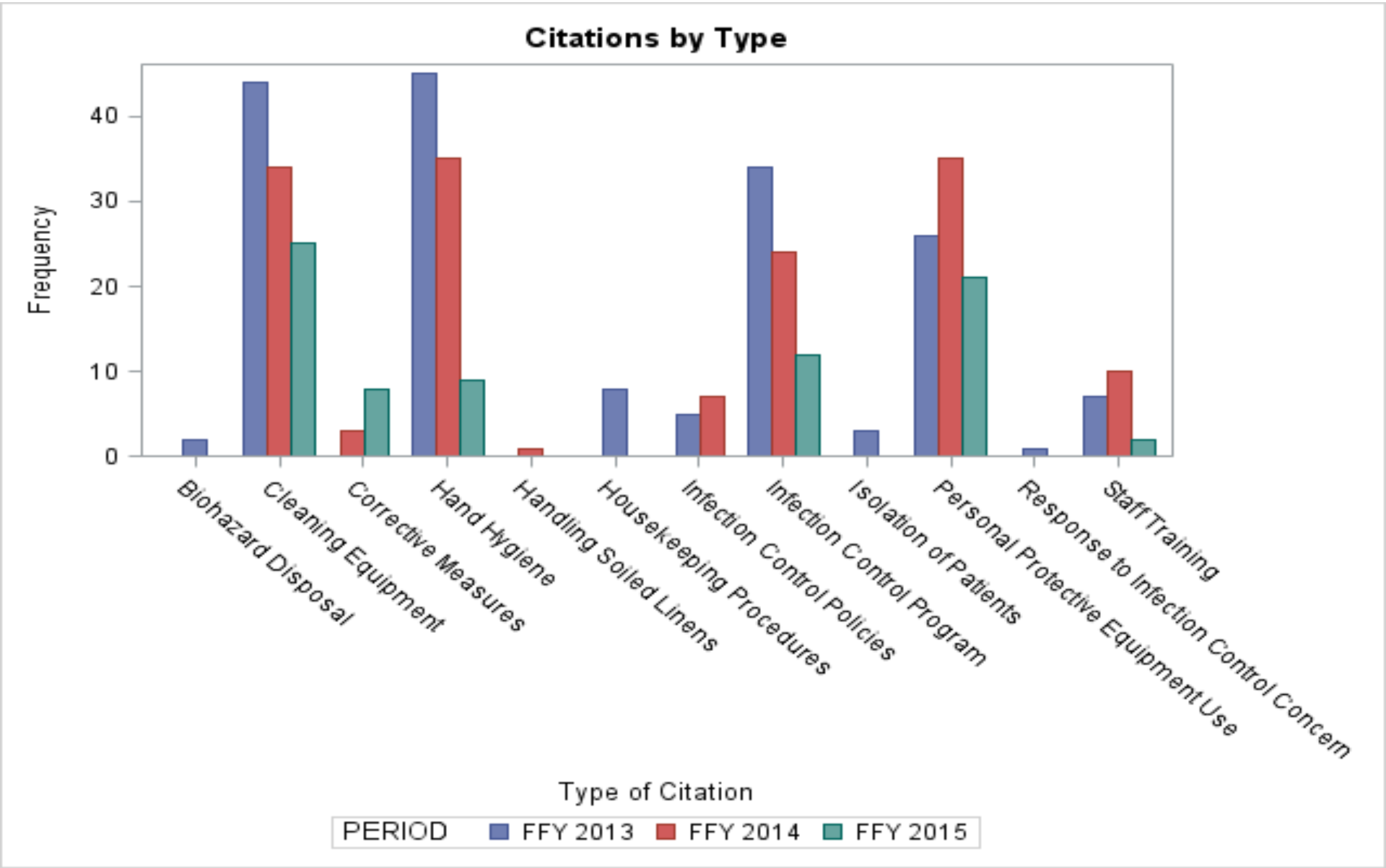
Licensing Data: Infection Control Citations per survey



Licensing Data: Infection Control Citations from 10/2012



Licensing Data: Types of Infection Control Citations



Take Home Messages:

- Infection Control Citations remain the leading citation category for both Federal and State Surveys
- The most recent data suggest that the number of Infection Control Citations are declining.
- The leading types of surveys are re-certification/re-licensure, and complaint surveys.
- The average number of infection control citations per survey is 11
- The leading categories of infection control citations have to do with hand hygiene, cleaning of equipment, use of personal protective equipment, and infection control programming

Challenges with Using the Data

- Current data provides only monitoring capability
- Data availability is often a full year behind
- To prevent negative health outcomes, you have to be able to anticipate them
- A predictive model could be a tool to prevent negative health outcomes before they occur.
- In 2014 we began to search for a mathematical predictive data model using more complex types of analysis on existing data resources.

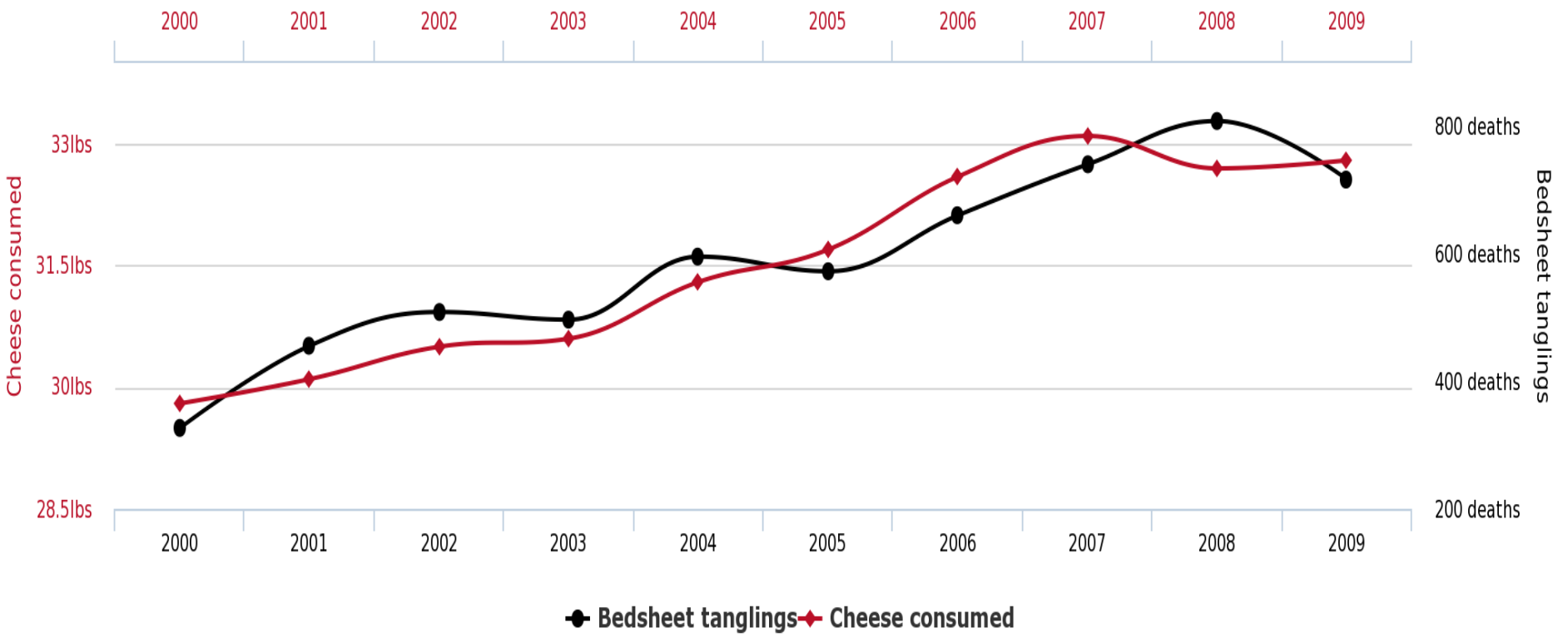
New Data Sources Used

- NHSN 10/1/2012 – 9/30/2014 Data at the facility level
- 2010 – 2013 calendar year Dialysis Facility Report data at the facility level as reported in the 2014 Master File.
- ASPEN Licensing Database – survey and citation events data among ESRD providers from 2010 – 2013.

Per capita cheese consumption

correlates with

Number of people who died by becoming tangled in their bedsheets



tylervigen.com

R=0.947091, Correlation = 94.7%

US Department of Agriculture and Centers
for Disease Control and Prevention

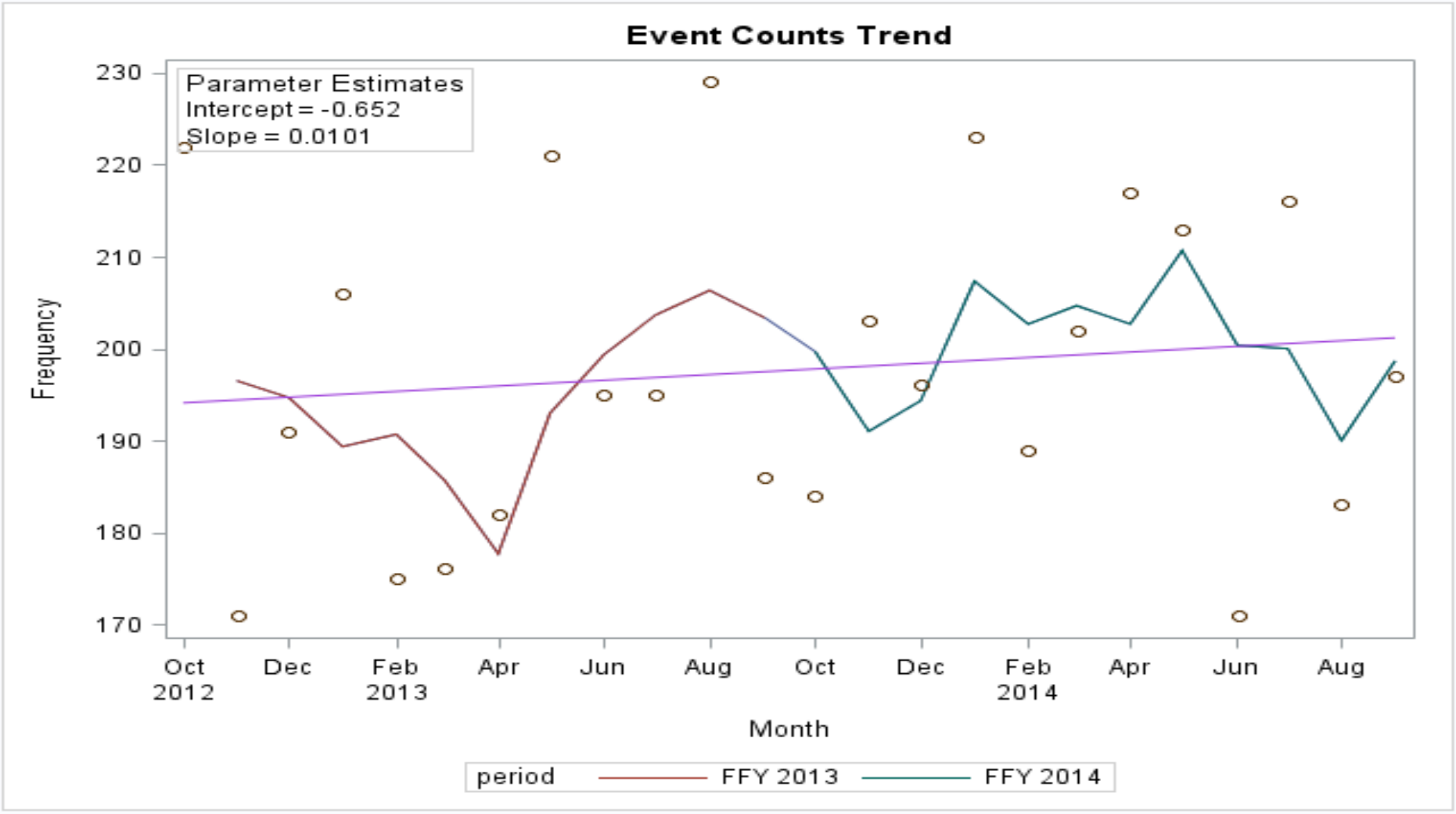
NHSN Data:

- Linear regression – infection outcomes x infection citations for all outcome variables (28 factors). Repeated with temporal analysis (6-month and 12-month windows).
- Identified no predictive models for health outcomes. Most correlations substantially failed the significance test ($p<=.05$)
- Just 3 met significance, but all failed heteroscedascity (variance in Y markedly differs at different values of X), and correlation slopes were unimpressive (flat line)

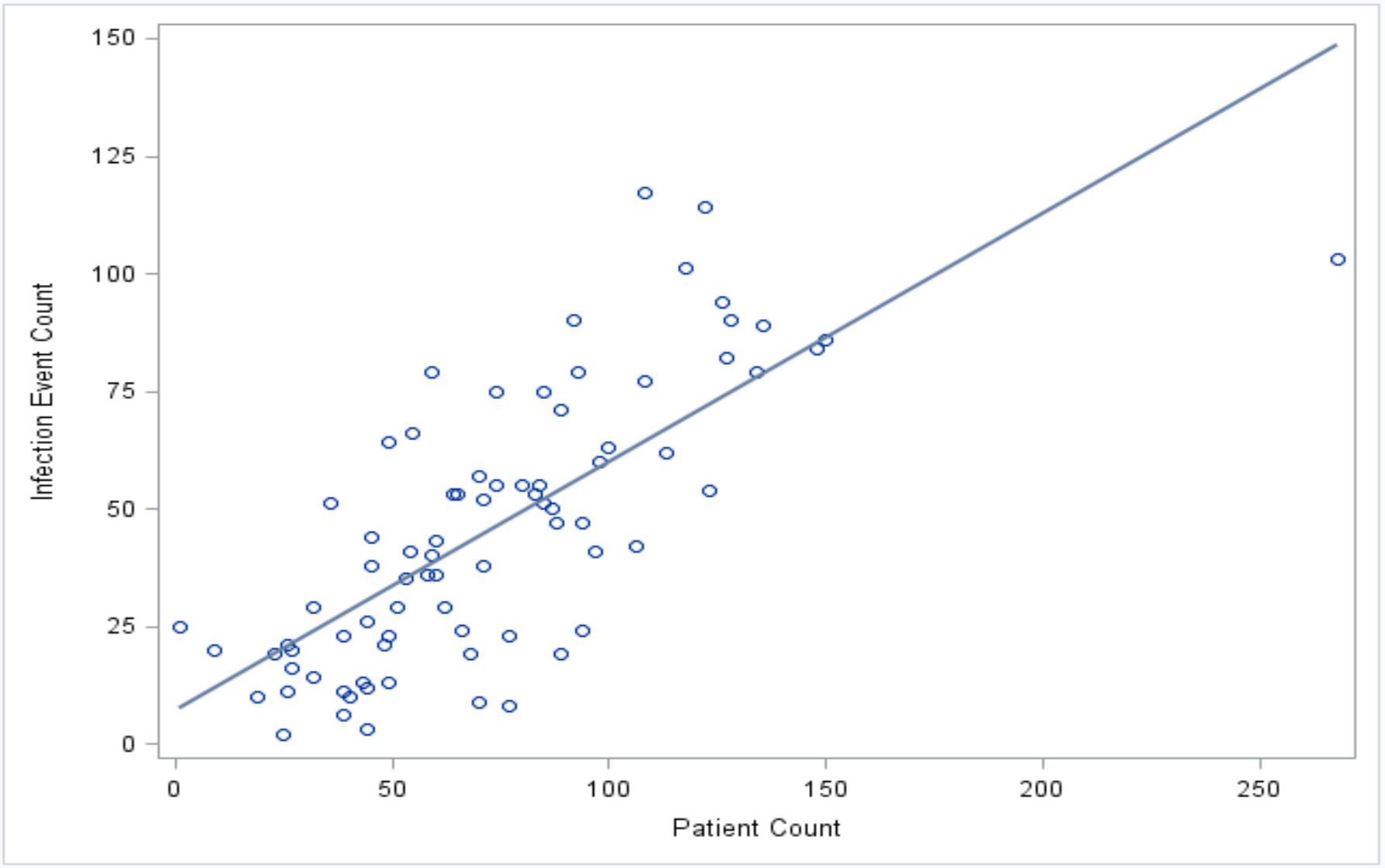
NHSN Data:

NHSN Infection Events for Arizona	FFY2013	FFY2014
IV Antimicrobial Start	2149	2209
IV Vancomycin Start	1655	1657
# of Fistulas	1173	1311
# Tunneled Central Line	1271	1190
Vascular Access Infection	1155	953
Pus, Redness, Swelling Event	844	676
Hospitalization Outcome	**561**	**612**
Local Access Site Infection	721	579
Fever	734	552
Positive Blood Culture	**518**	**476**
Chills or Rigors	481	408
# of Grafts	350	405
Access Related Bloodstream Infection	**434**	**374**
Pus, Redness, Swelling Event Tunneled CL	454	306
Pus, Redness, Swelling Event Fistula	264	262
Cellulitis	209	195
Wound with Pus or Redness	118	158
Pus, Redness, Swelling Event Graft	116	102
Loss of Vascular Access	0	95
Pneumonia or Respiratory Infection	67	63
# of Other Access Device	21	20
Death Outcome	22	17
# Non Tunneled Central Line	26	14
# Catheter graft H1 bird	2	8
Pus, Redness, Swelling Event Other Access Device	6	5
Pus, Redness, Swelling Event Non Tunneled CL	6	1

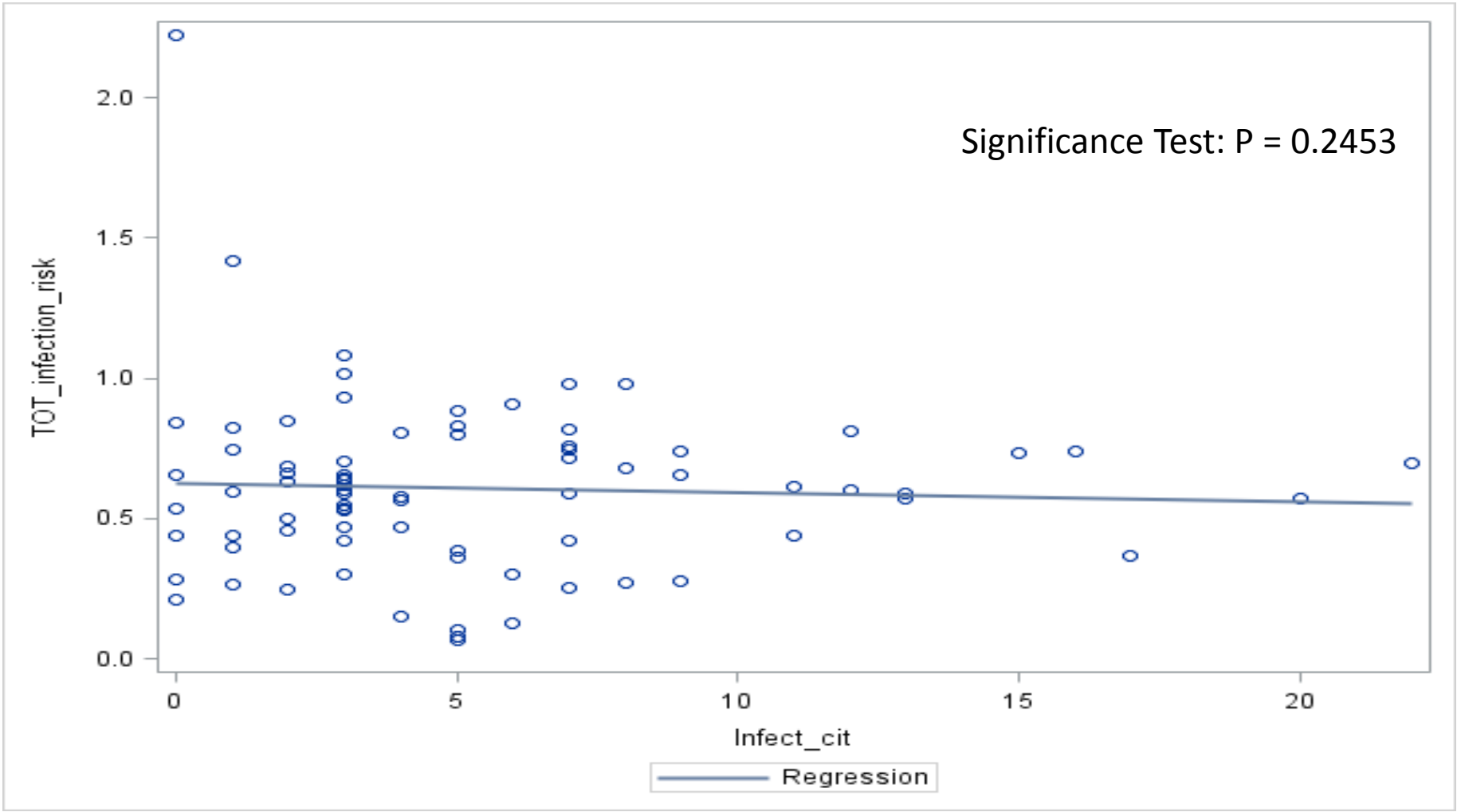
NHSN Data:


Event Counts Trend
Parameter Estimates
Intercept = -0.652
Slope = 0.0101
Frequency
230
220
210
200
190
180
170
Oct 2012
Dec
Feb 2013
Apr
Jun
Aug
Oct
Dec
Feb 2014
Apr
Jun
Aug
Month
period
FFY 2013
FFY 2014

NHSN Data: Infection events x patient count



NHSN Data: infection citations x per patient infection rate

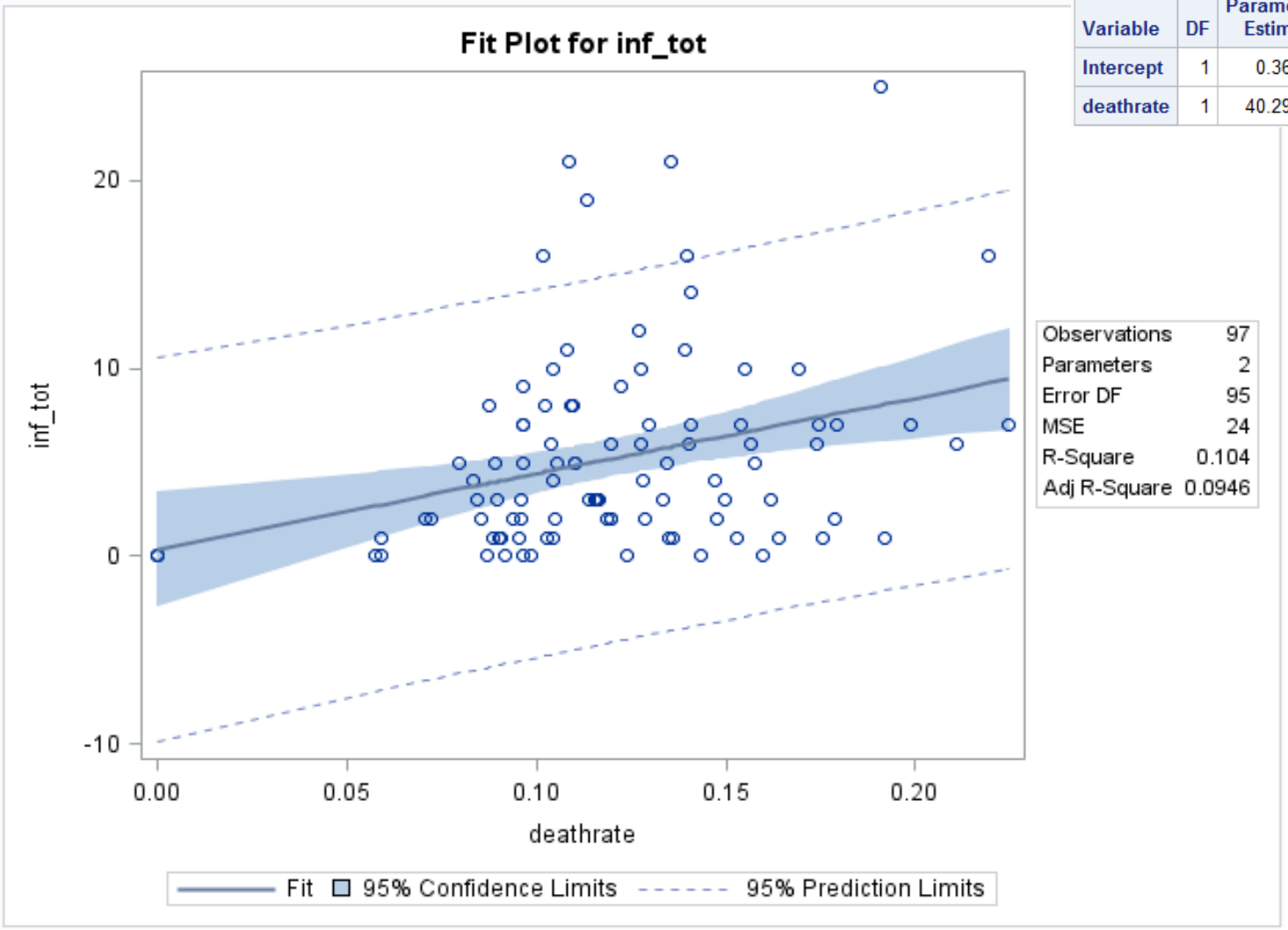


NHSN Data: Limitations We Found

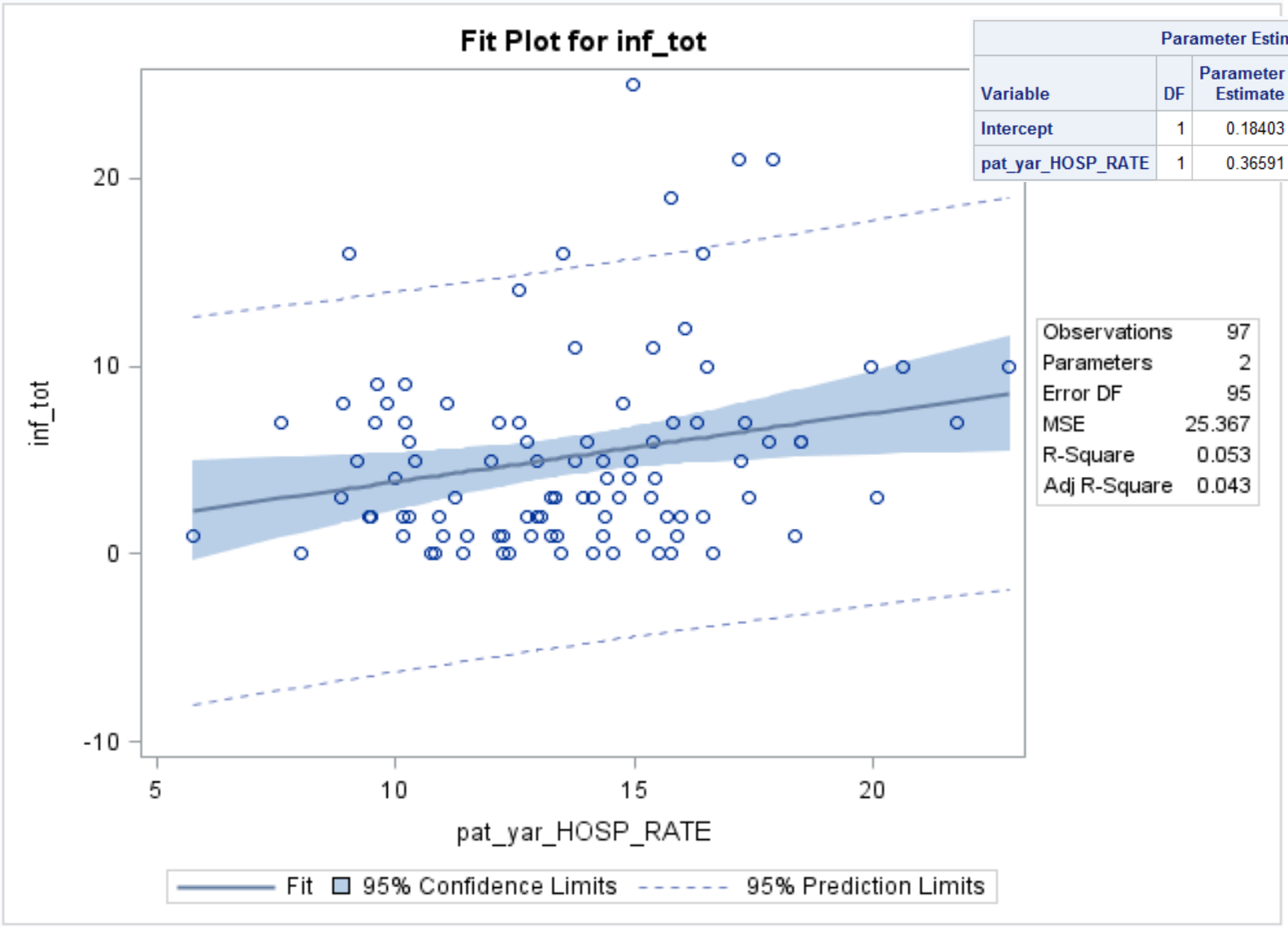
- There were some extremely small outcome event counts over the two-year period for which we had data.
- Some incompleteness of reporting – some null response values (10 of 28 outcomes were effected to some extent).
- ESRDs are on a 3 year certification survey cycle. With only 2 years of data, we only had data for 90 of 117 (77%).
- No patient populations per facility with the NHSN data. Forces invalid comparison of large facilities to small ones because rates per patient cannot be produced.
- Attempt to use ADHS re-licensure patient population counts to merge with NHSN only provided data for 79 sites, and the counts were found to be inaccurate in many cases.

DRF Data: Infection Citations x Death rate

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.36123	1.53560	0.24	0.8145
deathrate	1	40.29331	12.13396	3.32	0.0013



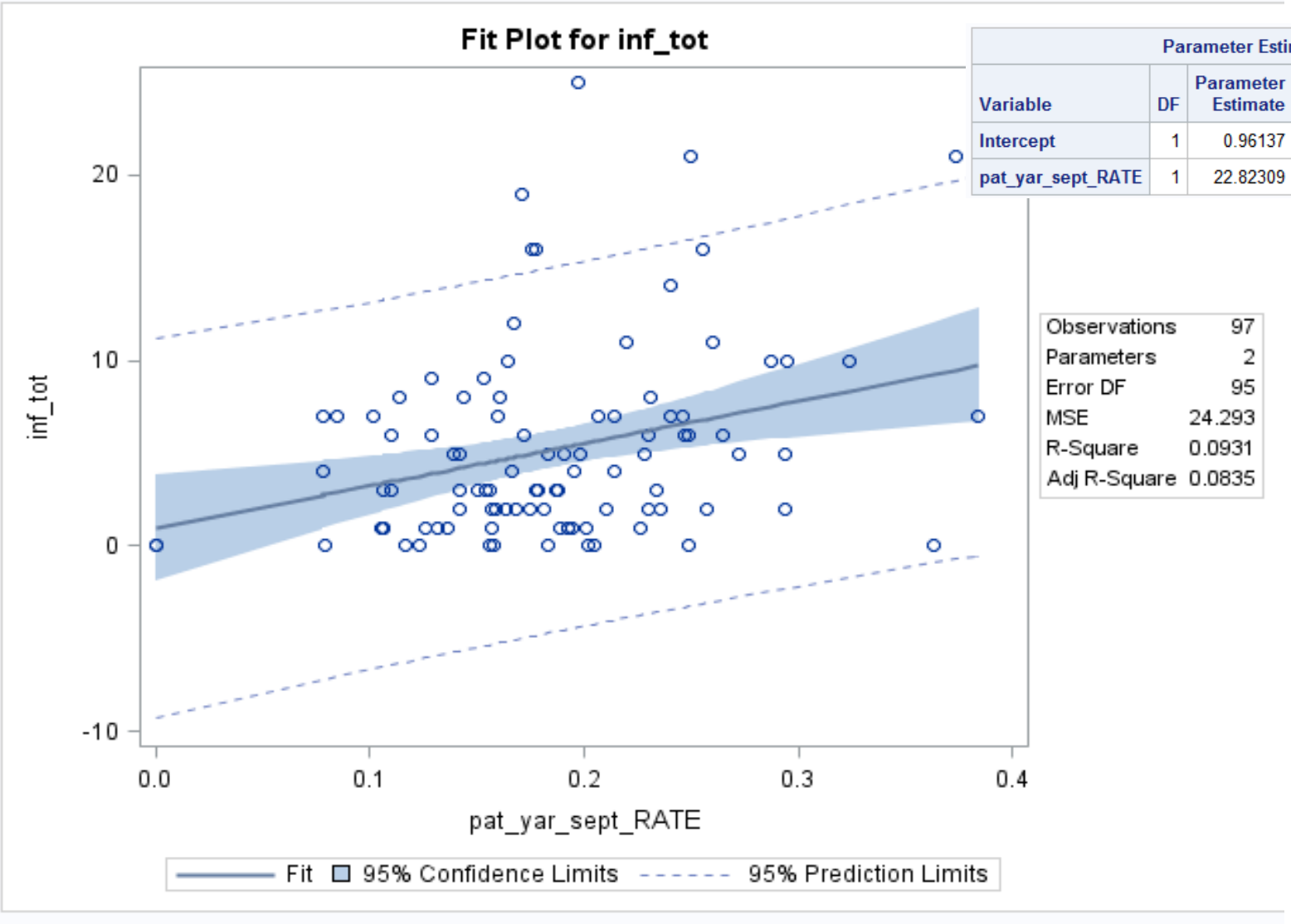
DRF Data: Infection Citations x Hospitalization rate



Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.18403	2.22941	0.08	0.9344
pat_yar_HOSP_RATE	1	0.36591	0.15875	2.30	0.0233

Observations	97
Parameters	2
Error DF	95
MSE	25.367
R-Square	0.053
Adj R-Square	0.043

DRF Data: Infection citations x Septicemia rate

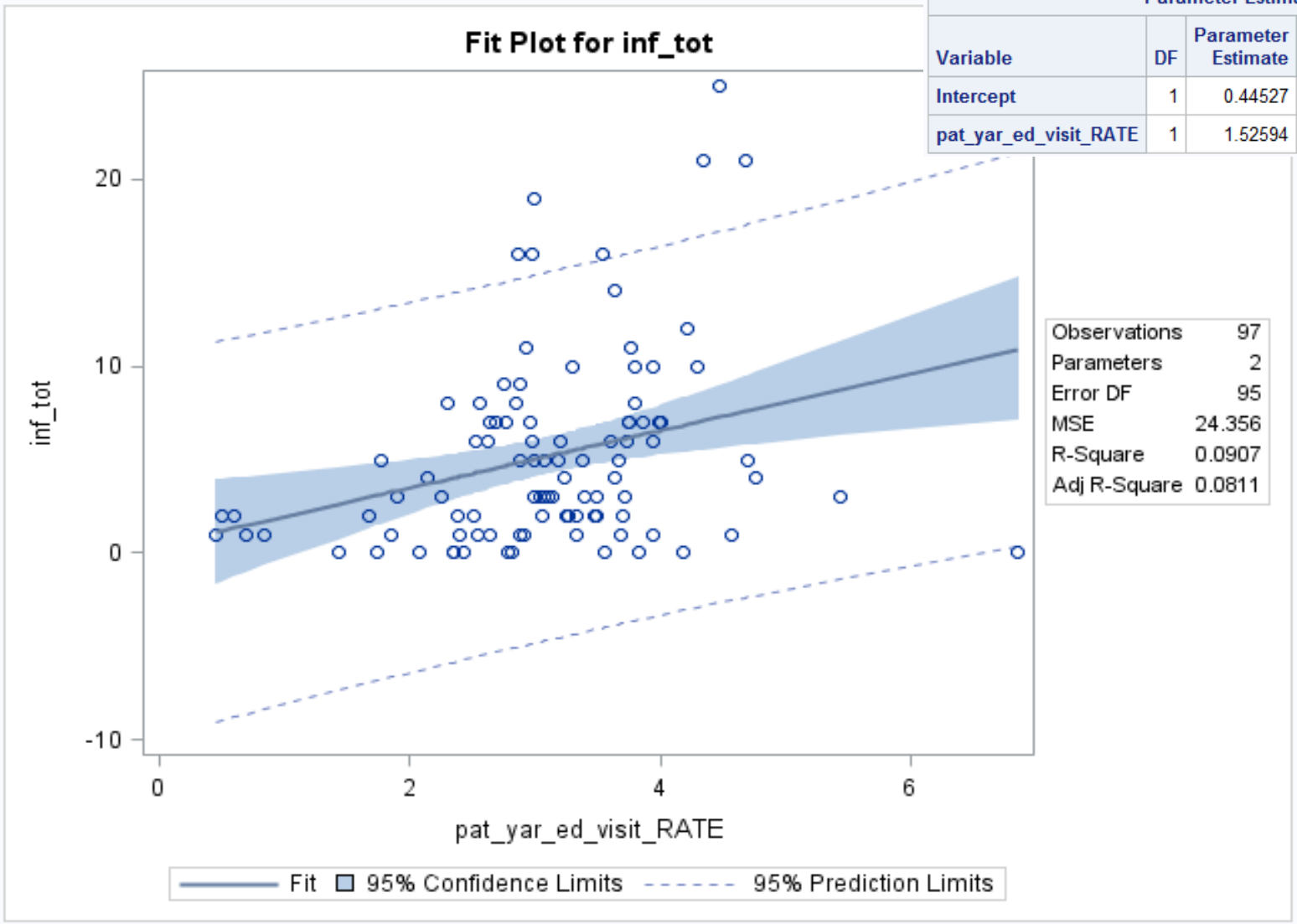


Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.96137	1.44254	0.67	0.5067
pat_yar_sept_RATE	1	22.82309	7.30990	3.12	0.0024

Observations	97
Parameters	2
Error DF	95
MSE	24.293
R-Square	0.0931
Adj R-Square	0.0835

DRF Data: Infection Citations x Patient Emergency Dept. Visit Rate

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.44527	1.61924	0.27	0.7839
pat_yar_ed_visit_RATE	1	1.52594	0.49566	3.08	0.0027



Take Home Messages:

- NHSN data indicate, and DFR data confirm that Infection Control Citations can be used as a (weak) predictor of higher rates of death, hospitalization, septicemia, and patient emergency department visits.
- Additional outcome variables in DRF data have yet to be tested, and may contribute to a stronger predictive model.
- With further years of data, we are considering merging NHSN and DFR data elements.

Recommendations:

- Improve data quality of NHSN – importance of reporting all elements.
- Validation of Arizona outcomes data is needed.
- Reducing the size and scope of Government means fewer resources.
- Collaboration should focus on assisting providers to develop independent outcome monitoring.
- Collaboration should focus on targeted technical support to achieve quality improvement
- How can we promote awareness of Chronic Kidney Disease?
- How can we resolve outcome disparities in Arizona's rural regions?

Send you ideas/suggestions to:

The Data Quality Team

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