Office of Public Health

Presentation to the Research Advisory Committee on Gulf War Veterans' Illnesses

Robert Bossarte, PhD
Director, Epidemiology Program

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September 22, 2014

VA | U.S. Department of Veterans Affairs
Veterans Health Administration
Office of Public Health

Outline

- Introductions
- Epidemiology Program
- Overview of data model
- Overview of Veterans from the Gulf War (GW) Roster and assessment of diagnostic data
- Results from GW Surveys
- Mortality among GW & GW Era Veterans
- Proposed studies
- Development of common data elements
- Institute of Medicine (IOM) study of multiple sclerosis (MS) and other neurologic conditions
- Discussion and recommendations

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Epidemiology Program

- Epidemiology is the study of the distribution and determinants of disease frequency and health related states and a <u>contributor to the rationale for public health policies, services and their evaluation</u>.

- The Epidemiology Program seeks to provide nationally-recognized leadership in the epidemiology of Veterans' health.

- VA's Office of Public Health (OPH) defines public health as <u>the science and practice of promoting health and preventing disease among Veterans</u> and VA staff populations.

- OPH's Epidemiology Program conducts descriptive, observational and analytic studies of cohorts defined by period of service.
    - Studies are informed by the observations and concerns of the Veteran community, results from internal and external research, clinical observation and direction from VA leadership with the goal of promoting health and preventing disease.

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2

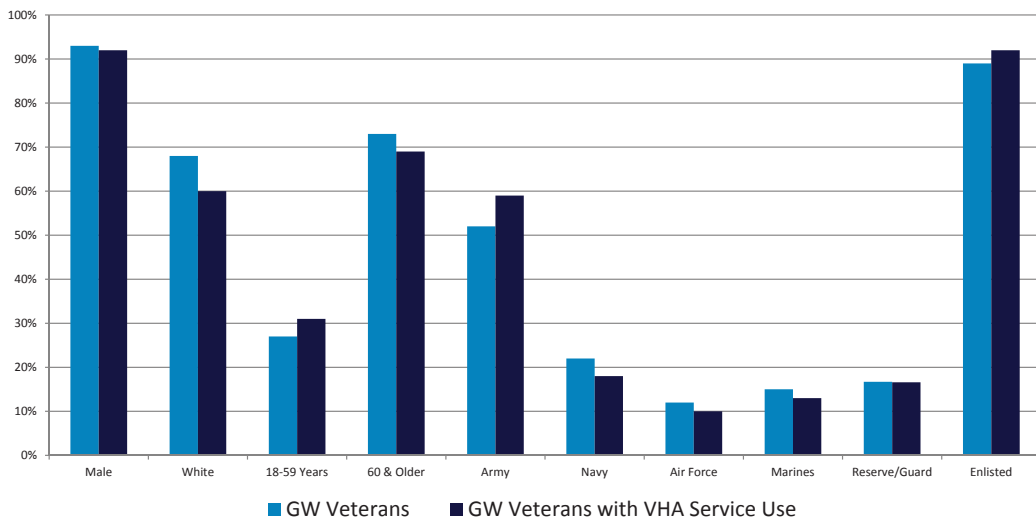# Data Model

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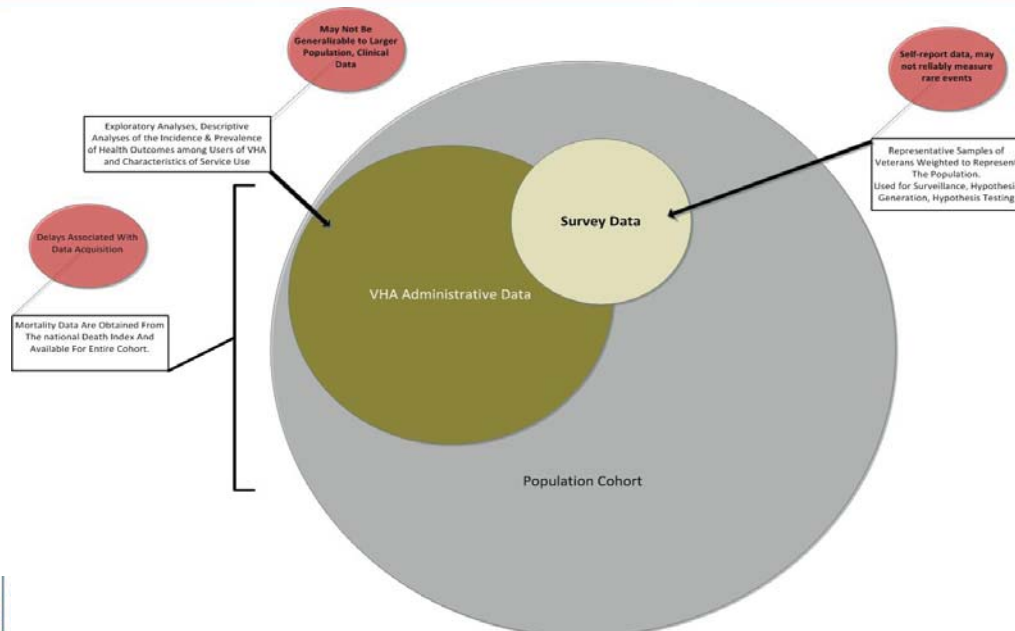
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Gulf War Veteran Roster

- Computerized data file of 621,901 Operation Desert Shield and Operation Desert Storm Veterans deployed to the Kuwaiti Theater of Operations 1990-1991.
- Computerized data file of 746,247 non-deployed Veterans - comparison population who served during the same period.
- Data elements include demographic variables and military service characteristics.
- Historically served as the basis for mortality and morbidity studies.
- Vital status and cause of death data through 2012 is currently being collected.
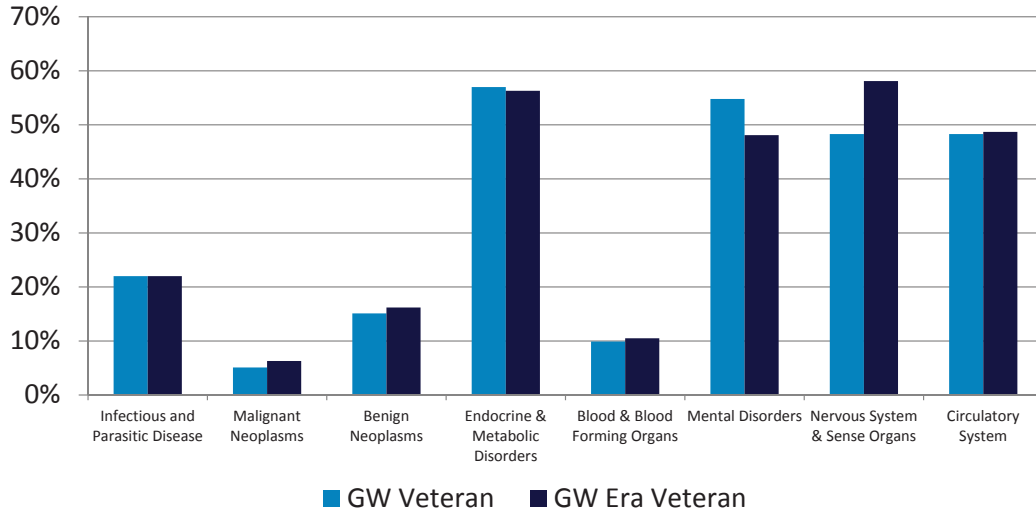
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4

Characteristics of Gulf War Veterans & Gulf War Veterans Who Used VHA Services

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1. Results from analyses of VHA administrative data are preliminary and presented for discussion of potential research applications.
2. Results from analyses of administrative data should not be used to test for differences.
3. Different results may be obtained using alternate algorithms for identifying diagnoses.
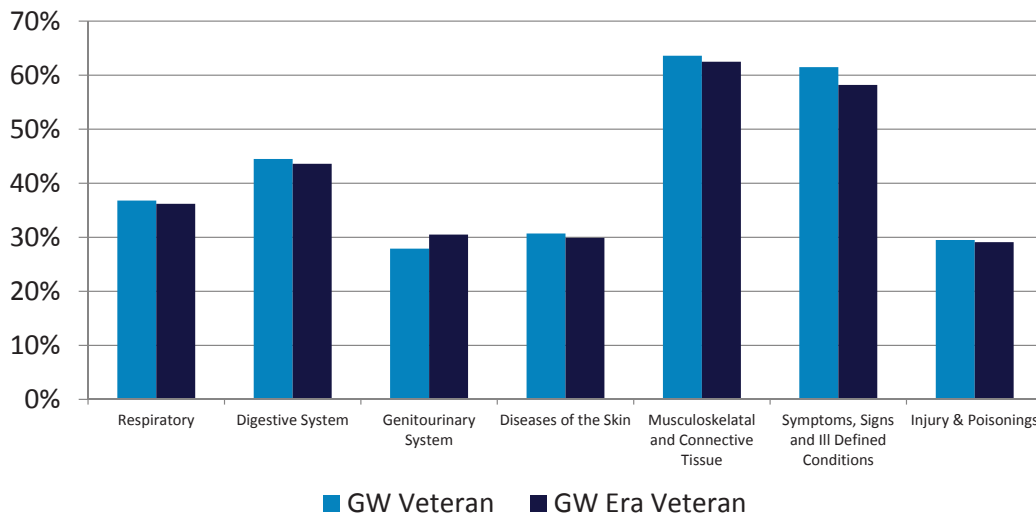
5

Prevalence of ICD-9 Diagnostic Categories among GW and GW Era Veterans with History of VHA Service Use, FY 2002 – FY 2013 [1,2]

1. Veterans are only counted once in each diagnostic category. However, an individual may have more than one diagnosis.
2. The total number of GW Veterans (n=286,995) and GW Era Veterans (n=269,635) who used VHA services was used to calculate percentages.

6

Prevalence of ICD-9 Diagnostic Categories among GW and GW Era Veterans with History of VHA Service Use, FY 2002 – FY 2013 [1,2]

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7

Most Common Diagnoses among Gulf War and Gulf War Era Veterans Diagnosed With A Malignant Neoplasm, FY 2002- FY 2013

GW Veterans (Diagnosis, Within Category Percentage)

1. Other malignant neoplasm of skin, 23.6%
2. Malignant neoplasm of prostate, 22.1%
3. Malignant neoplasm of the colon, 6.2%
4. Malignant neoplasm of the trachea, bronchus and lung, 6.0%
5. Malignant neoplasm of the skin, 5.3%
6. Other malignant neoplasms of lymphoid, histiocytic tissue, 5.2%
7. Secondary malignant neoplasm of other specified sites, 4.4%
8. Malignant neoplasm of kidney and other unspecified urinary organs, 4.1%
9. Malignant neoplasm – no site specified, 4.0%
10. Malignant neoplasm of the female breast, 3.8%

GW Era Veterans (Diagnosis, Within Category Percentage)

1. Malignant neoplasm of prostate, 24.4%
2. Other malignant neoplasm of skin, 23.8%
3. Malignant neoplasm of the trachea, bronchus, and lung, 6.3%
4. Malignant neoplasm of the female breast, 5.9%
5. Malignant neoplasm of the colon, 5.7%
6. Malignant neoplasm of the skin, 5.1%
7. Other malignant neoplasms of lymphoid, hystiocytic tissue, 5.0%
8. Secondary malignant neoplasm of other specified sites, 4.1%
9. Malignant neoplasm of kidney and other unspecified urinary organs, 3.8%
10. Malignant neoplasm – no site specified, 3.8%

GW Veterans n=14,752, GW Era Veterans n=17,105

8

Most Common Diagnoses among Gulf War and Gulf War Era Veterans Diagnosed With Disease of the Nervous System and Sense Organs, FY 2002- FY 2013

GW Veterans (Diagnosis, Within Category Percentage)

1. Disorders of refraction, accommodation, 48.3%
2. Hearing loss, 33.5%
3. Other disorders of the ear, 25.0%
4. Organic sleep disorders, 15.9%
5. Cataract, 15.5%
6. Migraine, 12.3%
7. Visual disturbances, 12.2%
8. Mononeuritis of upper limb, mononeuritis multiplex , 11.9%
9. Glaucoma, 11.5%
10. Disorders of the external ear, 9.6%

GW Era Veterans (Diagnosis, Within Category Percentage)

1. Disorders of refraction, accommodation, 50.6%
2. Hearing loss, 35.0%
3. Other disorders of the ear, 24.5%
4. Cataract, 19.3%
5. Organic sleep disorders, 13.4%
6. Visual disturbances, 12.5%
7. Glaucoma, 12.4%
8. Mononeuritis of upper limb, mononeuritis multiplex , 11.9%
9. Migraine, 11.2%
10. Diabetic retinopathy, 10.3%

GW Veterans n=166,396, GW Era Veterans n=156,772

9

Most Common Diagnoses among Gulf War and Gulf War Era Veterans Diagnosed With Symptoms, Signs and Ill-Defined Conditions, FY 2002- FY 2013

GW Veterans (Diagnosis, Within Category Percentage)

1. General symptoms, 53.7%
2. Symptoms involving respiratory system and other chest symptoms, 39.1%
3. Symptoms involving skin, integumentary tissue, 26.7%
4. Symptoms involving head, neck, 24.8%
5. Nonspecific findings on examination of blood, 24.1%
6. Other symptoms involving abdomen, pelvis, 17.7%
7. Symptoms involving digestive system, 17.6%
8. Nonspecific abnormal results of function studies, 15.1%
9. Other nonspecific abnormal findings, 12.8%
10. Other ill-defined, unknown causes of morbidity, 10.9%

GW Era Veterans (Diagnosis, Within Category Percentage)

1. General symptoms, 50.5%
2. Symptoms involving respiratory system, other chest symptoms, 39.5%
3. Symptoms involving skin, integumentary tissue, 27.1%
4. Nonspecific findings on examination of blood, 24.8%
5. Symptoms involving head, neck, 22.9%
6. Other symptoms involving abdomen, pelvis, 18.3%
7. Symptoms involving digestive system, 16.8%
8. Nonspecific abnormal results of function studies, 14.8%%
9. Other nonspecific abnormal findings, 12.7%
10. Renal colic, 11.3%

GW Veterans n=176,541, GW Era Veterans n=157,051

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10

Follow Up Study of a National Cohort of Gulf War and Gulf War Era Veterans

Erin K. Dursa, PhD, MPH

Principal Investigator

Post-Deployment Health Epidemiology Program

Office of Public Health

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Background

- Overarching research question: Is the health of Veterans who deployed to the 1991 Gulf War better, worse or the same as those who did not deploy?

  - Health includes several domains: physical (such as neurologic, immunologic and respiratory), mental, women's health, functional, and social

- Provide a population-level assessment of overall health and wellness of this group almost 20 years after the Gulf War.

- Describe the natural histories of disease and other health conditions in this Veteran population over time.

Background

- Population based sample of 15,000 Gulf War Veterans (deployed) and 15,000 Gulf War-era Veterans (non-deployed)

- Sampled from the known population of Gulf War veterans and Gulf War-era Veterans (50% of the total known non-deployed veterans during this time period)

Unit Component	Male	Female	Total
Active	4,800	1,200	6,000
Reserve	4,000	1,000	5,000
Guard	3,200	800	4,000
Total	12,000	3,000	15,000

Background

National Health Survey of Persian Gulf War Era Veterans (1995-1997)

- Health Findings: Gulf War Veterans reported higher prevalence of
  - Functional Impairment
  - Healthcare utilization
  - Wide variety of symptoms
  - Serious chronic health conditions
  - Lower perception of general health
  - Miscarriage (female Veterans and female partners of male Veterans)
  - Birth defects among live born infants (female Veterans and female partners of male Veterans)

Kang et al, 2000

Longitudinal Health Study of Persian Gulf War Era Veterans (2003-2005)

- Panel of 30,000 Gulf War and Gulf War Era Veterans were recontacted

- 14 years after deployment, Gulf War Veterans continued to report significantly higher rates of many adverse health including:
  - Unexplained multi-symptom illness
  - Chronic fatigue-like illness
  - Posttraumatic stress disorder
  - Functional impairment
  - Health care utilization
  - Majority of selected physical and mental conditions

Kang et al, 2009

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14

Methods

Follow-Up Study of a National Cohort of Gulf War and Gulf Era Veterans

- Data Collection (May 2012-December 2013)
  - Multimodal health survey - mail, Web, and Computer Assisted Telephone Interview (CATI)
    - Phase I: Veterans mailed a letter inviting them to take the survey on the Web using a unique personal identification number
    - Phase II: Veterans who did not respond to the Web survey were mailed a paper survey, 2 copies of the consent form, a benefits and healthcare information sheet, Veterans Crisis Line information sheet, and pre-addressed postage paid return envelope
    - Phase III: Veterans who did not respond to the Web or paper survey were called and invited to participate in a Computer Assisted Telephone Interview

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15

Methods

- Medical records validation
  - Conducted to verify and validate selected responses provided by mail and Web respondents in the main study. All Veterans who provided a valid verbatim response to either Question 5 (reason for clinic or doctor visit in the past 12 months) or Question 6 on the survey (reason for hospitalization in the past 12 months) were eligible to have these responses coded using the ICD-9 coding scheme

  - 2,500 Veterans were invited to participate in the medical records validation study

  - 86% of records were verified; validity of self-report is high

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16

Results

- Weights were applied to produce estimates that reflect what we would expect in entire population of Gulf War and Gulf Era veterans
  - Reflect the stratified sampling design used to draw the original sample in the baseline study
  - Adjust for non-response encountered in the field
  - Correct known inconsistences in the original frame information

- Weighting is performed in all large population based surveys so that prevalence estimates in the entire population can be determined from a sample
  - National Health and Examination Survey (NHANES)
  - National Health Interview Survey (NHIS)
  - Behavioral Risk Factor Surveillance System (BRFSS)

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17

Results

- 50% response rate (N=14,252)
  - 68% (n=9,643) responded by mail survey
  - 26% (n=3,808) responded by Web
  - 6% (n=801) responded by CATI
- Non-response analyses indicated that the following groups were over-represented in the 2012 follow up
  - Air Force and Army vs. Marines and Navy
  - Deployed vs. Non-deployed
  - Older vs. Younger
  - Officer vs. Enlisted
  - White vs. African American

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18

Results

Sample Frame Characteristic	Web		Mail		CATI		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Gender								
Male	3,072	80.7	7,783	79.7	603	75.3	11,358	79.7
Female	736	19.3	1,960	20.3	198	24.7	2,894	20.3
Deployment Status								
Deployed	2,209	58.0	5,443	56.4	452	56.4	8,104	56.9
Not Deployed	1,599	42.0	4,200	43.6	349	43.6	6,148	43.1
Service Branch								
Air Force	582	15.3	1,161	12.0	76	9.5	1,819	12.8
Army	2,236	58.7	6,394	66.3	540	67.4	9,170	64.3
Marine	421	11.1	941	9.8	76	9.5	1,438	10.1
Navy	569	14.9	1,147	11.9	109	13.6	1,825	12.8
Service Component								
Active Duty	1,705	44.8	3,551	36.8	311	38.8	5,567	39.1
Reserve	1,244	32.7	3,284	34.1	264	33.0	4,792	33.6
National Guard	859	22.6	2,808	29.1	226	28.2	3,893	27.3

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Results

Table I. Weighted prevalence and adjusted odds ratios for self-reported medical conditions in Gulf War and Gulf Era Veterans

Condition	Gulf (n=8,104) (%)	Gulf Era (n=6,148) (%)	aOR (95%CI)
Chronic Multisymptom Illness	43.9	20.3	3.06 (2.78, 3.83)
Migraine Headache	20.3	16.1	1.30 (1.15, 1.47)
Gastritis	20.2	14.3	1.59 (1.35, 1.73)
Irritable Bowel Syndrome	13.8	9.1	1.65 (1.41, 1.94)
Chronic Fatigue Syndrome	11.8	5.3	2.36 (1.94, 2.86)
Asthma	10.2	9.0	1.22 (1.04, 1.44)
Neuralgia	9.4	6.3	1.65 (1.40, 1.95)
Chronic Obstructive Pulmonary Disorder	8.4	6.3	1.48 (1.23, 1.78)
Tachycardia	8.1	5.9	1.47 (1.20, 1.79)
Fibromyalgia	3.7	2.9	1.48 (1.15, 1.91)
Multiple Sclerosis	0.6	0.5	1.35 (0.72, 2.51)
Brain Cancer	0.3	0.3	1.02 (0.47, 2.21)
Amyotrophic lateral sclerosis	0.1	0.05	4.32 (0.82, 21.74)

Models adjust for age, race, gender, BMI, smoking, service branch, and unit component

20

Results

Table II: Weighted prevalence and adjusted odds ratios for a positive screen of mental health conditions in Gulf and Gulf Era Veterans

Condition	Gulf (n=8,104) n (%)	Gulf Era (n=6,148) n (%)	aOR (95%CI)
PTSD	20.9	11.5	1.93 (1.67, 2.24)
Major Depressive Disorder	33.5	21.3	1.75 (1.54, 2.00)
Other Depressive Disorder	48.2	40.3	1.32 (1.19, 1.46)
Anxiety Disorder	18.6	14.4	1.34 (1.17, 1.54)

Adjusted models control for age, race, gender, service branch and unit component

21

Results

Table III. Weighted prevalence of selected symptoms in past 12 months by Gulf and Gulf Era Veterans with self-reported lifetime CMI

Symptom	Gulf (%)	Gulf Era (%)
Joint aching/pain	88.0	87.4
Unrefreshing sleep	86.3	80.3
Stiffness in joints	82.1	80.9
Generalized muscle aching	79.6	74.9
Headaches	73.1	65.9
Trouble finding words	64.8	58.0
Problems with coughing	39.9	38.5
Wheezing in chest	38.7	34.4
Fever/chills	35.4	32.0

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22

Results

Table IV: Weighted cases of self-reported brain cancer by service branch and deployment status

Service Branch	Cases in Gulf Veterans	Cases in Gulf Era Veterans	Total
Air Force	124	0	124
Army	1073	1035	2108
Marine Corps	278	1014	1292
Navy	534	449	983
Total	**2009**	**2498**	**4507**

Table V : Weighted cases of self reported brain cancer in Gulf War Army Veterans with and without exposure to Khamisiyah*

	Khamisiyah Exposed	Khamisiyah Unexposed	
Brain Cancer	27 (0.027)	984 (.47)	

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23

Neurological and all-cause mortality among U.S. Veterans of the Gulf War: 20-year follow-up

Shannon K. Barth, MPH

Principal Investigator

Post-Deployment Health Epidemiology Program

Office of Public Health

Objectives

- To determine the vital status of a cohort of Gulf War (GW) and GW Era Veterans through 2011.

- To determine cause of death among GW and GW Era Veterans.

- To compare mortality rates between GW and GW Era Veterans.

- To determine the association between neurological and other cause-specific deaths and military, exposure, and demographic characteristics.

Background

- 20-year follow up of mortality among GW Veterans compared to GW Era Veterans

  – All-cause mortality

  – Focus on neurological deaths

    - ALS (amyotrophic lateral sclerosis)

    - MS (multiple sclerosis)

    - Parkinson's disease

    - Brain cancer

- This cohort was previously followed-up at 2, 7, and 13 years

26

Measures

- Dependent variables:
  – All causes of death
  – Disease-related causes (infectious and parasitic diseases, all cancers, diseases of circulatory system, respiratory system, digestive system, neurological diseases)
  – External causes (motor vehicle accidents, suicide, homicide)

- Independent variables:
  – Demographic and military characteristics (date of birth, race, sex, branch of service, unit component)
  – Potential nerve gas exposure at Khamisiyah among Army GW veterans (1 day, 2 or more days, not exposed)
  – Potential oil well fire smoke exposure among Army GW veterans (considered exposed if at least 0.26 mg/m^3 of total suspended particulate)

27

Methods

- Update vital status through December 31, 2011 using National Death Index (NDI) data.

- Determine ICD-9 or ICD-10 cause of death using NDI data.

- Crude mortality rates calculated per 10,000 person years.

- Cox proportional hazard models used to calculate adjusted rate ratios (aRR) and 95% confidence intervals (95% CI) for cause-specific mortality while controlling for potential confounding variables

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28

Results- All Causes

Underlying cause of death	GW (n=621,901)		GW Era (n=746,247)		aRR[b]	95% CI
	n	rate[a]	n	rate[a]		
Total	21,163	16.65	29,396	19.36	0.98	0.97, 1.00
Disease related	12,903	10.15	20,299	13.37	**0.96**	**0.94, 0.98**
Infectious diseases	728	0.57	1,196	0.79	**0.74**	**0.67, 0.81**
Cancers	3,955	3.11	6,422	4.23	0.99	0.95, 1.03
Respiratory diseases	556	0.44	970	0.64	0.96	0.86, 1.06
Digestive diseases	822	0.65	1,160	0.76	1.01	0.93, 1.11
Circulatory system diseases	4,407	3.47	6,640	4.37	0.98	0.94, 1.02
External	8,050	6.33	8,883	5.85	1.02	0.99, 1.05
Motor vehicle	2,708	2.13	2,800	1.84	**1.09**	**1.03, 1.15**
Suicide	2,477	1.95	2,844	1.87	0.97	0.92, 1.02
Homicide	880	0.69	959	0.63	0.98	0.89, 1.07

[a] Crude death rate per 10,000 person years

[b] Models control for race, sex, age, branch of service, unit component

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29

Results- Neurological Causes

Underlying cause of death	GW (n=621,901)		GW Era (n=746,247)			
	n	rate[a]	n	rate[a]	aRR[b]	95% CI
Brain cancer	306	0.24	458	0.3	0.92	0.80, 1.07
ALS	88	0.07	141	0.09	0.97	0.74, 1.28
MS	31	0.02	48	0.03	0.85	0.53, 1.34
Parkinson's Disease	15	0.01	38	0.03	0.64	0.34, 1.21

[a] Crude death rate per 10,000 person years

[b] Models control for race, sex, age, branch of service, unit component

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30

Oil well fire smoke and nerve gas at Khamisiyah exposures among Army Gulf War veterans

- 322,249 Army GW Veterans total
- Exposure to nerve gas at Khamisiyah
  - 84,328 exposed for 1 day
  - 14,078 exposed for 2 or more days
- Oil well fire smoke exposure
  - 123,478 exposed
- Approximately 13% of Army GW Veterans were exposed to both oil well fire smoke and nerve agents at Khamisiyah

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31

Results – Neurological Deaths among Army Gulf War Exposed Groups

Adjusted rate ratios (aRR) estimated from the proportional hazard models relating various combinations of variables of potential risk factors to brain cancer among Army Gulf War Veterans

Variables	Estimated model[a], aRR, 95% CI				
	1	2	3	4	5
Oil well fire smoke exposure vs. not exposed	1.36 (0.96, 1.91)	b	b	1.35 (0.95, 1.92)	1.42 (0.93, 2.19)
Khamisiyah, 1 day of exposure vs. not exposed	b	1.22 (0.86, 1.73)	b	1.30 (0.90, 1.87)	b
Khamisiyah, 2 days + of exposure vs. not exposed	b	b	1.65 (0.86, 3.18)	b	1.60 (0.80, 3.20)

[a] All models control for sex, race, type of unit, and age

[b] Indicates variable not included in the model

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32

Summary

- No difference in mortality risk among GW and GW Era Veterans at 20 year follow up.
- GW Veterans had statistically significantly lower risk of death due to all disease related causes and infectious diseases compared to GW Era Veterans.
- GW Veterans had statistically significantly high risk of death due to motor vehicle accidents compared to GW Era Veterans.
- No increased relative risk of neurological diseases among GW vs GW Era Veterans.
- The findings from the 13-year follow up (2004) that Army Gulf War Veterans who were exposed to nerve agents at Khamisiyah (2+ days) or oil well fire smoke had greater risk of brain cancer are no longer statistically significant at the 20-year follow up
  - Increased number of brain cancer deaths among non-exposed groups
  - Increased number of person-years in the denominator

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33

Future Planned Analyses

Robert Bossarte, PhD
Director, Epidemiology Program

September 22, 2014

Future Planned Analyses –Clinical and Administrative Data

- Routine reporting on patterns of health care utilization and diagnoses among Gulf War (GW) and GW Era Veterans.
- Characterization of patients with multiple poorly defined symptoms/illnesses and high service utilization.
- Incidence of cancer among GW and GW Era Veterans using data from VA and state tumor registries.
- Patterns of morbidity among Veterans exposed to Khamisiyah or smoke from oil well fires.
- Patterns of morbidity among Veterans with self-report of CMI.

Future Planned Analyses – GW Survey

- Cross-sectional
  - Symptom characterization of Veterans with CMI
  - Comparison of health with Operation Enduring Freedom/Operation Iraqi Freedom Veteran cohort (New Generation Study)
  - Complementary and Alternative Medicine for CMI
- Longitudinal
  - Gulf War environmental/chemical exposures and disease incidence
    - CMI
    - Neurological Illness (ALS, brain cancer, migraines, Parkinson's, MS)
  - Longitudinal course of PTSD as predictor of chronic health conditions
  - Disease incidence and persistence over time
  - CMI symptom reporting over time

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36

Future Planned Analyses – Mortality

- Annual updates for leading causes of death among GW and GW Era Veterans by age group and sex.
- Continued updates of analyses of mortality among GW and GW Era Veterans.
- Medical records validation of neurological mortality.
- Continued analyses for populations with indication of increased risk including Veterans exposed at Khamisiyah.
- Time dependent models of cancer risk.

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37

Summary and Discussion

Robert Bossarte, PhD
Director, Epidemiology Program

September 22, 2014

U.S. Department of Veterans Affairs
Veterans Health Administration
Office of Public Health

Development of Common Data Elements

- The Epidemiology Program has proposed to convene an expert panel to develop recommendations for a common core of elements for sponsored studies.
- The goal of this effort is to identify essential measures of exposures encountered during military service and health.
- When implemented, a common core of measures would:
  - Allow for comparability across time and population on key indicators of exposure and health.
  - Provide a mechanism for standardized measurement across studies.
- The proposal requests support to convene a panel of experts and an external review of recommendations by an objective third party with documented expertise in Veterans health and measurement.

IOM Study of MS and Other Neurologic Disorders

- The Office of Public Health (OPH) has continued efforts to identify a mechanism that would satisfy legislative requirements for a study of MS and other neurologic disorders among Gulf War Veterans.
- OPH has been working with IOM to inventory data and other resources that could be made available to a study committee if requested.
- IOM has proposed a study designed to assess risk for MS and other neurological disorders among Gulf War Veterans.
- The anticipated cost of the proposed effort is ~3 million with a project duration of ~3 years.

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40

Questions

- Would a quarterly report of GW Veteran Diagnoses and Healthcare Utilization contribute to research?
  - If so, are there other elements that should be added?
- Are there other research priorities that can be addressed using clinical or administrative data?
- Are there other studies of CMI that should be prioritized using available data?
- Are there other studies of cancer (particularly brain cancer) that should be considered?
  - Should VA studies of cancer incidence include data from available state registries or should they be limited to information available from VA?
- Should there be a fourth wave of the GW Survey?

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41

Backup Slides

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42

Gulf War Roster Service Use Summary

- A large proportion of Veterans included in the Gulf War and Gulf War Era Roster have a history of VHA service use (46% & 36% respectively).

- Gulf War Veterans who used VHA services were more likely to be younger (age 59 years or less), have served in the Army and have been enlisted than all Veterans included in the larger Gulf War Veteran Roster.
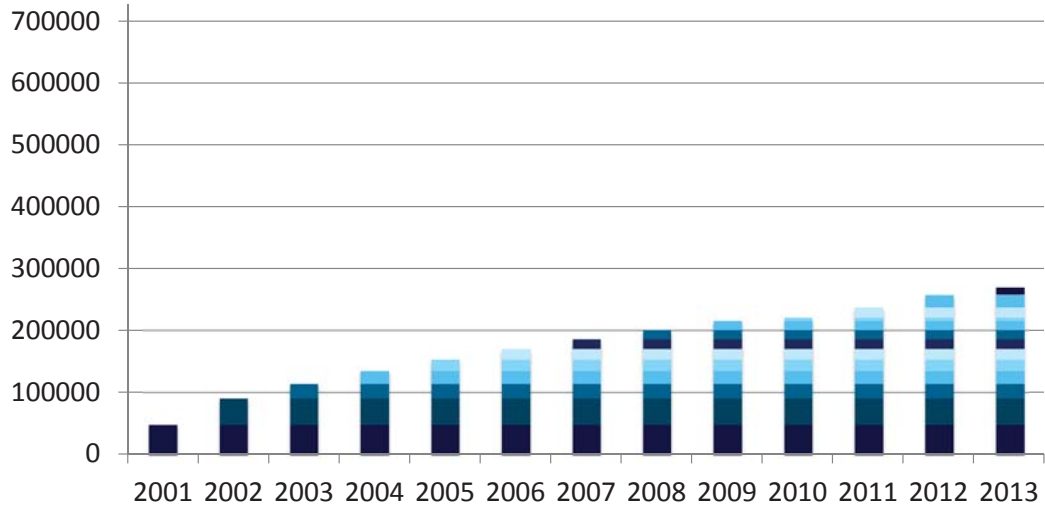
- Gulf War Era Veterans who used VHA services were also more likely to be younger (age 59 years or less), have served in the Army and have been enlisted than all Veterans included in the Gulf War Roster.

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43

VHA Administrative Data

- Administrative data provide a mechanism for assessing the prevalence and incidence of diagnoses and service utilization among Veterans who use Veterans Health Administration (VHA) services.

- The following results from analyses of VHA administrative data are preliminary and presented for discussion of potential research applications.

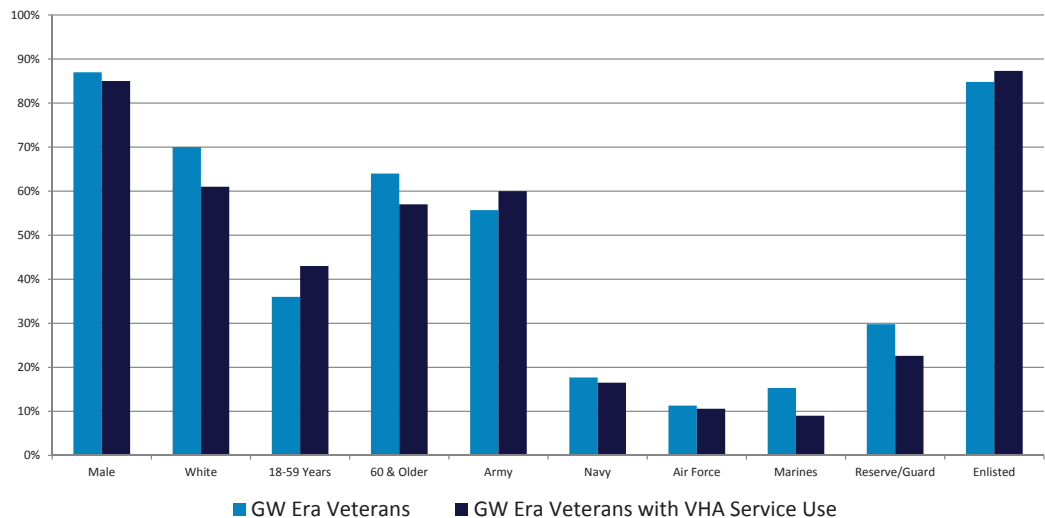- These data cannot be used to test for differences and different results may be obtained using alternate algorithms for identifying diagnoses.

44

GW Roster Veterans With Use of VHA Services by Year (N=286,993)

45
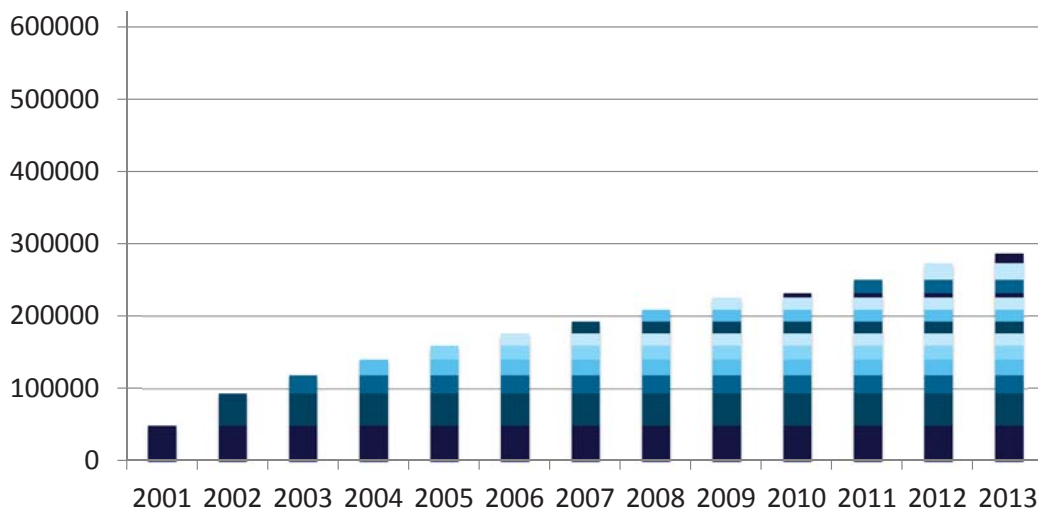
GW Era Roster Veterans With Use of VHA Services by Year (N=269,635)

46

Characteristics of Gulf War Era Veterans & Gulf War Era Veterans Who Used VHA Services

47

Most Common Diagnoses among Gulf War and Gulf War Era Veterans Diagnosed With A Mental Disorder, FY 2002- FY 2013

GW Veterans (Diagnosis, Within Category Percentage)

1. Adjustment disorder, 52.4%
2. Non-dependent abuse of drugs, 51.0%
3. Depressive disorder NOS, 48.5%
4. Anxiety, dissociative, somatofom disorders, 37.9%
5. Episodic mood disorders, 30.6%
6. Alcohol dependence syndrome, 16.8%
7. Sexual, gender identity disorders, 15.5%
8. Drug dependence, 9.8%
9. Special symptoms or syndromes NOS, 8.9%
10. Personality disorders, 5.3%

GW Era Veterans (Diagnosis, Within Category Percentage)

1. Nondependent abuse of drugs, 49.5%
2. Depressive disorder NOS, 46.1%
3. Adjustment disorder, 39.5%
4. Anxiety, dissociative, somatoform disorders, 35.3%
5. Episodic mood disorders, 29.6%
6. Sexual, gender identity disorders, 16.7%
7. Alcohol dependence syndrome, 14.7%
8. Drug dependence, 8.8%
9. Special symptoms or syndromes NOS, 8.1%
10. Delirium due to conditions classified elsewhere, 5.3%

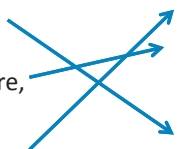GW Veterans n=157,277, GW Era Veterans n=156,772

48

Most Common Diagnoses among Gulf War and Gulf War Era Veterans Diagnosed Infectious and Parasitic Disease, FY 2002- FY 2013

GW Veterans (Diagnosis, Within Category Percentage)

1. Dermatophytosis, 46.9%
2. Other diseases due to virus, Chlamydia, 13.0%
3. Herpes simplex, 9.2%
4. Viral hepatitis, 8.9%
5. Bacterial infection in conditions classified elsewhere, unspecified site, 8.8%
6. Dermatomycosis NOS, 6.5%
7. Viral, chlamydial infection in conditions classified elsewhere, unspecified site, 6.0%
8. Candidiasis, 5.1%
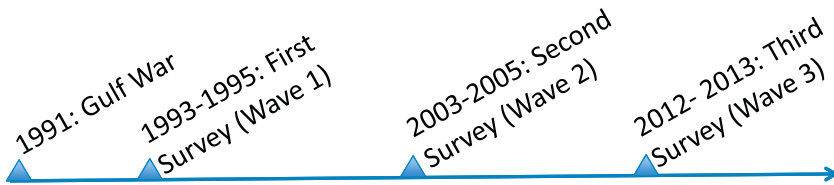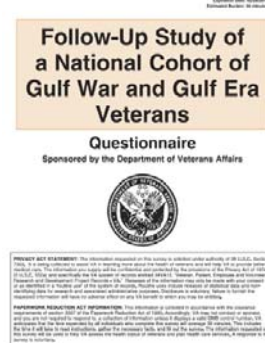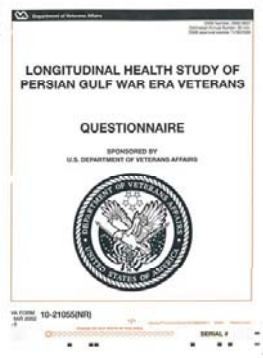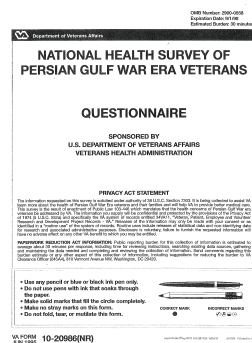9. Herpes zoster, 4.5%
10. Other venereal diseases, 3.4%

GW Era Veterans (Diagnosis, Within Category Percentage)

1. Dermatophytosis, 46.0%
2. Other diseases due to virus, Chlamydia, 12.6%
3. Herpes simplex, 9.8%
4. Viral hepatitis, 9.4%
5. Streptococcus infection in conditions NOS and of unspecified site, 8.6%
6. Candidiasis, 7.0%
7. Viral, chlamydial infection in conditions classified elsewhere, unspecified site, 6.1%
8. Dermatomycosis NOS, 5.4%
9. Herpes zoster, 5.1%
10. Other venereal diseases, 3.0%

GW Veterans n=63,096, GW Era Veterans n=58,721

49

Gulf War Studies

1991: Gulf War

1993-1995: First Survey (Wave 1)

2003-2005: Second Survey (Wave 2)

2012- 2013: Third Survey (Wave 3)

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50

Background

- Health Findings: Gulf War Veterans reported higher prevalence of

  – Functional Impairment

  – Healthcare utilization

  – Wide variety of symptoms

  – Serious chronic health conditions

  – Lower perception of general health

  – Miscarriage (female Veterans and female partners of male Veterans)

  – Birth defects among live born infants (female Veterans and female partners of male Veterans)

  Kang et al, 2000 (JOEM)

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51

Background

- Longitudinal Health Study of Persian Gulf War Era Veterans (2003-2005)
  - Panel of 30,000 Gulf War and Gulf War Era Veterans were recontacted
  - 14 years after deployment, Gulf War Veterans continued to report significantly higher rates of many adverse health outcomes compared with Gulf War Era Veterans including:
    - Unexplained multi-symptom illness
    - Chronic fatigue-like illness
    - Posttraumatic stress disorder
    - Functional impairment
    - Health care utilization
    - Majority of selected physical and mental conditions

Kang et al, 2009 (JOEM)

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52

Domains

- Survey Instrument
  - Military service
  - General health
  - Chronic multisymptom illness
  - Cancers
  - Liver dysfunction
  - GI disturbance
  - Endocrine disorders
  - Autoimmune conditions
  - Neurological conditions
  - Amyotrophic lateral sclerosis
  - Functional health
  - Post traumatic stress disorder
  - Exercise
  - Alcohol use
  - Tobacco Use
  - Complementary and alternative medicine (CAM)
  - Women's heath
  - Demographics
  - Health care utilization
  - Medication use

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53

Cohort description

- GW: 621,902 U.S. Veterans who were in the Persian Gulf during the time period of the armed conflict (August 1, 1990 - March 1, 1991)

- GW Era Veterans: 746,248 veterans from a stratified random sample of all military personnel (active duty, reserves or National Guard) who served during the GW but were not in theater

Results

- 21,163 deaths among GW Veterans.

- 29,396 deaths among GW Era Veterans.

- GW Veterans are more likely to be male, slightly younger, and not Reserve or National Guard.

- GW and GW Era Veterans similar in race, branch of service, marital status at deployment