Place of Death: A Useful Variable for Analyzing Cancer Mortality

Observations and Practical Implications

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Presentation Outline

1. Introduction: Place of Death: A Useful Variable on Analyzing Cancer Mortality

2. Place of Wisconsin Case Deaths 1995 – 2009

    * Part 1: Type of Place
    * Part 2: Geographical Location

3. Summary Discussion

1. Place of Death: A Useful Variable

Cancer Surveillance: A Public Health Mission

* Document and track the burden of cancer

* Document and track progress

    * Length of survival
    * Efficacy of screening and treatment
    * Quality of life, comorbidities

Mortality Data is of central importance ….
…but complete capture is challenging

1. Place of Death: A Useful Variable

Complete mortality capture is challenging

* Absence and errors/variants in key patient identifiers
    * SSN
    * Names and name usage changing with marital status and other events
    * Birthdate
* Non-hospital deaths (more difficult for follow-up)
* Change of State of residence

1. Place of Death: A Useful Variable

Part A: Type of Place of Death

* Hospitals
* Nursing homes
* At home (patient's ordinary residence)
* Other
    * Hospice facilities
    * Comm.-Based Residential Facilities (CBRF)

1. Place of Death: A Useful Variable

Part B: Geographical Location (Place) of Death

* Death in State of Diagnosis
    * Death certificate file available to CCR

* Death Elsewhere (State Residence Maintained)
    * Out-of-state records shared back by NCHS

* Death Elsewhere (State Residence Changed)

    * Where are you going to find them?

Social Security Records (SSDI)

Part A: Type of Place of Death

* Starting Points
    * Patient-decedent linkage (over a decade)
    * Curiosity about data capture completeness
    * Curiosity about hospice and related trends
    * Curiosity about post-diagnosis mobility

Type of Place of Death

* Preparation of Data Set for Analysis (n = 755,797 decedents)
    * Fifteen years (1995-2009) State death records

        Type of place 1995-2009:

        Hospital, nursing home, residence, other, NOS

        Type of place 2003-2009:

        Above listed, plus: Hospice and CBRF

Type of Place of Death

* Case Linkage from Annual Death Matching

  Limit to Wisconsin residence at Dx,

  Single primary cases

  Invasive cases

  n = 182,453 Registry cases

Type of Place of Death

Starting Point

Preparation of Data Set for Analysis

- Fifteen years (1995-2009) State death records
  - Type of place
- Case Linkage from Annual Death Matching
  - Limit to dxstate = “WI”, single primary, invasive

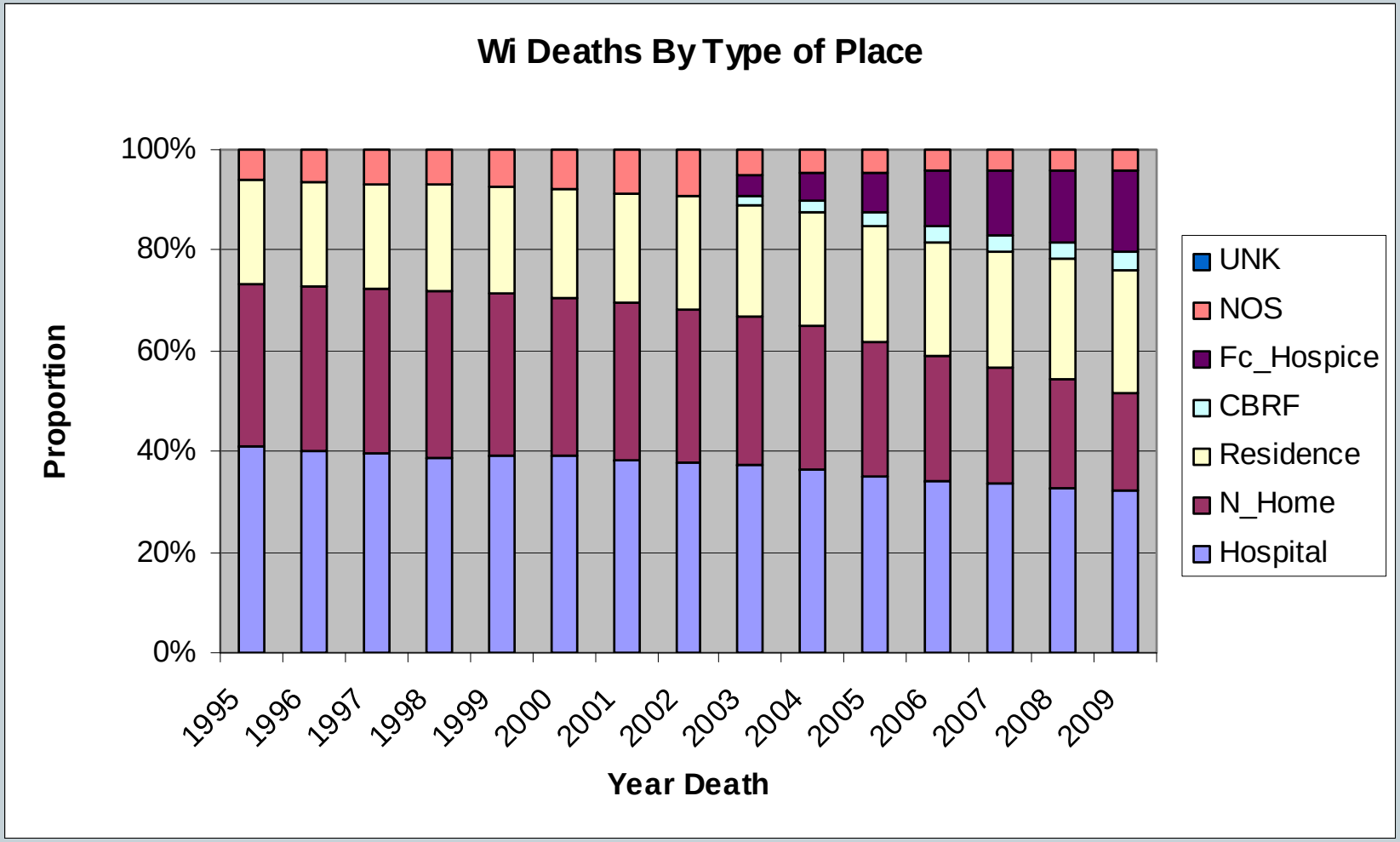
Wisconsin Deaths 1995-2009 – (All) Place of Death *Counts*

Year	Deaths	Hospital	Nursing H	Residence	CBRF	Hospice	NOS	UNK
1995	46,347	18,902	15,009	9,566	0	0	2,863	0
1996	46,353	18,593	15,135	9,567	0	0	3,058	0
1997	46,135	18,305	15,170	9,474	0	0	3,185	1
1998	47,079	18,309	15,500	9,988	0	0	3,282	0
1999	47,766	18,649	15,440	10,182	0	0	3,495	0
2000	47,651	18,647	15,024	10,268	0	0	3,711	1
2001	47,742	18,289	14,871	10,311	0	0	4,253	18
2002	47,982	18,225	14,597	10,676	0	0	4,483	1
2003	47,199	17,655	13,934	10,407	849	2,041	2,292	21
2004	46,671	17,076	13,195	10,692	983	2,570	2,153	2
2005	47,669	16,634	12,886	10,836	1,290	3,777	2,239	8
2006	47,190	16,133	11,689	10,714	1,390	5,304	1,953	7
2007	47,209	15,863	10,837	10,935	1,466	6,076	2,009	23
2008	47,702	15,668	10,373	11,284	1,619	6,843	1,900	15
2009	46,731	15,105	9,100	11,322	1,794	7,389	2,010	11

Wisconsin Deaths (All) 1995-2009 – Place of Death
Percentages

Year	WI Deaths	Hospital	N_Home	Residence	CBRF	Hospice	NOS	UNK
1995	46,347	41	32	21	0	0	6	0
1996	46,353	40	33	21	0	0	7	0
1997	46,135	40	33	21	0	0	7	0
1998	47,079	39	33	21	0	0	7	0
1999	47,766	39	32	21	0	0	7	0
2000	47,651	39	32	22	0	0	8	0
2001	47,742	38	31	22	0	0	9	0
2002	47,982	38	30	22	0	0	9	0
2003	47,199	37	30	22	2	4	5	0
2004	46,671	37	28	23	2	6	5	0
2005	47,669	35	27	23	3	8	5	0
2006	47,190	34	25	23	3	11	4	0
2007	47,209	34	23	23	3	13	4	0
2008	47,702	33	22	24	3	14	4	0
2009	46,731	32	19	24	4	16	4	0

WI Deaths 1995-2009 – Place of Death Counts

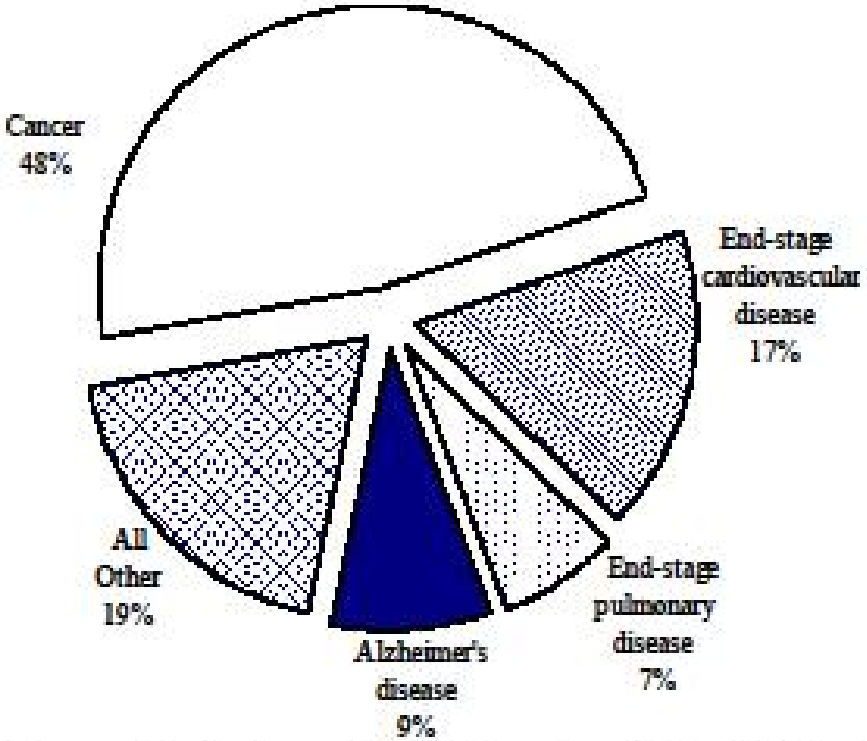


Wisconsin Type of Place of Death: Change 1995-2009 and 2003-2009

Year	1995	2009	Pct Change	2003	2009	Pct Change
Hospital	32	19	**-13**	30	19	**-11**
Nursing Home	21	24	**3**	22	24	**2**
Residence	0	4	**4**	2	4	**2**
CBRF	0	4	**4**	2	4	**2**
Hospice	0	16	**16**	4	16	**12**

Cancer Patients in Hospice - 2005

Figure 1. Principal Diagnosis of Hospice Patients, Wisconsin 2005



Source: Annual Survey of Hospices, Bureau of Health Information and Policy, Division of Public Health, Department of Health and Family Services.

Wisconsin Deaths 1995-2009 – (CCR Cases) Place of Death *Counts*

Year	Case Dths	Hospital	N_Home	Residence	CBRF	Fc_Hospice	NOS	UNK
1995	12,543	4,792	3,375	3,503	0	0	870	0
1996	12,358	4,538	3,376	3,534	0	0	910	0
1997	11,639	4,318	3,166	3,260	0	0	895	0
1998	12,622	4,531	3,478	3,613	0	0	1,000	0
1999	12,854	4,720	3,366	3,736	0	0	1,032	0
2000	12,549	4,647	3,297	3,532	0	0	1,073	0
2001	12,004	4,070	3,201	3,493	0	0	1,238	2
2002	12,138	4,162	3,039	3,590	0	0	1,347	0
2003	11,043	3,772	2,696	3,220	169	815	368	3
2004	11,715	3,934	2,709	3,490	204	1,054	323	1
2005	11,594	3,614	2,570	3,321	278	1,491	319	1
2006	10,688	3,145	2,223	3,032	276	1,750	262	0
2007	11,683	3,506	2,147	3,348	303	2,124	252	3
2008	12,139	3,540	2,132	3,476	342	2,374	272	3
2009	12,091	3,443	1,880	3,598	355	2,541	269	5

Wisconsin Deaths (CCR) 1995-2009 – Place of Death
Percentages

1995	12,543	38	27	28	0	0	7	0
1996	12,358	37	27	29	0	0	7	0
1997	11,639	37	27	28	0	0	8	0
1998	12,622	36	28	29	0	0	8	0
1999	12,854	37	26	29	0	0	8	0
2000	12,549	37	26	28	0	0	9	0
2001	12,004	34	27	29	0	0	10	0
2002	12,138	34	25	30	0	0	11	0
2003	11,043	34	24	29	2	7	3	0
2004	11,715	34	23	30	2	9	3	0
2005	11,594	31	22	29	2	13	3	0
2006	10,688	29	21	28	3	16	2	0
2007	11,683	30	18	29	3	18	2	0
2008	12,139	29	18	29	3	20	2	0
2009	12,091	28	16	30	3	21	2	0

Place of Death: All Deaths and Linked Cases

		1995	2009	Pct Change	2003	2009	Pct Change
Hospital	**All Deaths**	41	31	-10	30	19	-11
	Case Deaths	38	28	-10	34	28	-6
N_Home	**All Deaths**	32	19	-13	22	24	2
	Case Deaths	27	16	-11	24	16	-8
Residence	**All Deaths**	21	25	4	2	4	2
	Case Deaths	28	30	2	29	30	1
CBRF	**All Deaths**	0	4	4	2	4	2
	Case Deaths	0	3		0	2	3
Hospice	**All Deaths**	0	16	16	4	16	12
	Case Deaths	0	21	21	7	21	14

Part B: Geographical Location of Death

* Starting Points: Considering Mobility
    * Cancer patient immobility
        - Deaths close to residence at Diagnosis
        - Residence at Diagnosis as linkage support
    * Cancer patient mobility
        - How far within state from residence at Diagnosis?
        - Longer survival and change of state residence?

Part B1: Intra-State mobility

* Intra-State mobility during survival
    * Data methods

Limited residential location available in State death records

“Fuzzying-up” area locations

n = 182,453 Registry cases matched to 1995 – 2009 State death records

Part B1: Intra-State mobility

Post-Diagnosis Residence Change – Geographic Scale

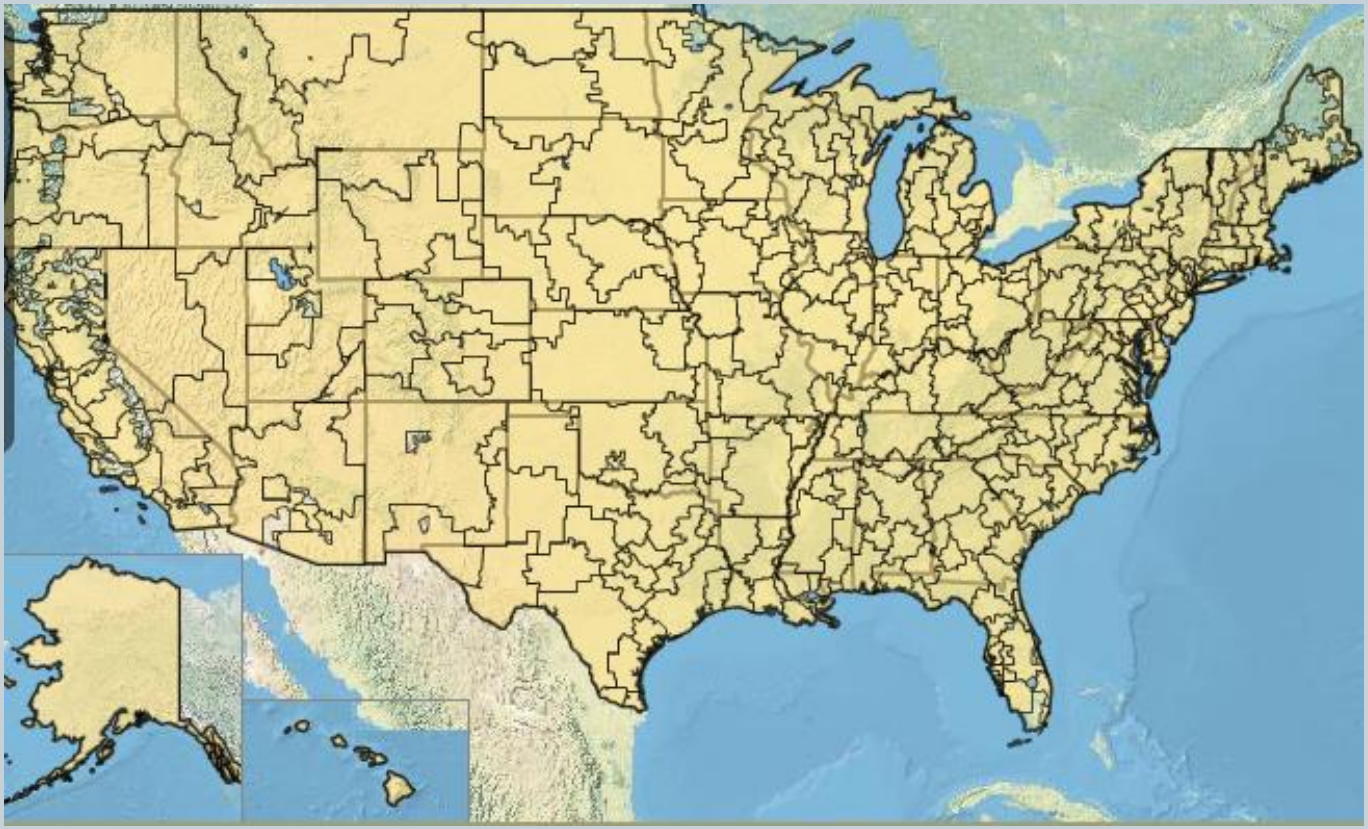
County (n = 72)

Dartmouth Atlas Hospital Service Area (Wisconsin in 110 H.S.A.s)

Dartmouth Atlas Hospital Referral Region (Wisconsin in 13 H.R.R.s)

Part B1: Intra-State mobility

Dartmouth Atlas Hospital Referral Regions



Part B1: Intra-State mobility

Dx-Death Residence Change by Year of Death

Year Death	Cases	Pct Same County	Pct Same H.S.A.	Pct Same H.R.R.
1995	11,960	90	91	95
1996	11,733	90	91	95
1997	11,092	90	91	95
1998	12,043	89	90	94
1999	12,254	89	91	95
2000	11,980	88	90	95
2001	12,004	90	92	96
2002	12,138	91	92	97
2003	11,043	90	91	96
2004	11,715	90	91	96
2005	11,594	89	90	96
2006	10,688	89	89	95
2007	11,683	89	90	95
2008	12,139	90	90	96
2009	12,090	89	90	95

Part B1: Intra-State mobility

Length of Survival by Decedents by Year of Death

Year Death	Less Than 1 Year	1-5 Years	5-10 Years	10-20 Years	Over 20 Years
1995	29	49	14	9	0
1996	25	45	14	10	0
1997	26	44	13	10	1
1998	27	47	14	10	1
1999	27	46	14	11	2
2000	25	45	16	11	3
2001	25	45	15	12	3
2002	26	44	14	12	3
2003	24	44	15	13	4
2004	23	43	15	14	5
2005	22	42	15	16	5
2006	17	43	17	16	6
2007	23	42	15	15	6
2008	23	42	14	14	6
2009	22	42	15	15	7

Part B1: Intra-State mobility

Dx-Death Change of Residence Area by Length of Survival

Survival	Cases	Pct Same Co	Pct Same H.S.A.	Pct Same H.R.R.
A_Less Than 1 Year	42898	94	95	97
B_1-5 Years	78176	91	93	97
C_5-10 Years	25843	86	86	94
D_10-20 Years	22089	83	82	92
E_Over 20 Years	6047	78	77	89

Part B2: Inter-State Mobility?

* Inter-State mobility during survival?
    * Data methods:

Marginal linkage of single (invasive) primary WI patients (Dx < 2010) not already linked to WI death files

n = 387,072 patients

CDC-Provided SSDI Files (1995-2009)

n = 33,285,520 decedent SSN-holders

Part B2: Inter-State Mobility?

Place of Death for Cases for Wisconsin Residents (State Death File)

Year of Death	State Death Records	Death In WI	Pct Deaths Outside Wisconsin
1995	12,543	11,960	**5%**
1996	12,358	11,733	**5%**
1997	11,639	11,092	**5%**
1998	12,622	12,043	**5%**
1999	12,854	12,254	**5%**
2000	12,549	11,980	**5%**
2001	12,004	11,776	**2%**
2002	12,138	11,905	**2%**
2003	11,043	10,839	**2%**
2004	11,715	11,497	**2%**
2005	11,594	11,389	**2%**
2006	10,688	10,479	**2%**
2007	11,683	11,439	**2%**
2008	12,139	11,968	**1%**
2009	12,091	11,842	**2%**

Part B2: Inter-State Mobility?

Gains from SSDI Death Matching Residents by SSA Benefit Address

Year Death	New Matches	Wisconsin	Other State	NOS
1995	522	254	228	40
1996	713	415	239	59
1997	883	505	306	72
1998	728	386	292	50
1999	653	256	354	43
2000	781	433	348	0
2001	878	471	336	71
2002	900	456	388	56
2003	1,211	677	460	74
2004	1,024	540	416	68
2005	1,472	958	391	123
2006	2,623	2,001	427	195
2007	1,608	1,049	465	94
2008	1,437	889	454	94
2009	1,117	634	409	74

Part B2: Inter-State Mobility?

Proportional Marginal Gains from SSDI Death Matching

Year Death	WI File Case Deaths	Pct SSDI Adds	Pct WI Gains	Pct Oth St Gains	Pct Place NOS
1995	12,543	4	49	44	8
1996	12,358	6	58	34	8
1997	11,639	8	57	35	8
1998	12,622	6	53	40	7
1999	12,854	5	39	54	7
2000	12,549	6	55	45	0
2001	12,004	7	54	38	8
2002	12,138	7	51	43	6
2003	11,043	11	56	38	6
2004	11,715	9	53	41	7
2005	11,594	13	65	27	8
2006	10,688	25	76	16	7
2007	11,683	14	65	29	6
2008	12,139	12	62	32	7
2009	12,091	9	57	37	7

Part B2: Inter-State Mobility?

Gains from SSDI Death Matching By SSA Benefit Location

Biggest Gains from Other States

Rank	State	SSDI Gain
1	FL	1,007
2	IL	858
3	MN	485
4	AZ	408
5	MI	278
6	CA	274
7	TX	272
8	IN	148
9	IA	132
10	CO	110

Biggest Out-State Gains by H.R.R

Rank	Hospital Referral Region	SSDI Gain
1	MINNEAPOLIS, MN	218
2	FORT MYERS, FL	199
3	ORLANDO, FL	195
4	PHOENIX, AZ	139
5	ST. PAUL, MN	134
6	ROCKFORD, IL	125
7	MELROSE PARK, IL	107
8	FORT LAUDERDALE, FL	103
9	ELGIN, IL	100
10	TUCSON, AZ	92

3. Summary Discussion

Cancer Surveillance: A Public Health Mission

* Case Linkage with Death Records is Very Important

* How Can We Improve Linkage Completeness?

  * Observe trends in place of cancer patient deaths

  * Investigate the potential role of non-hospital hosts of dying patients

3. Summary Discussion

* Investigate options for extending the breadth of patient death information resources

  Social Security Death Index

  CDC-NDI Linkage

* Can a Secure CCR-Accessible Inter-State Death Record Clearing House Be Established?

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