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Kansas Trends in Poisoning Morbidity and Mortality

In 2011, 320 Kansas residents died as a result of poisoning. Almost one in three of these deaths (93) were due to opioid analgesics. By 2009, hospializations for drug poisonings had increased by almost threefold from 1999. One of the Healthy People 2020 objectives is to reduce fatal poisonings in the United States. [1] Poisoning is now the leading cause of death from injuries in the United States. [2] In Kansas, resident deaths due to opioid analgesics rose almost threefold from 1999 to 2010.

Opioid analgesics are drugs usually prescribed to relieve pain, and include: natural and semi-synthetic opioid analgesics such as morphine, codeine, hydrocodone, and oxycodone; methadone, which is a synthetic opioid analgesic used to treat opioid dependency as well as pain; and other synthetic opioid analgesics (excluding methadone) such as fentanyl and propoxyphene. Opium and heroin are not included in this class of drugs.

Methods

Morbidity and mortality are coded using variants of the International Classification of Diseases (ICD). ICD-10 is used for mortality. ICD-9-CM (clinical modification) is used for morbidity.

All deaths for which the underlying cause of death was some form of poisoning were selected from the Kansas Vital Records database. The relevant ICD-10 codes for underlying cause of death are X40-X49, X60-X69, X85-X90, Y10-Y19, Y35.2, or U01(.6-.7). The individual codes in this group indicate intentionality (accidental, self-inflicted, assault, or undetermined intent) and broad classes of chemical agents.

In records for which the underlying cause of death was poisoning, the fields for contributing causes of death were searched for codes for opioid analgesics: T40.2 (methadone), T40.3 (*other opioids*, such as oxycodone and hydrocodone), and T40.3 (*other synthetic narcotics*, such as fentanyl and propoxyphene). Opioid analgesic codes in records for which the underlying cause of death was not poisoning were excluded.

While there is only one underlying cause of death, there can be up to twenty listed contributing causes. Some of the deaths included in this analysis had multiple drugs in their lists of contributing causes. Heroin, cocaine, and benzodiazepine are not included in the opioid analgesic class, but deaths with codes for these drugs were included for comparison purposes.

Morbidity data were extracted from the Kansas Hospital Association hospital discharge dataset provided to the Kansas Department of Health and Environment. Patients with a primary diagnosis of drug poisoning (ICD-9 CM codes 960-979) were selected. Presence of an external cause of injury and poisoning code ("E" code) in any secondary diagnosis field was used to determine if the hospitalization was accidental (E850-E858) or suicide (E950-E959). Any secondary diagnosis of ICD-9CM code 305.5 for opium, heroin, methadone, codeine, meperidine and morphine was used to identify opioid analgesic abuse.

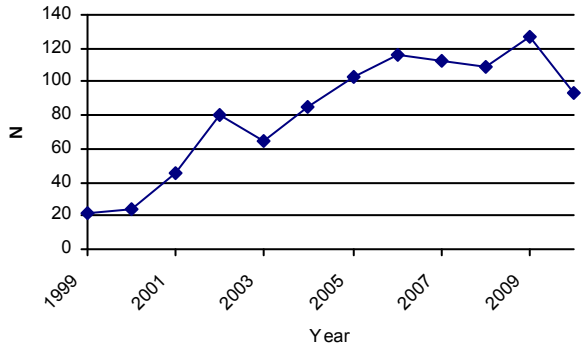
Because of coding method differences, morbidity and mortality statistics are not directly comparable. Opium and heroin cannot be excluded from hospitalizations coded to ICD 9 CM code 305.5. Crude mortality rates are presented as single year or multi-year. Since the number of opioid analgesic deaths in any given year is relatively small, multi-year death rates were used when analyzing demographic factors.

Results

Overall mortality for Kansas residents due to poisoning has increased almost threefold in the last twelve years from 123 deaths (4.6 per 100,000 population) in 1999 to 347 deaths (12.3 per 100,000 population) in 2009. Poisoning mortality dropped to 320 deaths (11.2 per 100,000) in 2010, from 347 deaths in 2009.

Opioid analgesics were a contributing factor in 22 (17.9%) of the poisoning deaths in 1999, rising to 127 (36.6%) of the poisoning deaths in 2009 (Figure 1). Since 2001, opioid analgesics have contributed to more deaths than heroin, cocaine, and benzodiazepine combined. (Table 1)

Figure 1. Poisoning deaths due to opioid analgesics, Kansas Residents, 1999-2010



In 1999, the crude death rate due to opioid analgesics was 0.8 per 100,000 population. It more than doubled by 2001, when it reached a level of 1.7 per 100,000 population, and doubled again by 2005, when it reached a level of 3.8 per 100,000 population. The death rate due to opioid analgesics reached a high of 4.5 per 100,000 in 2009 before falling back to 3.3 per 100,000 in 2010.

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Table 1. Deaths due to poisoning Kansas Residents, 1999-2010

Year	All Poisoning	Opioid Analgesics	Heroin	Cocaine	Benzo-diazepine
1999	123	22	2	9	4
2000	159	24	1	21	10
2001	179	46	1	20	13
2002	205	80	0	21	15
2003	216	65	1	31	15
2004	219	85	1	26	16
2005	282	103	0	33	24
2006	284	116	1	45	30
2007	323	113	1	34	25
2008	302	109	10	20	14
2009	347	127	10	13	11
2010	320	93	8	13	6

During the 12-year period, the death rate for males was 3.6 per 100,000 population, while that for females was 2.4. The death rate was 3.4 per 100,000 population for White non-Hispanics, 1.6 for Black non-Hispanics, 4.1 for Native American non-Hispanics, 0.3 for Asian/Pacific Islander non-Hispanics, and 0.4 for Hispanics; but by raw count, most decedents were White non-Hispanic (913 out of 983). Death rates were highest for the 35-44 age-group (6.6 per 100,000 population) and the 45-54 age-group (7.0), and lowest for the 0-14 age-group (0.1) and the over-65 age-group (0.4).

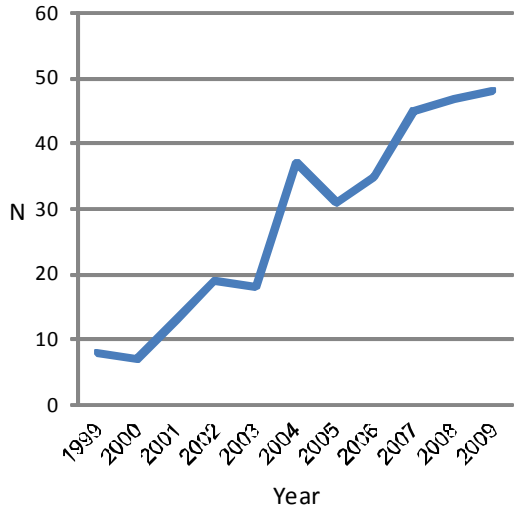
Approximately two-thirds (65.1%) of Kansas residents to whose deaths opioid analgesics contributed in the 12-year period lived in counties in the urban peer group. For the years 1999-2004, slightly more than two-thirds (68.0%) had less than four years of college; while for the years 2005-2010 slightly fewer than two-thirds (64.3%) had either a high school degree/ GED or some college but no degree. (The education questions on the death certificate changed in 2005, so direct comparisons of educational data between years before and after that date are not possible.)

Manner of death was usually accident (72.8%), with the remainder being undetermined (12.8%) or suicide (12.6%). Approximately one-fifth (21.7%) of poisonings involving opioid analgesics also included benzodiazepine, cocaine, or heroin, in descending order of frequency, as a contributing cause of death.

The majority (548 or 55.7%) of deaths due to opioid analgesics occurred in a residential setting (including the decedent's own home, a relative or a friend's home, a hotel or motel, a nursing home, a homeless shelter, or a similar setting). Only about ten percent (99 or 10.1%) of opioid analgesic deaths occurred in a hospital setting, and most (60) of those occurred in the emergency department.

Hospitalizations due to drug poisoning increased steadily, from 375 hospitalizations (14.0 per 100,000 population) in 1999 to 1,095 hospitalizations (38.8 per 100,000 population) in 2009. (Figure 2) Increasingly, they were due to opioid analgesics: eight poisonings in 1999 compared to 48 in 2009. Opioid analgesics were the third most common drug causing hospitalization due to poisoning in Kansas; cocaine was the first and amphetamines the second.

Figure 2. Hospitalizations due to Opioid Analgesic Poisonings, Kansas, 1999-2009



Fifty-two percent (51.6%) of Kansas resident hospitalizations due to opioid analgesics were male, 79.7% were white, and 62.7% lived in an urban area. Sixty-four percent (64.3%) were between the ages of 25 and 49 years.

Discussion

Despite the decrease in Kansas resident poisoning deaths from 2009 to 2010 it is too early to say that the surge in poisoning mortality has slowed or ended. The increase in opioid analgesic deaths to Kansas residents is consistent with an increase in deaths involving opioid analgesics in the United States in the last decade. Opioid analgesic poisoning in Kansas has been a major component of the rapid increase in over-all poisoning mortality in the state. Demographic analyses indicate that Kansans for whom the cause of death includes opioid analgesic poisoning are likely to be middle-aged, white, urban men with a high school education or less than four years of college.

Deaths where opioid analgesics were taken in conjunction with illegal drugs such as heroin or cocaine suggest recreational drug use, but for the majority of cases it is impossible to tell whether the drug involved was obtained legally or illegally, or (if obtained legally) whether it was used in accordance with a physician's instructions.

The increase in hospitalizations due to opioid analgesic drug poisonings is consistent with the increase in mortality. The analysis of the populations affected indicates that those hospitalized for opioid analgesic poisoning are likely to be white males in their mid-twenties to late forties and from urban areas.

Most of hospitalizations involving opioid analgesics in Kansas were determined to be accidental.

Mortality findings are subject to at least two limitations. While most of the Kansas deaths involving opioid analgesics have been accidental, the death certificate does not collect enough information to determine why the decedents were taking opioid analgesics. While coding of mortality is consistent, the system can not take into account individual differences among physicians completing the cause of death information.

Morbidity findings are subject to at least four limitations. The ICD-9-CM code 305.5 does not distinguish between typical opioid analgesics and opium or heroin. No information exists as to whether the opioid analgesics involved in these poisonings were prescribed and taken according to a physician's instructions or illegally obtained. The hospital discharge data may overcount, as persons may be admitted for the same diagnosis more than once in a year. The extent of opioid analgesic poisoning morbidity is likely understated because the hospital discharge dataset excludes emergency department visits at hospitals.

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Reference

1 Healthy People 2020 Topics and Objectives. [Internet] U.S. Department of Health and Human Services. [cited 2012 Jan 11] Available from : http://www.healthypeople.gov/2020/.
2 Warner M, Chen L, Makuc D, Anderson R, and Minino A. Drug Poisoning Deaths in the United States, 1980-2008. NCHS data brief, no 81. Hyattsville, MD: National Center for Health Statistics.

Suicides among Kansas Residents 2001-2010

Suicide is a serious, preventable public health concern in the U.S. Preliminary U.S. data for 2010 showed suicide was the 10th leading cause of death claiming 37,793 lives [1]. Failed suicide attempts resulting in injury and hospitalization have been estimated to be 10-20 times the number of completed suicides [2]. Healthy People 2020 set a suicide rate of 10.2 per 100,000 as the national goal. The goal represents a 10 percent improvement in the 2007 age-adjusted rate of 11.3 per 100,000 population [3].

Suicide was also the 10th leading cause of death to Kansas residents in 2010. It is important to continue monitoring state-level data on suicides in the effort to maintain public health priorities and evaluate the effectiveness of suicide prevention strategies.

Methods

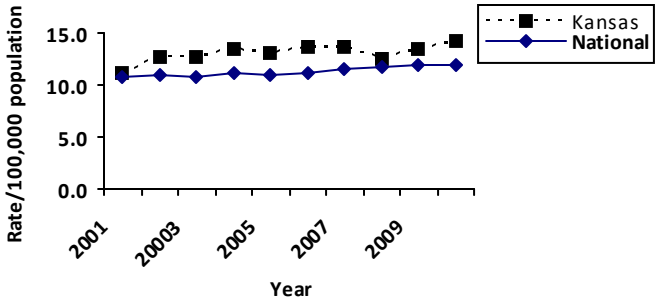
Death statistics are compiled from death certificates which are filed by state law with the Office of Vital Statistics in the Bureau of Epidemiology and Public Health Informatics at the Kansas Department of Health and Environment. Data concerning deaths of Kansas residents include virtually all Kansas resident deaths regardless of where the death took place. Deaths due to suicide are classified in accordance with the International Classification of Diseases (ICD-10) codes U03, X60-X84 and Y87.0.

Suicide rates, determined as the number of deaths divided by the Kansas population multiplied by 100,000, are a common way to report death statistics. Frequencies and rates were obtained via the Kansas Information for Communities Death Statistics Table Queries and reported in a descriptive epidemiological approach [4]. Rate changes are not significant unless otherwise noted.

Results

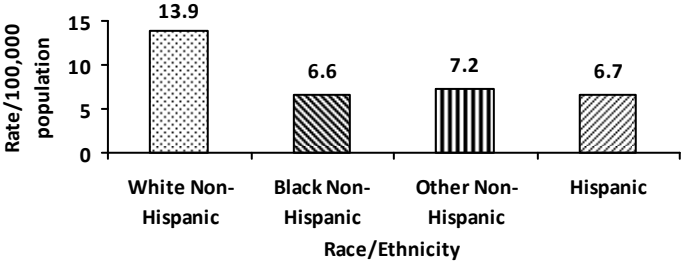
In 2010, 408 suicides occurred in Kansas – 32 more than in 2009 and 58 more than in 2008 representing the highest number in the past 10 years. Kansas's suicide rate of 13.8 per 100,000 population is higher than the estimated 2010 national rate of 12.2 per 100,000 population. In the past ten years, Kansas suicide rates have been higher than national rates (Figure 3).

Figure 3. Age-Adjusted Suicide Rates, U.S. and Kansas, 2001-1010



In 2010, 16 suicides (3.9%) occurred among the Hispanic population in Kansas, while African Americans/blacks accounted for 17 suicides (4.3%). Slightly less than nine out of 10 suicides were among the Caucasian/white population (89.4%). Comparisons among population groups for Kansas data combined from 2001 to 2010 shows white non-Hispanics had about two times the suicide rate as black non-Hispanic and Hispanic populations (Figure 4).

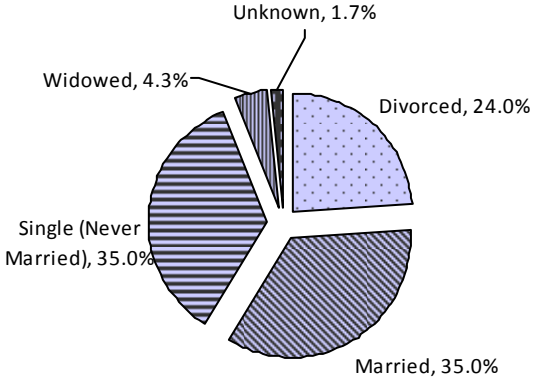
Figure 4. Age-Adjusted Suicide Rates by Selected Population Groups Kansas, 2001-2010



Suicide rates increased between 2009 and 2010 among 15 to 24 year olds by almost 30 percent and individuals 45 to 64 by about 15 percent. There was a 38 percent decrease in suicides among individuals 65 years and older from 2009 to 2010. The two age groups with the highest number of suicides in 2010 were 25-44 (137 deaths) 45-64 (164 deaths). The number of suicides among individuals under age 15 was too small for rate calculation.

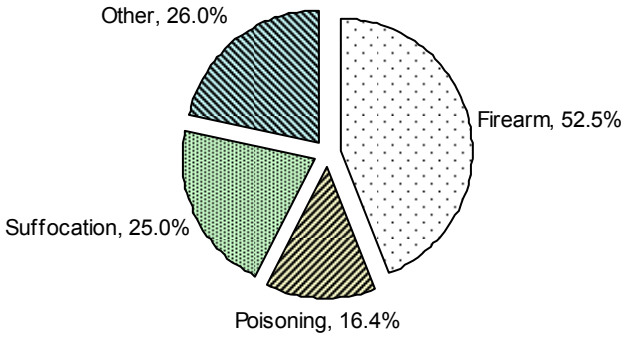
Males accounted for over three-quarters of suicides in 2010. Married and single (never married) individuals were proportionally equal in the number of suicides accounting for 70 percent of the deaths in 2010, while 24 percent were among divorced individuals. Widowed had the least number of suicides (Figure 5).

Figure 5. Percent of Suicide Deaths by Marital Status Kansas, 2010



Slightly over half of suicides involved firearms, while one fourth died by means of suffocation. Poisoning was the third most common known method of suicide (Figure 6).

Figure 6. Percent of Suicide Deaths by Method Kansas, 2010



Limitations

These results are subject to at least two limitations. Changes to the method of collecting race information on Kansas vital records in 2005 and under-reporting of minority races on death certificates may impact rates reported by minority groups. National statistics have shown that Native American/Alaska Natives have had suicide rates close to those of white non-Hispanic individuals [5]. Another limitation is the inability to take into account differences in knowledge and attitudes among physicians who complete the cause of death information. Individual biases cultural norms, unfamiliarity with the patient, or inability to perform an autopsy may affect the information available to or reported by the physician when certifying the cause of death.

Discussion

The following pattern of suicide rates in Kansas mirrors demographic characteristics seen nationally [1, 5]:

- White non-Hispanic populations have had higher suicide rates than Black non-Hispanic and Hispanic populations.
- Suicide rates increased for individuals between the ages of 45 and 64 years.
- Firearms, suffocation and poisoning were the most common methods of suicide.

While changes in suicide rates during the last decade were not statistically significant, the number of suicides in Kansas have been increasing. Suicides in Kansas were at the highest number within the past ten years and rates have remained above national rates. It is important to focus preventive efforts toward reducing the number of suicides in line with objectives from the Healthy People 2020 report which strongly supports efforts toward improving environmental and mental health problems associated with suicidal behavior.

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References

1. Murphy SL, Xu J, Kochanek KD. Deaths: Preliminary data for 2010. National Vital Statistics Reports 2010: 60:4. Available at http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_04.pdf.
2. World Health Organization Media Centre News Release. Suicide huge but preventable public health problem, 2004. Available at http://www.who.int/mediacentre/news/releases/2004/pr61/en/index.html. Accessed December 12, 2011.
3. Healthy People 2020 available at http://www.healthypeople.gov/2020/default.aspx.
4. Kansas Information for Communities. http://kic.kdhe.state.ks.us/kic/death.html.
5. American Foundation for Suicide Prevention (AFSP). Facts and Figures. Available at http://www.afsp.org/index.cfm?fuseaction=home.viewPage&page_id=04EA1254-BD31-1FA3-C549D77E6CA6AA37. Accessed December 30, 2011.

Newborn Screening Identifies 73 Kansas Infants with Inheritable Disorders

Newborn screening has been an integral part of assessing an infant's health in Kansas since 1965, when testing for phenylketonuria (PKU) began. Since then, the program has added additional tests, with the latest expansion beginning in July 2008, when Kansas added 22 disorders to its testing protocol. Kansas currently tests for 28 of the 29 metabolic disorders (Table 2) recommended by the American College of Medical Genetics (ACMG). [1] The unscreened disorder – severe combined immune deficiency (SCID) – was approved by the U.S. Department of Health and Human Services and added to the ACMG core panel in May 2010. [2] Ten states have implemented full or partial screening for SCID, and another 15 have approved SCID screening. Twenty-five states, including Kansas, are in a fact-finding stage regarding SCID screening. Program staff participate in the monthly SCID teleconference calls sponsored by ACMG and the Newborn Screening Translational Research Network.

Table 2. Disorders Screened for in Kansas Newborn Screening Program

Misc. Disorders	*Fatty Acid Disorders*
Biotinidase Deficiency	Carnitine Update Defect
Congenital Adrenal Hyperplasia	Long Chain 3-OH Acyl-CoA Dehydrogenase Defect
Congenital Hypothyroidism	Medium Chain Acyl-CoA Dehydrogenase Deficiency
Cystic Fibrosis	Very Long Chain Acyl-CoA Dehydrogenase Deficiency
Galactosemia	Tri Functional Protein Deficiency
Amino Acid Disorders	*Organic Acid Disorders*
Argininosuccinic Acidemia	Isovaleric Acidemia
Citrullinemia	Glutaric Acidemia Type I
Homocystinuria	3-hydroxy-3-methybutarl-CoA Lyase Deficiency
Maple Syrup Urine Disease	Multiple Carboxylase Deficiency
Phenylketonuria	Methylmalonic Acidemia – Mutase Deficiency
Tyrosinemia Type I	3-Methylcrotonyl-CoA Carboxylase Deficiency
Hemoglobinopathies	Methylmalonic Acidemia – CblA & CblB
Sickle Cell Anemia	Propionic Acidemia
Hemoglobin S/Beta Thalassemia	Beta-ketothiolase Deficiency
Hemoglobin S/C Disease	

The goal of newborn screening is to prevent disability, mental retardation, and death through early identification and treatment of infants affected by a screened disorder. All core metabolic disorders have treatments. Although most disorders are rare (some occur as infrequently as 1:100,000), it remains important to screen, identify, and treat infants early so that they can lead productive and healthy lives.

Methods

The Kansas Newborn Screening (NBS) program is operated by the Kansas Department of Health and Environment (KDHE). The two NBS sections – testing laboratory and follow-up program – meet regularly to discuss changes and coordinate efforts.

In State Fiscal Year 2011 (July 1, 2010 – June 30, 2011), Kansas screened 40,697 infants. Kansas occurrence births during the time period totaled 40,938 [3]. Of the infants screened, 2,780 had presumptive positive or inconclusive results and re-

quired further testing (Table 3). Most often, this meant the newborn screen had to be repeated. For certain presumptive positives, immediate consultation and additional blood work or urine analysis was indicated. For cystic fibrosis (CF), a sweat chloride test was recommended if one or more mutations were detected.

Results and Discussion

Out of 2,780 screening tests with positive results, 73 were positive on follow up tests and were diagnosed with a metabolic disorder. Twenty received services through the KDHE Children and Youth with Special Health Care Needs (CYSHCN) program, 11 attended a CYSHCN sponsored clinic, and nine received direct services. Families of diagnosed infants are referred to CYSHCN; however, not all families apply to the program, and not all families who apply are eligible to receive services.

On December 1, 2010 a new, two-tiered screening protocol was implemented for cystic fibrosis. Immune reactive trypsinogen (IRT) was still the initial screen used; however if the IRT was elevated, the same sample was refluxed to a polymerase chain reaction (PCR) test for cystic fibrosis transmembrane conductance regulator (CFTR) gene mutations. This reduced the number of infants needing a repeat NBS and also reduced the number of infants referred for a sweat chloride test. From July 1, 2010 to November 30, 2010 (five months of data), there were 59 infants referred for a sweat chloride test. Of these, eight did not complete the sweat chloride test, as the pilot DNA showed no mutations. All eight were in neonatal intensive care units. Of the remaining 51 infants, two declined further testing due to other medical conditions, 34 had normal sweat chloride tests (normal infants), 12 were identified as CF carriers, and three were diagnosed with cystic fibrosis. After implementation of IRT/DNA, (December 1, 2010 to June 30, 2011—seven months of data), only 29 infants were referred for a sweat chloride test. Of these, three who had high IRTs (≥170 ng/mL) but no mutations detected were normal infants, seventeen were identified as CF carriers and six were diagnosed with cystic fibrosis. Three infants (with a single mutation) are pending, and parents have been notified of the need to complete a sweat chloride test.

One-thousand sixty-three infants had positive results for congenital hypothyroidism (CH). Sixty-two were presumptive positive, and 1,001 were borderline positive. Thirty-seven were diagnosed, including one with transient CH. Of the 37 diagnosed, 15 had initial borderline results (including the one transient diagnosis).

Seven-hundred ninety-two hemoglobin results were reported to physicians for follow-up. Of these, 18 were presumptive hemoglobin diseases, and 774 were hemoglobin traits. Approximately 20 percent of the traits have been confirmed, while another 555 are still pending. The recommendation is to do confirmatory testing at the one year exam, so this pending number is not unexpected.

There were 553 abnormal MS/MS results: 330 with amino acid disorders, 68 with fatty acid oxidation disorders and 155 with organic acid disorders. Ninety-three percent were confirmed as normal infants after either a repeat screen or additional testing. Three infants were diagnosed with an amino acid disorder—one with argininosuccinic aciduria (ASA), one with phenylketonuria (PKU) and one with methyladenosyltransferase deficiency (MAT). MAT is on the secondary screening panel but can be identified by an elevated methionine level, which is also the marker for homocystinuria (HCY), a core panel disorder. Five fatty acid oxidation disorders were diagnosed—three carnitine uptake defect (CUD) and two medium chain acyl-coA dehydrogenase deficiency (MCAD). Two infants were diagnosed with 3-methylcrotonyl CoA carboxylase deficiency (3MCC), an organic acid disorder.

Table 3. Newborn Screening Follow-up Results on Infants Screened in Kansas for SFY2011

Condition Screened	Number of Presumptive Positive or Inconclusive Results on Initial Screen	Number of Normal Infants (after repeat screen or other testing)	Number of Pending Screen Results	Number of Screens Lot to Follow-up to NBS	Number of Parental Notifications	Number of Deceased	Number of Confirmed Positive/ Diagnosed (classical or partial with treatment) *
Biotinidase Deficiency	1	1	0	0	0	0	0
Cystic Fibrosis	279	233	0	0	6	2	**9** Cystic Fibrosis **29** CF Carriers
Endocrine Disorders							
Congenital Adrenal Hyperplasia	87	79	0	1	0	3	**4**
Presumptive Congenital Hypothyroidism	62	40	0	1	0	0	**21**
Borderline Congenital Hypothyroidism	1001	939	0	46	0	0	**15** + 1 transient CH
Galactosemia	5	4	0	0	0	0	**1** Duarte
Hemoglobinopathies							
Sickle Cell Anemia	4	0	0	0	0	0	**4**
Sickle C Disease	4	0	0	0	0	0	**4**
Sickle/Beta-Thalassemia Disease	2	0	1	0	0	0	**1**
Other Hemoglobin Disease	8	2 Hgb C Traits	1	0	1	0	**1** Hgb E Disease **1** Sickle/α Thal **2** Hgb C/ β Thal
Hemoglobin Traits	774	60	555	0	0	0	90 Sickle Traits 69 Other Traits
Amino Acid Disorders	330	312	1	2	1	11	**1** ASA **1** PKU **1** MAT I/III †
Fatty Acid Disorders	68	61	0	0	0	2	**3** CUD **2** MCAD
Organic Acid Disorders	155	143	0	0	1	9	**2** 3MCC

* Numbers in bold are infants diagnosed with a disorder

† Methyladenosyltransferase deficiency; a secondary panel disorder

Primary care physicians for all 2,780 infants with results outside of normal limits were notified by both the newborn screening follow-up coordinator and the neonatal testing laboratory. Of these, only 59 infants (2.1 percent) were lost to follow-up or did not follow up as recommended by the program.

More information about the Kansas Newborn Screening Program, including annual reports and quarterly newsletters, is available at www.kdheks.gov/newborn_screening. Questions may be directed to the program phone at: 785-291-3363 (follow-up program) or 785-296-1650 (laboratory).

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Reference

1. American College of Medical Genetics [Internet] Bethesda, MD. c2000-01 [cited 17 Feb 2012]. Available from: http://www.acmg.net/AM/Template.cfm?Section=Policy_Statements&Template=/CM/HTMLDisplay.cfm&ContentID=3671
2. Secretary's Advisory Committee on Heritable Disorders in Newborns and Children. US Department of Health and Human Services. [Internet] [updated Sep 2011, cited 17 Feb 2012] Available from: http://www.hrsa.gov/advisorycommittees/mchbadvisory/heritabledisorders/recommendedpanel/index.html
3. Kansas Department of Health and Environment (2012). Unpublished data.

Perinatal Periods of Risk (PPOR) Approach to Better Understand Fetal-Infant Mortality: A State-Level Analysis in Kansas, 2005-2009

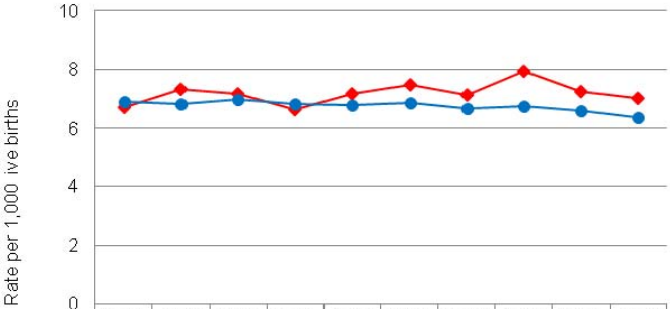
Background

Since 2004, Kansas' infant mortality rate (IMR) has been persistently higher than the national rate [1]. In recent years, Kansas's IMR has stagnated while the national rate has declined (Figure 7) [1]. *Furthermore, while many states have made progress closing the mortality gap between non-Hispanic black and non-Hispanic white infants, Kansas has not (Figure 8) [1]. Although only a small proportion of Kansas's population are non-Hispanic black, the rates of infant mortality are disproportionately high and represent a significant mortality burden in the state. In order to decrease overall infant mortality as well as within non-Hispanic black communities, we must understand more about the context and nature of infant mortality in Kansas.

This analysis uses an approach called the Perinatal Periods of Risk (PPOR) [2,3,4,5,6]. Traditionally, infant mortality is examined by a single dimension, age at death [5]. PPOR uses two dimensions: age at death and birthweight, a strong predictor of an infant's survival at the time of birth [5]. In addition, the PPOR approach includes both fetal and infant deaths. The inclusion of fetal deaths is important because they represent a significant proportion of deaths and contribute information necessary to fully understand a community's mortality problem. A third aspect of the PPOR approach is that the study population is compared with an agreed-upon reference population with good outcomes to estimate excess mortality and target preventable deaths.

*Note: Although it is not shown here, the number of infant deaths to Kansas residents dropped from 290 in 2009 to 253 in 2010. This resulted in an infant mortality rate (IMR) of 6.26 per 1,000 live births compared to 7.01 in 2009. Although the one year decline was not statistically significant at the 95% confidence level, the number of infant deaths is the lowest in Kansas since recordkeeping began in 1912 [7]. The infant mortality rate is the lowest recorded [7]. During 2000-2010, Poisson Joinpoint regression analysis showed an increasing trend in IMR over the interval 2000-2007 followed by a decreasing trend from 2007-2010. The annual percent changes were not significant.

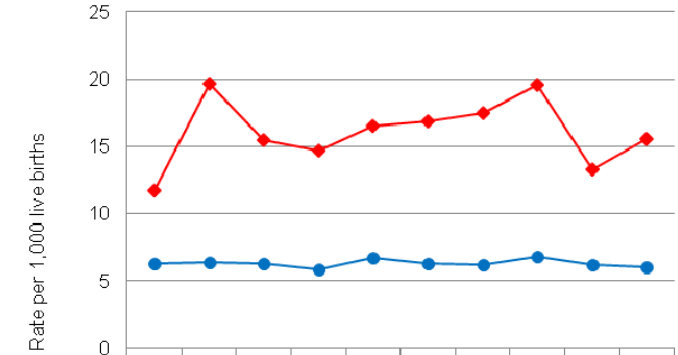
Figure 7. Trends in Infant Mortality Rates, Kansas and U.S., 2000-2009



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
KS	6.71	7.34	7.17	6.66	7.18	7.48	7.16	7.94	7.25	7.01
US	6.91	6.85	6.97	6.85	6.79	6.87	6.69	6.75	6.61	6.39

Source: Bureau of Epidemiology and Public Health Informatics, KDHE; National Center for Health Statistics

Figure 8. Trends in Infant Mortality Rates Among Non-Hispanic Blacks And Non-Hispanic Whites, Kansas, 2000-2009



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
BNH*	11.69	19.67	15.47	14.65	16.53	16.85	17.49	19.61	13.28	15.55
WNH†	6.29	6.40	6.27	5.83	6.75	6.26	6.16	6.79	6.16	6.04

*BNH= non-Hispanic black; †WNH=non-Hispanic white
Source: Bureau of Epidemiology and Public Health Informatics, KDHE

Purpose

This study uses the PPOR approach to analyze resident fetal and infant death data in Kansas for the period 2005-2009 to gain greater insight into the underlying factors contributing to Kansas' fetal and infant deaths [5]. Results offer important information that can be used to develop community-based prevention strategies to decrease overall infant mortality and to reduce racial/ethnic disparities in infant mortality [8].

Methods

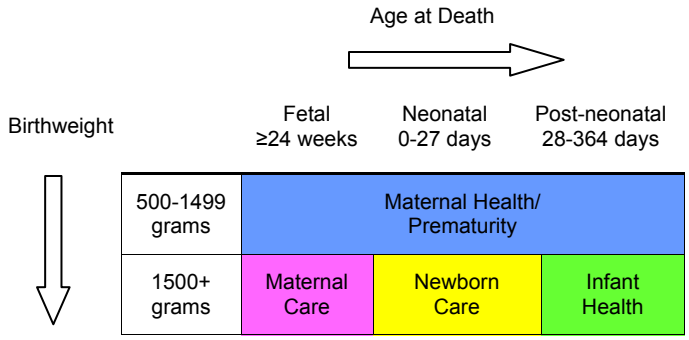
Kansas fetal death and linked birth-infant death certificate files (2005-2009) were analyzed using the PPOR methods [2, 3, 4, 5, 6]. The study population includes fetal deaths, live births, and infant deaths to mothers residing in the state of Kansas at the time of delivery, for deliveries occurring during 2005-2009. Infants weighing less than 500 grams at birth, and fetal deaths at less than 24 weeks gestation or weighing less than 500 grams are excluded from analysis. The denominator is the remaining live births plus fetal deaths; the numerator is the remaining infant deaths plus fetal deaths.

Figure 9 depicts the PPOR model [2,3,4,5,6]. This fetal-infant mortality map combines age at death and birthweight to yield a two-dimensional grid which serves as a simple framework upon which prevention efforts can be built [9]. The three categories for age at death begin with fetal deaths, continue with neonatal deaths (first month of life, <28 days) and end with post-neonatal

deaths (28 to 364 days) [5]. Birthweight is divided into two major birthweight categories: less than 1,500 grams, defined as very low birthweight (VLBW), and 1,500 grams or more, defined in this model as higher birthweight (HBW) [5]. The PPOR approach clusters these six cells into four primary groups [5]. First, the VLBW fetal, neonatal, and post-neonatal deaths are combined into one group [5]. The HBW (1,500 grams and greater) cells within each age at death form the three remaining groups [5].

Using the PPOR approach, fetal and infant deaths within each box or period of risk are examined. Each period of risk corresponds to a different set of risk and preventive factors (Figure 10). Deaths related to VLBW can best be prevented by addressing maternal health to reduce prematurity rates or by promoting policy and practice to increase survival among the very premature. Among HBW-related deaths, fetal deaths can best be prevented by improving maternal care, neonatal deaths can best be prevented by ensuring quality newborn care, and post-neonatal deaths can best be prevented by addressing infant health and safety issues.

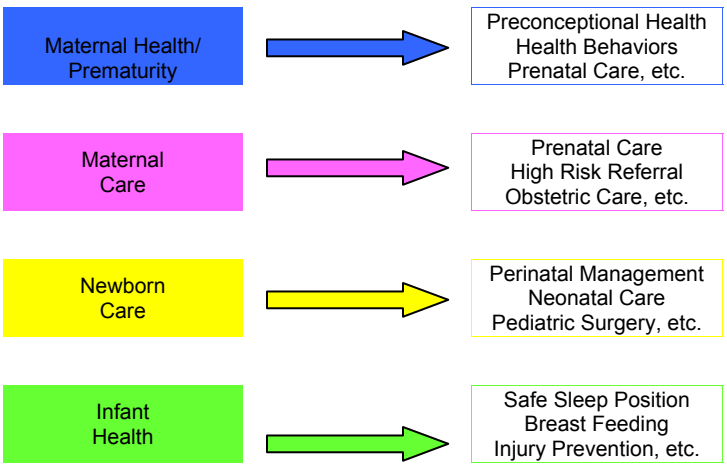
Figure 9. The Perinatal Periods of Risk (PPOR) Model
Source: CityMatCH, http://www.citymatch.org



In the first phase of PPOR analysis, study population mortality rates in each period are compared to the corresponding rates in the reference population. Excess mortality identifies "opportunity gaps" – populations and periods of risk that account for a large portion of the study population's excess mortality.

The second phase of PPOR analysis uses specific analytic methods to examine the excess mortality and identify which known risk factors are most likely to be contributing to the mortality gap.

Figure 10. PPOR Intervention Model



Source: CityMatCH, http://www.citymatch.org

Results

Phase 1: PPOR Analysis [4, 5]

As shown in Table 4, the overall denominator used for PPOR in Kansas during 2005-2009 was 206,052 [fetal deaths (714) + live births (205,338)]. The overall numerator during this same time period was 1,833 [fetal deaths (714) + infant deaths (1,119)].

Table 4. Frequency of Live Births, Fetal and Infant Deaths by Race and Hispanic Origin of Mother* in Kansas, for Inclusion in PPOR Analysis, 2005-2009

Group	Kansas	White non-Hispanic	Black non-Hispanic	Hispanic
Fetal Deaths	714	480	94	122
Infant Deaths (Neonatal + Post-Neonatal)	1,119 (581+538)	734 (398+336)	137 (62+75)	192 (92+100)
Live Births	205,338	147,560	14,004	32,832

Source: Bureau of Epidemiology and Public Health Informatics, KDHE
*Based on race and Hispanic origin of mother as stated on the fetal death and live birth certificates.

Note: PPOR analysis could not be performed by other race and Hispanic origin categories. For the analysis to have sufficient statistical power, and to assure stability and reliability of mortality rates, at least 60 infant and fetal deaths and at least 10 deaths in each period of risk, in each of the study groups/population being studied, would have been necessary [2,3,4,5]

Table 5 presents the results of overall fetal infant mortality rates in each risk period by race and Hispanic origin of mother in Kansas during 2005-2009. Specific findings are as follows:

A comparison of the PPOR results of non-Hispanic black fetal-infant deaths to those of non-Hispanic whites reveals disparities in the following areas (Table 5):

- Fetal-infant mortality within the Maternal Health/ Prematurity risk period was 2.6 times higher among non-Hispanic blacks compared to non-Hispanic whites (7.0 and 2.7, respectively).
- Fetal-infant mortality within the Maternal Care risk period was twice as high among non-Hispanic blacks compared to non-Hispanic whites (3.8 and 1.8, respectively).
- Fetal-infant mortality within the Infant Health risk period was twice as high among non-Hispanic blacks compared to non-Hispanic whites (3.9 and 2.0, respectively).

Smaller disparities appear in the comparison of PPOR results of Hispanic fetal-infant deaths to those of non-Hispanic whites (Table 5):

- Fetal-infant mortality within the Maternal Care and Infant Health risk periods were approximately 30 percent higher among Hispanics (2.4 and 2.6, respectively) compared to non-Hispanic whites (1.8 and 2.0, respectively).

Analysis of Excess Fetal-Infant Mortality in Kansas

Excess mortality is defined as mortality beyond that which would be expected if all groups had the same standard of health and health care and, therefore, had the same chances for health care outcomes as the reference group [2, 3, 4]. There are many potential reference groups from which communities using the PPOR approach can choose. In this report, the 2000-2002 U.S. reference group [4] (non-Hispanic white mothers 20 or more years of age with 13 or more years of education) was used to estimate excess mortality in Kansas.

Table 5. PPOR Model - Period-Specific and Overall Fetal Infant Mortality Rates* by Race and Hispanic Origin of Mother† in Kansas, 2005-2009

Group	Maternal Health/ Prematurity		Maternal Care		Newborn Care		Infant Health		Total	
	FIMR§	CI95¶	FIMR	CI95	FIMR	CI95	FIMR	CI95	FIMR	CI95
Kansas	3.1	2.9 - 3.3	2.1	1.9 - 2.3	1.5	1.3 - 1.6	2.3	2.1 - 2.5	9.0	8.6 - 9.4
WNH‡	2.7	2.4 - 3.0	1.8	1.6 - 2.0	1.5	1.3 - 1.7	2.0	1.8 - 2.3	8.0	7.6 - 8.5
BNH‡	7.0	5.6 - 8.5	3.8	2.9 - 5.0	1.7	1.1 - 2.5	3.9	2.9 - 5.1	16.4	14.3 - 18.5
Hispanic	3.2	2.5 - 3.8	2.4	1.9 - 3.0	1.3	0.9 - 1.8	2.6	2.1 - 3.3	9.5	8.5 - 10.6

Source: Bureau of Epidemiology and Public Health Informatics, KDHE
*Fetal and infant mortality per 1,000 live births plus fetal deaths
†Race and Hispanic origin of mother is based on race and Hispanic origin of mother as stated on the fetal death and live birth certificates.
‡WNH=non-Hispanic white; BNH=non-Hispanic black
§FIMR=Fetal Infant Mortality Rate
¶CI95= 95% confidence interval

Table 6 presents the results of overall mortality rates and excess mortality rates in each risk period by race and Hispanic origin of mother. Specific findings are as follows:

- When compared to the national reference group, almost 70 percent of Kansas' excess fetal-infant mortality was in two risk periods: Maternal Health/ Prematurity and Infant Health. Approximately 42.4 percent (288 deaths/680 deaths) of Kansas' excess fetal-infant mortality was in the post-neonatal period among infants ≥1,500 grams (Infant Health risk period) and 27.2 percent (185 deaths/680 deaths) of Kansas' excess fetal-infant mortality was among infants <1,500 grams (Maternal Health/Prematurity risk period).
- The excess mortality rate for non-Hispanic blacks (10.7) was 4.7 times greater than non-Hispanic whites (2.3).
- Among non-Hispanic white and Hispanic mothers, excess fetal-infant mortality was largely attributable to risks arising during the Infant Health period.
- For non-Hispanic black mothers, the excess fetal-infant mortality was largely attributable to risks arising during the Maternal Health/Prematurity and Infant Health periods of risk.

Table 6. PPOR Model - Comparison of Excess Fetal Infant Mortality Rates* in Kansas, 2005-2009

Group	Maternal Health/ Prematurity		Maternal Care		Newborn Care		Infant Health		Total	
	Group Specific Rates	Excess Rate‡	Group Specific Rates	Excess Rate	Group Specific Rates	Excess Rate	Group Specific Rates	Excess Rate	Group Specific Rates	Excess Rate
U.S. Reference Group†	2.2		1.5		1.1		0.9		5.7	
Kansas	3.1	0.9 185 deaths	2.1	0.6 124 deaths	1.5	0.4 82 deaths	2.3	1.4 288 deaths	9.0	3.3 680 deaths
White non-Hispanic	2.7	0.5 74 deaths	1.8	0.3 44 deaths	1.5	0.4 59 deaths	2.0	1.1 163 deaths	8.0	2.3 340 deaths
Black non-Hispanic	7.0	4.8 68 deaths	3.8	2.3 32 deaths	1.7	0.6 8 deaths	3.9	3.0 42 deaths	16.4	10.7 151 deaths
Hispanic	3.2	1.0 33 deaths	2.4	0.9 30 deaths	1.3	0.2 7 deaths	2.6	1.7 56 deaths	9.5	3.8 125 deaths

Source: Bureau of Epidemiology and Public Health Informatics, KDHE
* Fetal and infant mortality per 1,000 live births plus fetal deaths
† The USA reference group concerns fetal infant deaths to white non-Hispanic mothers 20 or more years of age with 13 or more years of education, 2000-2002 combined.
‡ Excess rate is calculated by the group specific rate minus the USA reference rate.

Phase 2: PPOR Analyses [6]

Part A: Infant Health Risk Period

In Kansas, especially among non-Hispanic white and Hispanic mothers, the period of risk with the largest excess mortality rates is the Infant Health period (i.e., post-neonatal infants ≥1500 grams) (Table 6). The Infant Health risk period also comprised a large part of non-Hispanic black excess mortality. This period was examined in greater depth in the Phase 2 PPOR analyses (Table 7).

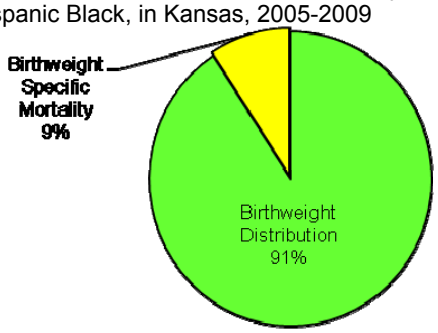
The underlying causes of death (ICD-10 code), as captured on the birth-death linked file created by the Bureau of Epidemiology and Public Health Informatics, KDHE, were grouped into six categories [6]: birth defects (Q00-Q99), infections (A00-B99, G009, J180 and J189), injuries (V01-Y89), perinatal conditions (P00-P96), Sudden Infant Death Syndrome (SIDS) (R95), other ill-defined and unspecified causes of mortality (R99), and other causes. Cause-specific mortality rates for the Infant Health risk period were calculated for the study population by dividing the number of deaths in each category by the population at risk of death in the period (2005 -2009) and expressed as per 1,000 infants [6].

The cause-specific excess mortality rate (CSEMR) is the cause-specific mortality rate (CSMR) for the study population

minus the cause-specific mortality rate for the reference population [6]. The contribution of each cause of death category is calculated by dividing the cause-specific excess mortality rate for that category by the total excess mortality rate [6].

Table 7 shows the results of overall mortality rates and excess mortality rates for the Infant Health risk period in each category of underlying cause of death by race and Hispanic origin of mother. Overall, the Kansas rate was higher than the U.S. reference group in all categories of underlying cause of death except perinatal conditions. In Kansas, the largest excess mortality rates occurred in the SIDS and injuries categories. This closely mirrors the pattern of non-Hispanic white and Hispanic infants. For non-Hispanic black infants, the largest excess mortality rates occurred in the SIDS category.

Figure 11. Maternal Health/Prematurity Category: Components of the Excess Fetal Infant Mortality Rates* among Non-Hispanic Black, in Kansas, 2005-2009



Source: Bureau of Epidemiology and Public Health Informatics, KDHE
*Fetal and infant mortality per 1,000 live births plus fetal deaths

Table 7. Mortality and Excess Mortality Rates for Infant Health Deaths by Underlying Cause of Death by Race and Hispanic Origin of Mother in Kansas, 2005-2009

Group	U.S. Reference†	Kansas		White Non-Hispanic		Black Non-Hispanic		Hispanic	
	CSMR†	CSMR	CSEMR§	CSMR	CSEMR	CSMR	CSEMR	CSMR	CSEMR
CA¶	0.263	0.385	0.122	0.336	0.073	*	*	0.586	0.323
			25 deaths		11 deaths		*		10 deaths
ILL¶	0.069	0.104	0.034	0.096	0.027	*	*	*	*
			7 deaths		4 deaths		*		*
INF¶	0.037	0.079	0.042	0.076	0.038	*	*	*	*
			8 deaths		6 deaths		*		*
INJ¶	0.100	0.400	0.300	0.405	0.305	*	*	0.494	0.394
			61 deaths		44 deaths		*		13 deaths
OTH¶	0.232	0.351	0.118	0.336	0.104	*	*	0.432	0.199
			24 deaths		15 deaths		*		6 deaths
PC¶	0.031	*	*	*	*	-	-	-	-
			*		*		-		-
SIDS¶	0.218	0.978	0.760	0.803	0.585	2.866	2.648	0.956	0.738
			154 deaths		85 deaths		36 deaths		24 deaths
All Causes	0.951	2.307	1.355	2.067	1.115	4.042	3.091	2.684	1.732
			274 deaths		162 deaths		42 deaths		56 deaths

Source: Bureau of Epidemiology and Public Health Informatics, KDHE
- Quantity zero.
* Estimates with a relative standard error (RSE) of greater than 30% are replaced with * and are not shown.
† The USA reference group concerns fetal infant deaths to white non-Hispanic mothers 20 or more years of age with 13 or more years of education, 2000-2002 combined.
‡ CSMR = cause specific mortality rate per 1,000 infants; Denominator for cause of death in infant health period of risk is infants born alive ≥1,500g and still living at 28 days.
§ CSEMR = cause specific excess mortality rate; Excess rate is calculated by the group specific rate minus the USA reference rate.
¶ CA= congenital malformations, deformations and chromosomal abnormalities (Q00-Q99); ILL=other ill-defined and unspecified causes of mortality (R99); INF=infectious and parasitic diseases (A00-B99, G009, J180 and J189); INJ=external causes of mortality (V01-Y89); OTH= other; PC= certain conditions originating in the perinatal period (P00-P96); SIDS=Sudden Infant Death Syndrome (R95)

Part B: Maternal Health/Prematurity Risk Period: Kitagawa Analysis

Among non-Hispanic black mothers, the excess mortality rates were greatest in the Maternal Health/Prematurity category. Because this represented the greatest disparity, this area was examined further in the Phase 2 PPOR analyses.

The Kitagawa formula was used to assess whether excess deaths are due to birthweight distribution (a higher frequency of prematurity) or to higher mortality rates when born with a birthweight between 500-1,499g (birthweight-specific mortality) [5]. Kitagawa's formula informs where to focus [2,3]. The factors and services that generally affect birthweight distribution are different from the factors and services that affect birthweight-specific mortality rates (i.e., Should the community examine prevalence and impact of risk factors causing high VLBW/prematurity rates in their community? Or, should the community examine aspects of their perinatal care system that are responsible for higher birthweight-specific infant mortality rates in their community?) [2,3]. The Kitagawa analysis (Figure 11) shows that the excess fetal-infant mortality among non-Hispanic blacks in Kansas was due to a larger proportion of very low birthweight (VLBW) births (91%). Only 9 percent of the non-Hispanic black VLBW disparity was due to birthweight-specific mortality.

Discussion

Based on PPOR Phase 1 and 2 analyses, opportunities for intervention to reduce excess fetal-infant death vary according to the mother's race/ethnicity. Specific findings are as follows:

- Excess mortality in the Maternal Health/Prematurity risk period due primarily to high rates of VLBW births call for targeted interventions for improving preconception health of non-Hispanic black mothers in particular. This could involve improving the overall health of women in general. Or, a more targeted approach could focus on women of reproductive age with chronic diseases, previous poor birth outcomes, or poorly managed chronic diseases and ensuring better well-woman

care and receipt of prenatal care (maternal health/ prematurity issues).

- Excess mortality in the Infant Health risk period suggests the need for targeted interventions to better provide and monitor infant care, especially of non-Hispanic black and Hispanic infants, in the post-neonatal period. This may include promotion of breastfeeding and safe sleep practices, and prevention of life -threatening injuries.
- The excess fetal infant mortality among non-Hispanic blacks and Hispanics in the Maternal Care risk period highlights the importance of improving access to and utilization of prenatal care services and referrals for high-risk pregnancies.
- To significantly impact Kansas overall IMR, community -specific, tailored prevention efforts on prematurity, safe sleep, and injury prevention may be necessary.

The next step in PPOR Phase 2 analysis for the Infant Health risk period could be to examine the risk factors for SIDS, such as smoking during and after pregnancy, infant sleep position, and bedding. Population-based data are limited for these risk factors but could be supplemented by a survey of recent mothers such as the Pregnancy Risk Assessment Monitoring System (PRAMS) and case-based data when communities undertake prevention planning efforts. In addition, Kansas FIMR and Child Death Review teams could be consulted about cause of death coding practices to see whether ICD-10 codes such as R99 (other ill-defined and unspecified causes) and W77 (accidental suffocation or strangulation in bed) might be commonly used to code SIDS deaths.

The next step in PPOR Phase 2 analysis for the Maternal Health/Prematurity risk period could be to study disparities in the prevalence of factors that are known to be associated with VLBW births, such as maternal obesity, asthma, infections, hypertension before and during the first trimester of pregnancy, lack of insurance prior to pregnancy, delay of prenatal care, etc. These could be obtained through vital records and Medicaid files and supplemented by a survey of recent mothers (e.g., PRAMS). Risk and preventive factors could also include social factors such as poverty, domestic violence and incarceration of family members, which may be obtainable from other data sources at the county, city, or neighborhood levels.

Additional data such as PRAMS are needed to supplement phase 2 analyses. The information would help understand maternal behaviors and experiences before, during, and shortly after pregnancy to support public health and community decision making. In summary, complex factors necessitate a multi-pronged approach and collaborative efforts of community members, public health, and the medical community to reduce Kansas' overall infant mortality rate.

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References

1. Kansas Blue Ribbon Panel on Infant Mortality. *Infant Mortality in Kansas.* April 2011.
2. Handouts from the CityMatCH PPOR Workshop "*Perinatal Periods of Risk: Using Data and Community Involvement to Prevent Infant Mortality.*" 2009 MCH EPI Pre-Conference Data Skills Trainings.
3. Information on Perinatal Periods of Risk (PPOR) from the CityMatCH website, http://www.citymatch.org/ppor_index.php.
4. Sappenfield WM, Peck MG, Gilbert CS, Haynatzka VR, and Bryant T. Perinatal Periods of Risk: *Analytic Preparation and Phase 1 Analytic Methods for Investigating Feto-Infant Mortality.* Matern Child Health J (2010) 14:838-850
5. SUNNY FUTURES Healthy Start Consortium. Data Subcommittee. *Infant Mortality and Morbidity in Houston,Texas: 1999-2003. A report from the Neighborhood Centers Inc.*
6. Sappenfield WM, Peck MG, Gilbert CS, Haynatzka VR, and Bryant T.. *Perinatal Periods of Risk: Phase 2 Analytic Methods for Further Investigating Feto-Infant Mortality.* Matern Child Health J (2010) 14:851-863
7. Crawford G. Bureau of Epidemiology and Public Health Informatics, Kansas Department of Health Environment.. *Infant Mortality Kansas, 2010, Provisional Findings*. http://www.kdheks.gov/phi/download/Infant_Mortality_Kansas_2010_Provisional_Findings.pdf
8. Cai J, Hoff GL, Archer R, Jones LD, Livingston PS, and Guillory VJ. *Perinatal periods of Risk Analysis of Infant Mortality in Jackson County, Missouri.* J Public Health Management Practice, 2007, 13(3), 270–277
9. *W.H.O. Perinatal Periods of Risk Approach: The U.S. Urban Experience*, http://webmedia.unmc.edu/community/citymatch/PPOR/howto/PPORGeneralDescription.pdf.

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Trends in Breastfeeding Initiation Rates in Kansas, 2005-2010

Introduction

For nearly all infants, breastfeeding is the best source of infant nutrition and immunologic protection, and it provides remarkable health benefits to mothers as well [1]. The Agency for Healthcare Research and Quality [2] released a review of the evidence on the effects of breastfeeding in developed countries in April 2007. Reviewing over 9,000 abstracts, they found a reduction in the risk of acute otitis media, gastroenteritis disorders, severe lower respiratory tract infection, atopic dermatitis, asthma, obesity, type 1 and 2 diabetes, childhood leukemia, sudden infant death syndrome, and necrotizing enterocolitis for breastfed infants. Mothers who breastfed had a reduced risk of type 2 diabetes and breast and ovarian cancers. Reduced incidence of illnesses provides health care cost savings.

Surgeon General Regina M. Benjamin, M.D., M.B.A. released a *2011 Call to Action to Support Breastfeeding* [1]. The *Call to Action* states that "One of the most highly effective preventive measures a mother can take to protect the health of her infant and herself is to breastfeed." The report sets forth the roles of clinicians, employers, communities, researchers and government leaders in the promotion and support of breastfeeding. The report states "Mothers are acutely aware of and devoted to their responsibilities when it comes to feeding their children, but the responsibilities of others must be identified so that all mothers can obtain the information, help, and support they deserve when they breastfeed their infants."

Objectives

The objectives of this study were to examine trends in breastfeeding initiation rates using selected characteristics of mothers and infants in Kansas.

Methods

The Kansas electronic birth certificate was used to measure breastfeeding initiation rates from 2005 to 2010. To assess breastfeeding initiation, we used the question: "Is infant

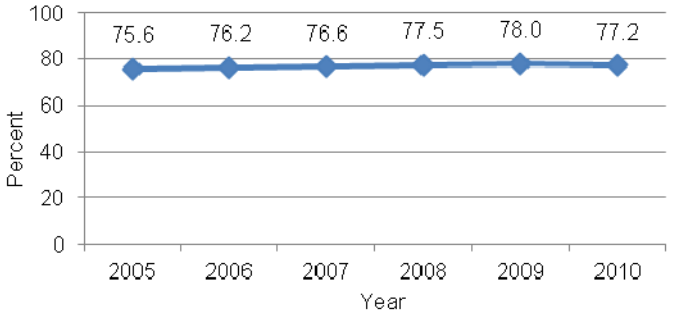
being breast-fed at discharge? (yes/no)." Whether an infant that died shortly after birth was assessed by the question: "Is infant alive at the time of this report? (yes/no)." The county-level data were combined for three-year periods, 2005-2007 and 2008-2010, due to the small number of records. Three years of birth certificate data (2008-2010) were analyzed to identify differences related to breastfeeding initiation for selected characteristics of mothers and infants. Joinpoint regression was used to identify trends in breastfeeding initiation rates over time. Records with missing or unknown breastfeeding status and infants that died shortly after birth were excluded.

Results

Breastfeeding Initiation Trends

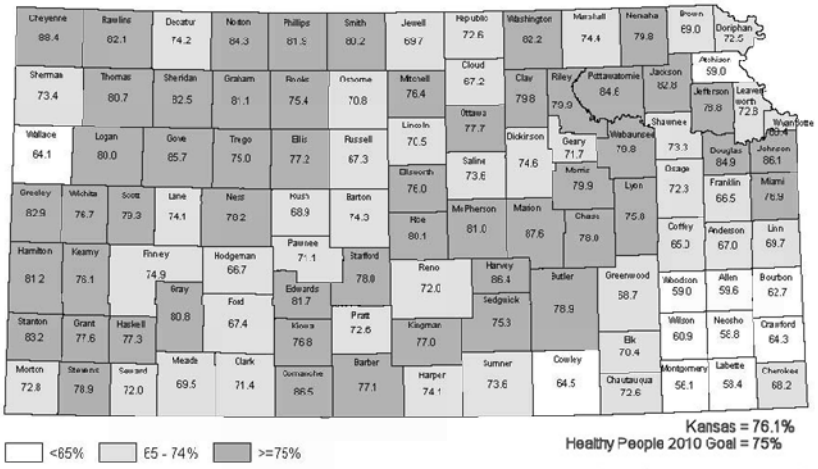
In 2010, Kansas birth certificate data [3] showed a breastfeeding initiation rate of 77.2 percent, indicating that mothers in Kansas exceeded the Healthy People 2010 (HP2010) target of 75 percent initiation. Joinpoint regression analysis showed a statistically significant increase in breastfeeding initiation during the six-year period (2005-2010), remaining above the national HP2010 goal of 75 percent initiation (Figure 12).

Figure 12. Trends in Breastfeeding Initiation, Kansas, 2005-2010*



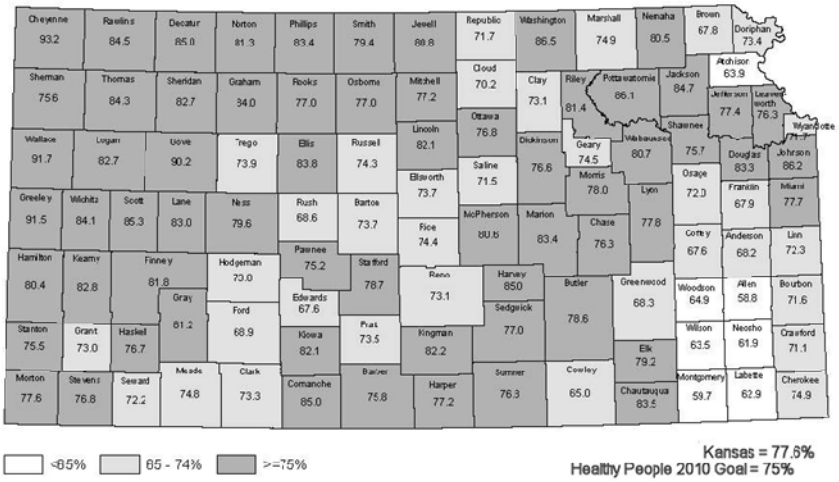
* Missing/unknown breastfeeding status and infants that died shortly after birth were excluded.
Source: KDHE Bureau of Epidemiology and Public Health Informatics

Figure 13. Percent of Live Births by Initiation of Breastfeeding* by County of Residence, Kansas, 2005-2007



*Missing/unknown breastfeeding status and infants that died shortly after birth were excluded.
Source: Birth Certificate Data, Bureau of Epidemiology and Public Health Informatics, KDHE

Figure 14. Percent of Live Births by Initiation of Breastfeeding* by County of Residence, Kansas, 2008-2010



*Missing/unknown breastfeeding status and infants that died shortly after birth were excluded.
Source: Birth Certificate Data, Bureau of Epidemiology and Public Health Informatics, KDHE

The county-level data were combined for three-year periods, 2005-2007 and 2008-2010, due to the small number of records. From 2005-2007 to 2008-2010, the overall percentage of breastfeeding initiation increased significantly in Kansas (76.1 and 77.6 percent, respectively) (Figure 13 and Figure 14). For Bourbon, Crawford, Ellis, Finney, Geary, Leavenworth, Lincoln, Sedgwick, Shawnee and Wyandotte counties, the percentage of breastfeeding initiation was significantly higher in 2008-2010 than in 2005-2007. By contrast, for Clay and Edwards counties, the percentage of breastfeeding initiation was significantly lower in 2008-2010 than in 2005-2007. For the 2010 county specific data, please visit the Kansas Annual Summary of Vital Statistics, 2010 http://www.kdheks.gov/hci/as/2010/AS_2010.pdf, Table 20, Page 50-51.

Selected Characteristics of Mothers and Infants Related to Breastfeeding Initiation

Three years of birth certificate data (2008-2010) were analyzed to identify statistically-significant differences in breastfeeding initiation for selected characteristics of mothers and infants (Table 8). Some of the specific findings are as follows:

- Significantly fewer mothers who were of non-Hispanic black background (59.7%) initiated breastfeeding their infants than did mothers who were non-Hispanic white, non-Hispanic other or Hispanic (78.8%, 78.7% and 79.3%, respectively).
- The percentage of mothers who initiated breast feeding of their infants increased with increasing age. Significantly fewer mothers aged in the under 30 age groups (≤17, 62.8%; 18-19, 68.2%; 20-24,71.9%; 25-29, 80.5%) initiated breastfeeding than did mothers aged 30-34 (83.3%).
- Breastfeeding initiation rates increased with the mothers' highest level of education achieved. Significantly fewer mothers with less than high school (65.8 percent), high school (68.1%) or some college (79.4%) initiated breastfeeding than did mothers who were college graduates (91.2%).
- Significantly fewer unmarried mothers (66.0%) initiated breastfeeding than did mothers who were married (84.7%).

- Significantly fewer mothers who participated in WIC during pregnancy (68.7%) initiated breastfeeding than did mothers who did not (83.3%).
- Significantly fewer mothers residing in rural (76.0%), densely-settled rural (73.8%) or semi-urban (75.2%) areas initiated breastfeeding their infants than did mothers in urban areas (79.6%).
- Significantly fewer mothers who smoked in the three months before pregnancy, in the last three months of pregnancy or any time during pregnancy (61.2%, 56.5% and 59.0%, respectively) initiated breastfeeding than did mothers who did not smoke (81.2%, 80.7% and 81.0%, respectively).

Table 8. Breastfeeding Initiation* by Selected Maternal and Infant Characteristics, Kansas, 2008-2010

		Initiated Breastfeeding Percent (95% CI)†
Overall		77.6 (77.3-77.8)
Race/Ethnicity	White non-Hispanic	78.8 (78.5-79.1)
	Black non-Hispanic	59.7 (58.6-60.7)
	Other non-Hispanic	78.7 (77.7-79.7)
	Hispanic	79.3 (78.8-79.9)
Age of Mother (Years)	≤ 17	62.8 (61.2-64.3)
	18-19	68.2 (67.2-69.2)
	20-24	71.9 (71.4-72.3)
	25-29	80.5 (80.1-80.9)
	30-34	83.3 (82.9-83.8)
	35-39	83.2 (82.5-83.9)
	40+	82.0 (80.4-83.6)
Education	< High school	65.8 (65.2-66.5)
	High school	68.1 (67.5-68.6)
	Some college‡	79.4 (79.0-79.8)
	College graduate	91.2 (90.9-91.5)
Marital status	Married	84.7 (84.4-84.9)
	Unmarried	66.0 (65.6-66.4)
Principal source of payment for this delivery	Medicaid	63.0 (62.5-63.5)
	Private/employer Ins.	85.0 (84.7-85.3)
	Self-pay	80.8 (80.0-81.5)
	Indian Health Services	76.3 (68.6-83.9)
	CHAMPUS/TRICARE	82.0 (81.0-83.0)
	Other government	69.9 (68.6-71.2)
	Other	81.8 (80.1-83.5)
Prenatal WIC participation	Yes	68.7 (68.3-69.1)
	No	83.3 (83.0-83.5)
Birthweight	Very low (<1500g)	68.2 (65.6-70.8)
	Low (1500-2499g)	68.4 (67.3-69.5)
	Normal (2500-3999g)	77.7 (77.5-78.0)
	Heavy (4000g+)	83.4 (82.6-84.1)
Gestational age	Very premature (<32 weeks)	67.6 (65.2-70.0)
	Moderate and late premature (32-36 weeks)	71.5 (70.6-72.4)
	Normal (37-41 weeks)	78.2 (78.0-78.5)
	Overdue (42 weeks+)	83.7 (80.6-86.7)
Primary language spoken in the home	English	76.7 (76.4-76.9)
	Spanish	83.7 (83.0-84.5)
	Other	89.2 (88.1-90.3)
Peer groups§	Frontier	79.7 (78.3-81.2)
	Rural	76.0 (75.1-76.8)
	Densely-Settled Rural	73.8 (73.2-74.5)
	Semi-Urban	75.2 (74.7-75.8)
	Urban	79.6 (79.3-79.9)
Pre-pregnancy weight status	Underweight (BMI <18.5)	72.8 (71.5-74.1)
	Normal (BMI 18.5-24.9)	79.3 (79.0-79.7)
	Overweight (BMI 25-29.9)	78.6 (78.2-79.1)
	Obese (BMI ≥30)	73.6 (73.1-74.2)
Smoked 3 months before pregnancy	Yes	61.2 (60.5-61.8)
	No	81.2 (80.9-81.4)
Smoked last 3 months of pregnancy	Yes	56.5 (55.7-57.3)
	No	80.7 (80.5-81.0)
Smoked anytime during pregnancy	Yes	59.0 (58.3-59.7)
	No	81.0 (80.7-81.2)

*Missing/unknown breastfeeding status and infants that died shortly after birth were excluded.
†95%CI: 95% Confidence Interval
‡Some college is defined as some college credit, but no degree and associate degree.
§Peer groups are defined as those with similar population density based on their 2000 actual census counts.
Source: Birth Certificate Data, Bureau of Epidemiology and Public Health Informatics, KDHE

Discussion

According to the data from the Kansas electronic birth certificate, the percentage of mothers who initiated breastfeeding of their infants increased significantly between 2005 and 2010, remaining above the national HP2010 goal of 75 percent initiation. Significantly more mothers initiated breastfeeding of their infants in 2008-2010 than in 2005-2007. The percentage of mothers in Kansas who initiated breastfeeding of their infants varied by selected socio-demographic characteristics. More work is needed to meet the HP2020 target for breastfeeding initiation of 81.9 percent.

Although this study examined breastfeeding initiation, supporting continued breastfeeding should be encouraged. In general, exclusive breastfeeding and longer durations of breastfeeding are associated with better maternal and infant health outcomes [2].

Breastfeeding initiation and duration data are also available from the Centers for Disease Control and Prevention (CDC) *Breastfeeding Report Card* [4] and the *Maternity Practices in Infant Nutrition and Care* (*mPINC*) [5] survey. The *Report Card* utilizes data from the *National Immunization Survey* and the *mPINC* data relies on accurate reporting from Kansas birthing centers. The *2011 Breastfeeding Report Card* shows Kansas with a 10.6 percent exclusive breastfeeding rate at six months, well below the HP 2020 goal of 25.5 percent. These reports also reflect data about hospital practices that support breastfeeding. Hospitals receive back a *mPINC* report specific to their facility comparing responses in Kansas and an U.S. summary on labor and delivery care practices, feeding of breastfed infants and breastfeeding assistance care, facility discharge care, staff training, and supporting policies. The composite Kansas score for the 2009 *mPINC* report is 62 out of 100 points, with a composite ranking of 33 out of 52.

Accurate Kansas data are crucial for both local hospitals and the communities they serve, as well as programs supporting breastfeeding at the state level. Community hospitals can use their own *mPINC* data to help promote innovations in helping moms and babies in their communities. Nearly all Kansas infants are born in the hospital setting, so breastfeeding-friendly hospital policies, education and follow-up care are crucial to a family's breastfeeding success. The Kansas Breastfeeding Coalition, http://ksbreastfeeding.org/, local breastfeeding clinics, lactation consultants and coalitions, the High 5 for Mom and Babies initiative, http://high5kansas.org/, and the Kansas WIC Program provide additional breastfeeding support to families, employers and hospitals. For more information contact Martha Hagen at mhagen@kdheks.gov.

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References

1. U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Support Breastfeeding.* Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General; 2011.
2. Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. *Breastfeeding and Maternal and Infant Health Outcomes in Developed Countries.* Agency for Healthcare Research and Quality (US) *Evidence Reports/ Technology Assessments, No. 153.* April 2007 Report No: 07-E007
3. Oakley D, Crawford G, Moyer C, Zornes R. *Kansas Annual Summary of Vital Statistics, 2010.* http://www.kdheks.gov/hci/as/2010/AS_2010.pdf
4. Centers for Disease Control and Prevention. Breastfeeding Report Card – United States, 2011. http://www.cdc.gov/breastfeeding/data/reportcard.htm
5. Centers for Disease Control and Prevention. CDC National Survey of Maternity Practices in Infant Nutrition and Care (mPINC). http://www.cdc.gov/breastfeeding/data/mpinc/index.htm

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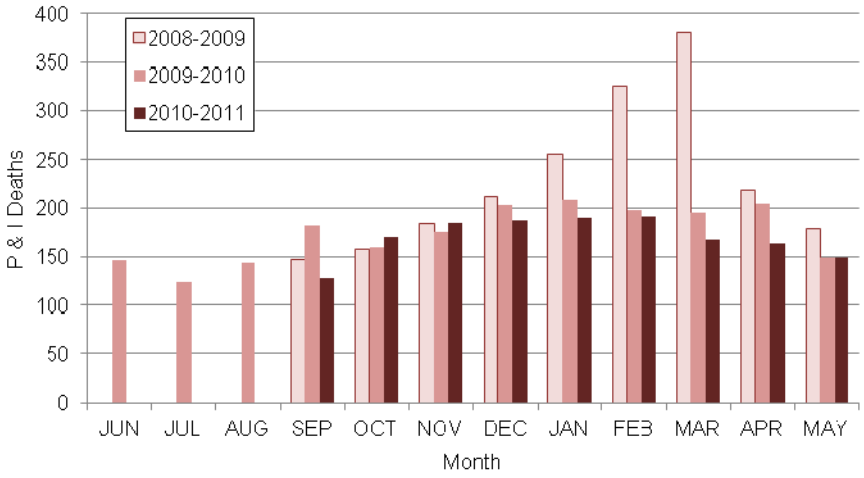
Pneumonia and Influenza Mortality, Kansas, 2010-2011

The Kansas Department of health and Environment's Bureau of Epidemiology and Public Health Informatics monitors influenza-related mortality. Death certificate data is analyzed to determine the number of deaths caused by pneumonia or influenza (P&I). Mortality is divided among three categories: pneumonia or influenza recorded as a contributing factor of death, influenza recorded as the direct cause of death, and pneumonia recorded as the direct cause of death.

Traditionally, the mortality surveillance period is September 1 to May 31 of the following year. Because pandemic 2009 A/H1N1 influenza (pH1N1) was detected in Kansas on April 24, 2009, the mortality surveillance period was adjusted. The 2008-2009 period was changed to September 1, 2008 to April 30, 2009. The 2009-2010 period was adjusted to include both waves of pH1N1, beginning May 1, 2009 and ending May 31, 2010. The 2010-2011 flu season surveillance returned to the traditional period.

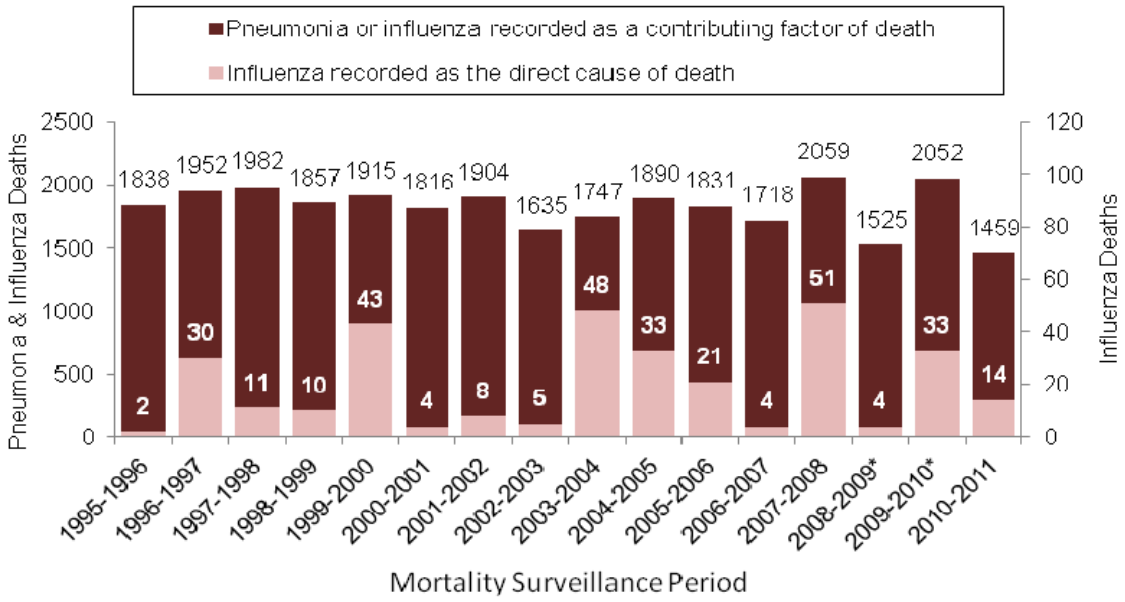
During the 2010-2011 period, the largest numbers of P&I deaths were recorded in the month of February (Figure 15).

Figure 15. Deaths attributed to pneumonia or influenza by month, Kansas, September 2008-May 2011*



**Death certificate lists pneumonia or influenza as a contributing factor or direct cause of death. The surveillance period typically begins September 1 and ends May 31 of the following year; however, due to the emergence of pandemic H1N1 in Kansas in late April 2009, the 2008-2009 period (September1, 2008 through April 30, 2009) ended one month early and the 2009-2010 period (May 1,2009 through May 31,2010) began one month early and was extended through the summer. The 2010-2011 data is provisional and subject to change*

Figure 2: Pneumonia and influenza mortality by surveillance period, Kansas, 1995-2011 *



** Each influenza season begins September 1 and ends May 31 of the following year, with the exception of 2008-2009 (September 1, 2008 Through April 30, 2009) and 2009-2010 (May 1, 2009 through May 31, 2010). This time shift is due to the emergence of pandemic H1N1 in May 2009. The 2010-2011 data is provisional and subject to change.*

A total of 1,459 deaths attributed to pneumonia and Influenza occurred during the 2010-2011 surveillance period. The observed mortality was below the 15-year median of 1,857 (Figure 16). Fourteen deaths were directly attributed to influenza—this number was above the 14-year median (11 deaths) observed since the 1995-1996 surveillance period, but below the 14-year mean (20 deaths).

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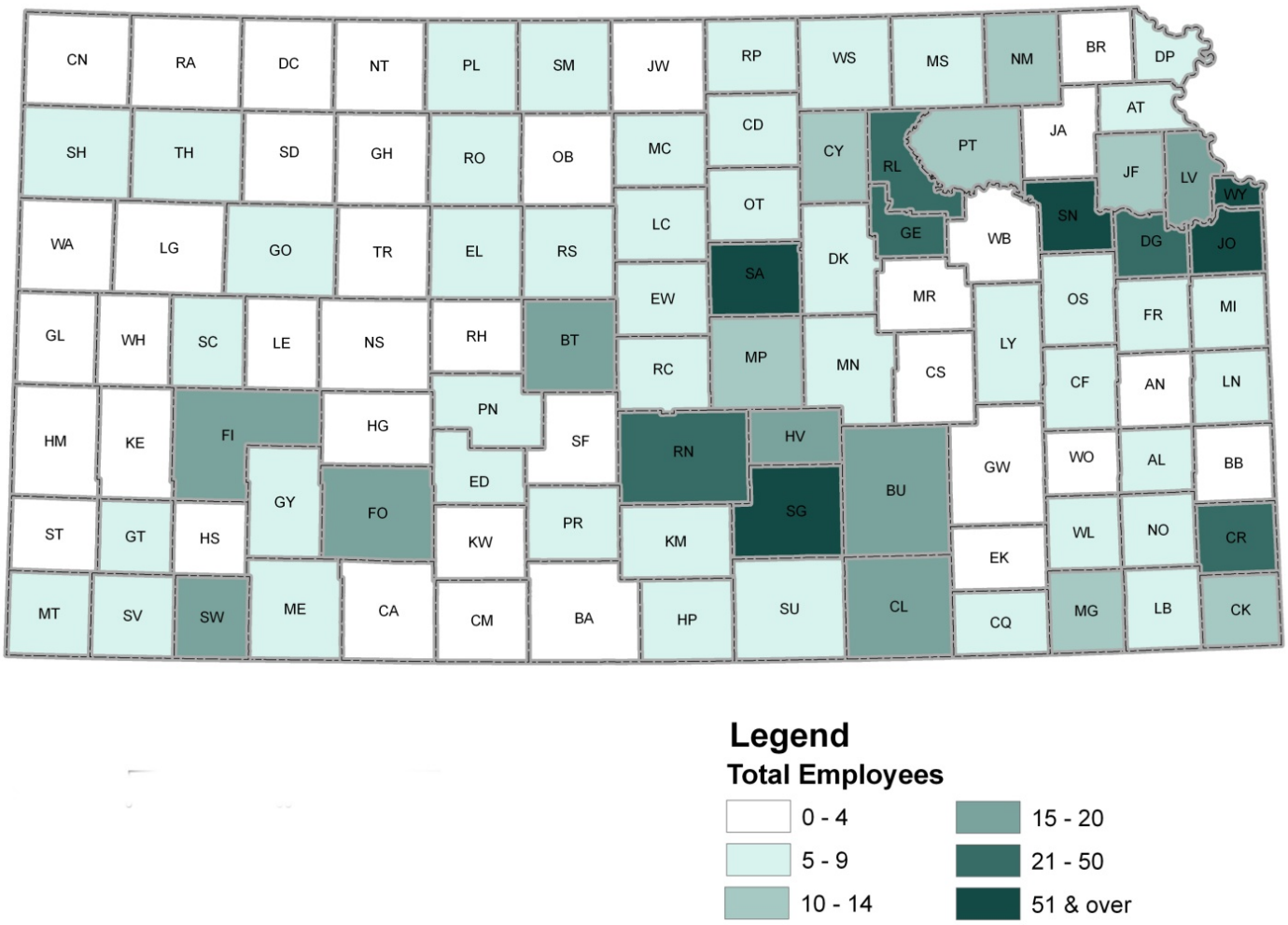
From the Bureau of Community Health Systems

Number of Local Health Department Employees by County



The National Association of City and County Health Departments reports since 2008, 34,400 local health department jobs have been eliminated due to budget cuts. As a result, local health departments (LHDs) have been forced to make tough decisions about cutting jobs and public health services as they continue to keep their communities healthy and protected from public health emergencies. One of the goals of the Kansas Department of Health and Environment Office of Local Public Health is increasing the capacity of the public health workforce to achieve core competencies for public health. The office conducted a survey of local health department workforce in the Fall 2011. The survey found that three out of five counties (64 %) had fewer than 10 employees.

Source: KDHE Bureau of Community Health Systems Survey, 2011

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