

APPROACH



Alberta Provincial Project for
Outcome Assessment in Coronary Heart Disease



APPROACH WORKING REPORT

Diagnostic Cardiac Catheterization and Revascularization Rates for Coronary Heart Disease in Alberta Regional Health Authorities from 1995 to 2002 (Version 1).

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SUMMARY

Background: The Alberta Provincial Project for Outcomes Assessment in Coronary Heart Disease (APPROACH) maintains a clinical registry of all patients undergoing diagnostic cardiac catheterizations and subsequent cardiovascular procedures in Alberta. Although Alberta appears “on average” to be doing well relative to other Canadian provinces, this study addresses the equitability of cardiac care delivery across Alberta health regions between 1995 and 2002.

Objectives: To examine the age- and sex-adjusted rates of diagnostic cardiac catheterization, percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) surgery in Alberta health regions.

Methods: Data from the APPROACH registry were used to calculate age- and sex-adjusted procedure rates for persons aged 20 and older in each health region. We used maps, tables and graphs to show the distribution of rates in the Alberta regional health authorities between 1995 and 2002.

Results and Conclusions: . For all years, the catheterization rates in the Capital Health Authority (CHA - region 10) were lower than in the Calgary Health Region (CHR - region 4). In 1995, regions 7, 13, and 15 had the lowest cardiac catheterization rates, all close to 300 per 100,000. These regions also showed the largest increases in catheterization rates, and by 2002 the rates in these regions were closer to the provincial rate of 514 per 100,000. In 1995, there was significant variation in procedure rates across regional health authorities. Regardless of the type of procedures examined, however, the disparities among regions appeared to diminish over time. This is surprising, given that only two of the health regions (the CHA and CHR) provide cardiac procedures for the entire province, and several of the health regions are remote and sparsely populated.

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BACKGROUND

The Alberta Provincial Project for Outcomes Assessment in Coronary Heart Disease (APPROACH) maintains a clinical registry of all patients undergoing diagnostic cardiac catheterizations and subsequent cardiac revascularization procedures in Alberta. This APPROACH report examines the rates of cardiovascular procedures in the 17 Alberta regional health authorities (RHAs) between 1995 and 2002.

Cardiovascular procedures, such as diagnostic cardiac catheterization and bypass surgery, are performed in Canada at rates similar to those in many European countries^[1]. The rates observed in Canada, however, are generally lower than those in the United States, and there is considerable variation in procedure rates across the provinces^[2].

In general, Alberta has compared favorably to other Canadian provinces in recent studies examining cardiovascular procedure rates and outcomes. In a study of procedure rates in Canada from 1997/1998 to 2001/2002^[2], the rate of cardiac catheterization procedures in Alberta (553.2 per 100,000 in 2001/2002) was second only to Nova Scotia (555.2 per 100,000), and the rate of revascularization procedures performed in Alberta using percutaneous coronary intervention (PCI, average rate of 150.6 per 100,000 from 1997/1998 to 2001/2002) was second to Quebec (155.5 per 100,000). The rate of coronary artery bypass graft (CABG)

procedures in Alberta over this time period (82.7 per 100,000), was seventh of 10 provinces, and was lower than the national average of 93.7 per 100,000. However, another recent study found that Alberta had the highest rate of revascularization (36%) and lowest wait times for patients suffering from AMI^[3]. Although optimal procedure rates have yet to be established^[4], it is possible that the high revascularization rate following AMI contributed to the overall good cardiac outcomes following AMI in Alberta; a StatCan study identified Alberta as having the best outcomes following AMI of the four provinces studied (Nova Scotia, Saskatchewan, Alberta, and British Columbia)^[5].

Although Alberta appears “on average” to be doing well relative to other Canadian provinces with respect to cardiovascular procedures and outcomes, studies have not yet addressed the equitability of cardiac care delivery across Alberta health regions. This is important given the time-sensitive nature of cardiac procedures, especially for the treatment of acute myocardial infarction (AMI). APPROACH has produced this report as a first step in the investigation of regional variation in cardiac procedure rates in Alberta.

Data Sources. APPROACH maintains a clinical registry of all patients undergoing coronary angiography in Alberta. Because all patients receiving revascularization procedures (both CABG and PCI) must first have an angiogram, APPROACH is

also able to capture clinical information on revascularization procedures performed in Alberta. In addition to clinical information, the APPROACH database also has information on the age, sex and postal code for each patient. Additional information on APPROACH can be found at www.approach.org^[6].

Analysis. We used a file provided by Alberta Health and Wellness to map patient postal codes within the new regional health authority boundaries. Age- and sex-adjusted rates were calculated using the method of direct standardization. For each year and provincial health region, we used population projections from Alberta Health and Wellness to obtain denominators for each age and sex category. Procedure rates were then calculated within each of these categories, and these rates were then applied to the Canadian 1996 age and sex distribution. The resulting adjusted rates accounted for differences in procedure rates that were due to regional variation in age and sex distributions.

For coronary angiography, CABG and PCI, we calculated annual age- and sex-adjusted procedure rates per 100,000 population aged 20 years and older for each of the seventeen regional health authorities. In addition, we calculated annual age- and sex-adjusted procedure rates for all Albertans aged 20 and older,

and the average age- and sex-adjusted rates for Alberta from the years 1995 to 2002.

Maps. We used maps to show the distribution the rates in the Alberta regional health authorities from the years 1995 to 2002. In these maps, procedure rates in each Regional Health Authority were compared to the overall average rate for Alberta over the entire study period by taking the ratio of the regional rate to the average rate. These ratios were then placed into five different categories, with region to Alberta rate ratios of 0.00 to 0.75, 0.75 to 0.90, 0.90 to 1.10, 1.10 to 1.30, and 1.30 and greater. These categories are represented by shades of brown, with the lightest shade representing the smallest ratios (i.e. the lowest regional rates) and the darkest shade representing the highest ratios (i.e. the highest regional rates).

RESULTS

For reference, a map with the seventeen labeled regional health authorities is presented in Figure 1. In addition, Table 1 presents the regions, along with the populations 20 years of age and over within the respective regions in 1995 and 2002.

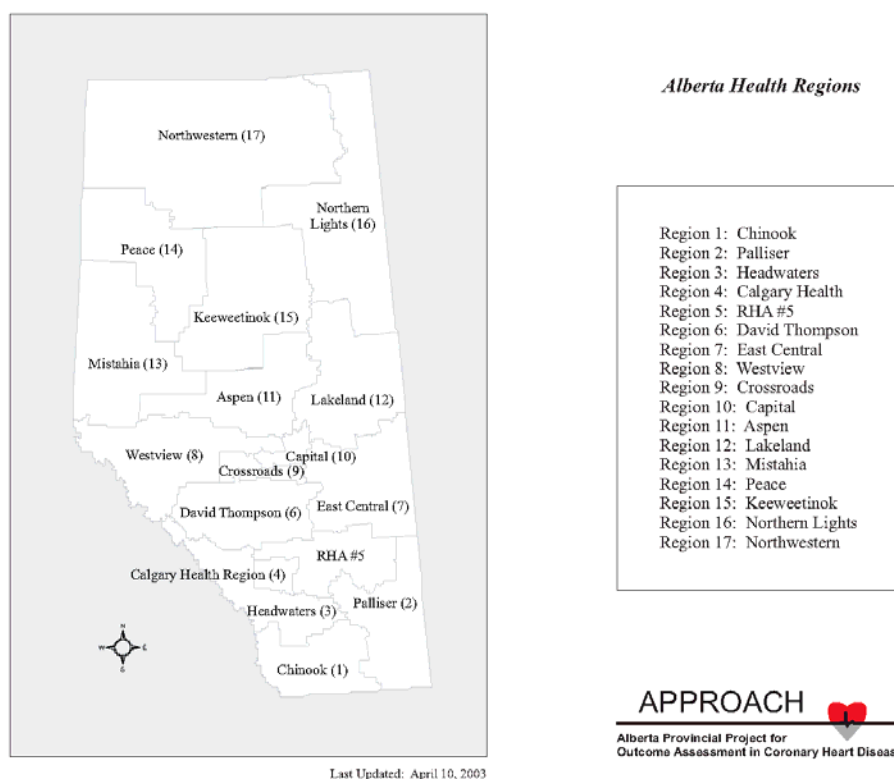


Figure 1: Alberta Health Regions in 2002

Table 1. Health Regions: Names, Populations Aged >= 20 in 1995 and 2002, and Associations with 2003 Health Regions.

2002 Health Regions	1995 Pop >=20	2002 Pop >=20	2003 Regions
Region 1 Chinook	97,089	105,651	Region 1
Region 2 Palliser Health Region	58,665	68,929	Region 2
Region 3 Headwaters RHA	45,783	57,059	Region 3
Region 4 Calgary Health Region	586,222	725,210	Region 3
Region 5 RHA #5	34,163	39,297	Region 2,3,4
Region 6 David Thompson RHA	118,694	136,841	Region 4,5
Region 7 East Central Regional Health	70,209	73,052	Region 4,5
Region 8 Westview RHA	55,769	65,877	Region 6,7
Region 9 Crossroads RHA	25,801	32,199	Region 4
Region 10 Capital Health Authority	564,054	629,768	Region 6
Region 11 Aspen RHA	53,403	65,763	Region 6,7,8
Region 12 Lakeland RHA	68,972	67,004	Region 5,6,7
Region 13 Mistahia RHA	54,205	62,770	Region 8
Region 14 Peace RHA	13,147	16,730	Region 8
Region 15 Keeweenok RHA	14,686	16,566	Region 7,8
Region 16 Northern Lights RHA	23,441	31,028	Region 9
Region 17 Northwestern RHA	9,011	11,371	Region 9



Table 2. Cardiac procedure counts for Alberta in 2002 and 2003.

Procedure	1995	1996	1997	1998	1999	2000	2001	2002
Cardiac Catheterization	7,288	7,518	7,934	8,586	9,753	10,393	10,285	10,409
Percutaneous Coronary Intervention	2,172	2,340	2,501	2,925	3,210	3,474	3,324	3,741
Coronary Artery Bypass Graft	1,158	1,466	1,514	1,551	1,664	1,724	1,780	1,863

Procedure Counts

The number of procedures performed in Alberta is presented in Table 2. A total of 7,288 diagnostic cardiac catheterization procedures were performed in 1995, and this increased to 10,409 in 2003. There were 2,172 PCI procedures performed in 1995 and 3,741 performed in 2002. The number of CABG procedures performed increased from 1,158 in 1995 to 1,863 in 2002.

Catheterization Rates

The age- and sex-adjusted catheterization rates for each regional health authority are presented in Table 2 and in Figures 2 and 3. The overall age- and sex-adjusted catheterization rate for Alberta increased from 432 per 100,000 in 1995 to a peak of 559 per 100,000 in 1999. Following 1999, there was a steady decrease in

catheterization rates to 511 per 100,000 in 2002. For all years, the catheterization rates in the Capital Health Authority (region 10) were lower than in the Calgary Health Region (region 4). In 1995, regions 7, 13, and 15 had the lowest cardiac catheterization rates, all close to 300 per 100,000. These regions also showed the largest increases in catheterization rates, and by 2002 the rates in these regions were approached or exceeded the provincial rate of 514 per 100,000. As can be expected, there was considerable variation in the catheterization rates in regions with small populations (e.g. region 15). In general, it is evident from Table 1 and Figures 2 and 3 that the variability of rates among the regions decreased over time, and with the exception of region 17 (385 per 100,000), in 2002 all regions had catheterization rates over 400 per 100,000.

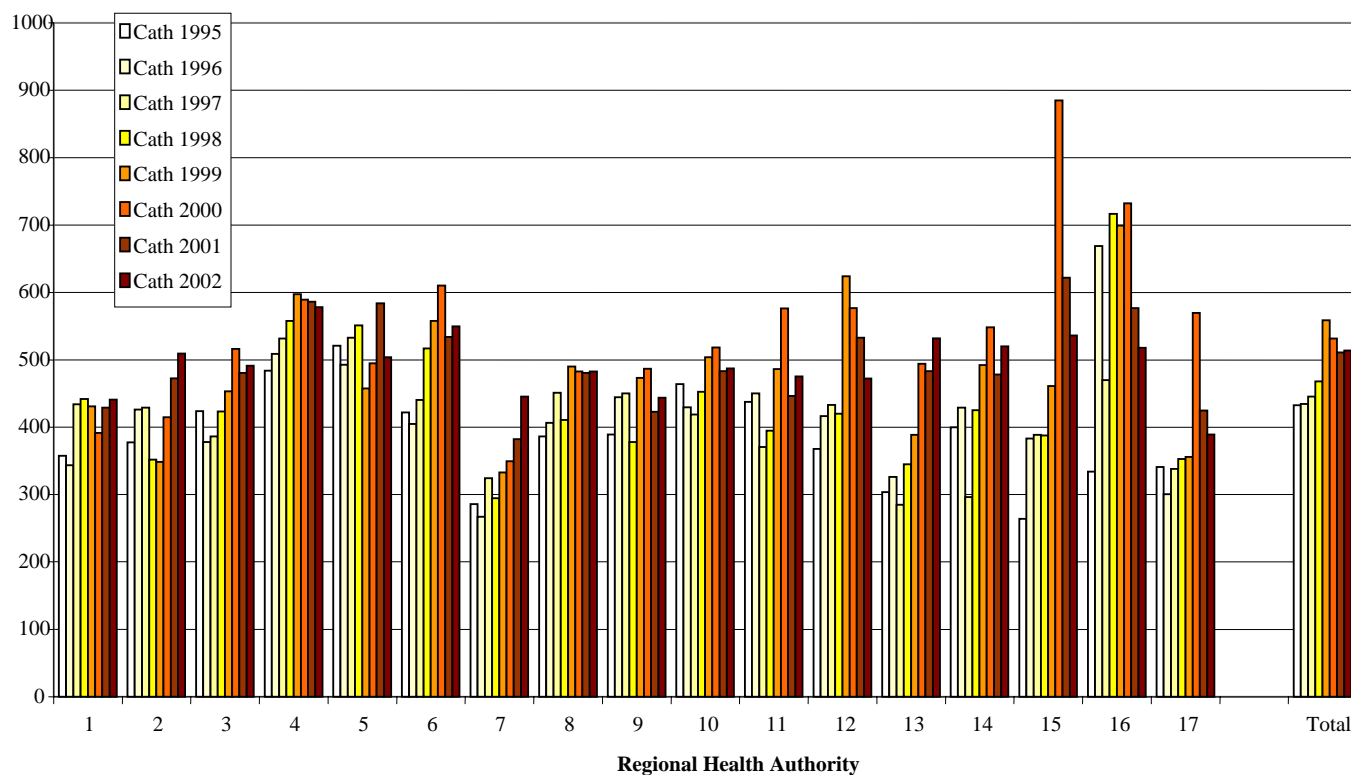


Figure 2: Age- and Sex-Adjusted Catheterization Rates per 100,000 Population Aged >= 20 Years

Table 3. Age- and Sex-Adjusted Catheterization Rates Per 100,000 Population Aged >=20

		1995	1996	1997	1998	1999	2000	2001	2002
Region 1	Chinook	357	343	434	442	431	392	429	441
Region 2	Palliser	378	426	429	352	349	415	472	509
Region 3	Headwaters	424	378	386	423	453	516	481	491
Region 4	Calgary	484	509	532	557	597	589	586	578
Region 5	RHA #5	521	493	533	551	457	494	584	504
Region 6	David Thompson	422	405	441	517	557	610	534	550
Region 7	East Central	286	267	324	294	333	350	382	445
Region 8	Westview	386	406	451	411	490	483	481	482
Region 9	Crossroads	389	445	450	378	473	486	423	444
Region 10	Capital	464	429	419	453	504	518	483	487
Region 11	Aspen	438	450	371	395	486	576	446	475
Region 12	Lakeland	368	416	433	420	624	577	533	472
Region 13	Mistahia	304	326	285	345	389	494	483	532
Region 14	Peace	400	429	296	426	492	548	478	520
Region 15	Keeweenok	264	383	389	388	461	885	622	536
Region 16	Northern Lights	334	669	470	716	700	732	577	518
Region 17	Northwestern	341	301	338	353	356	569	425	389
All Alberta		432	435	446	468	559	531	511	514

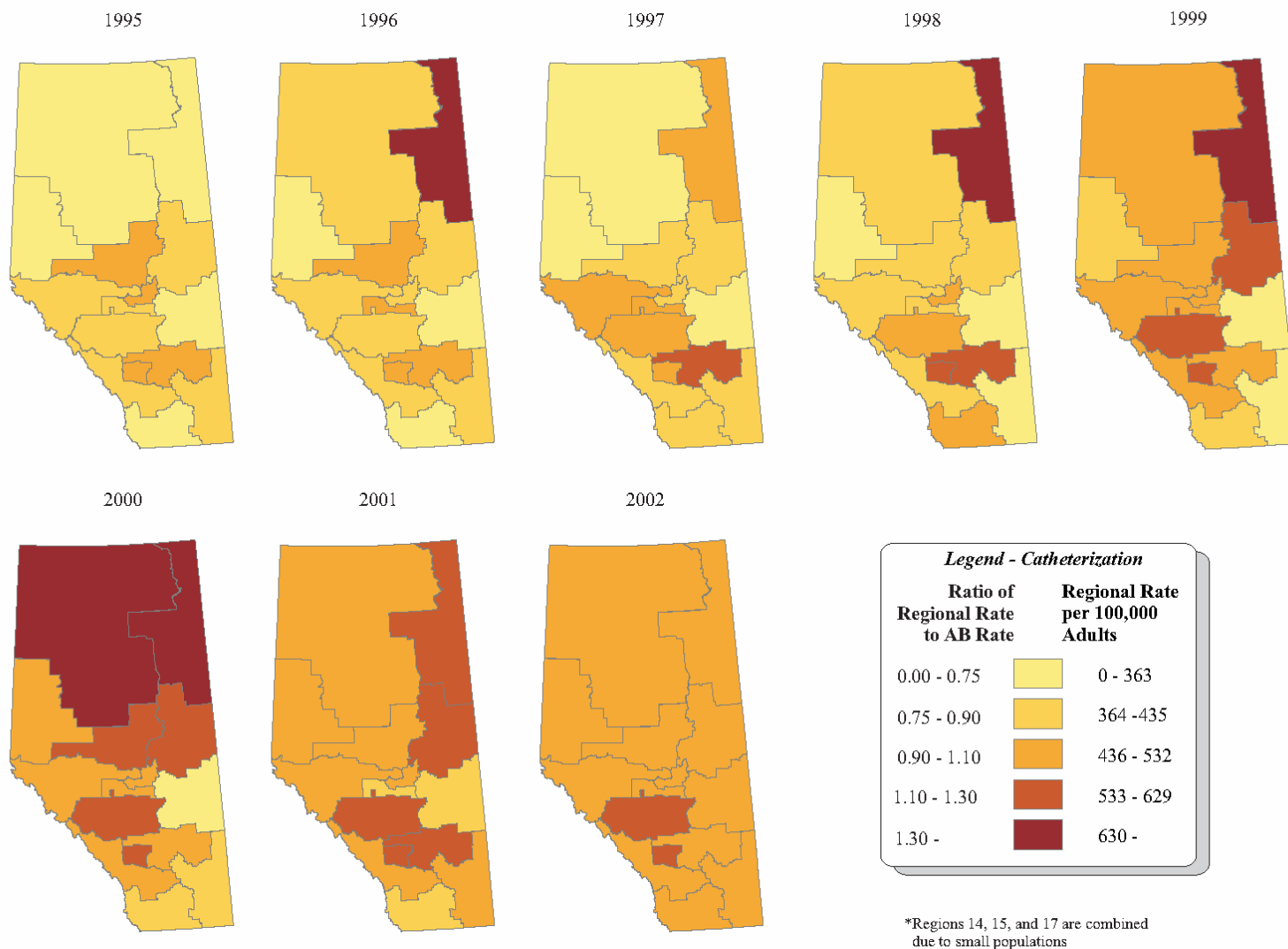


Figure 3: Age- and Sex-Adjusted Catheterization Rates by Alberta Health Region

PCI Rates

The age- and sex-adjusted PCI rates for each regional health authority are presented in Table 2 and in Figures 4 and 5. The overall age- and sex-adjusted PCI rates for Alberta increased from 128 per 100,000 to 176 per 100,000 between 1995 and 2000. The rate then dipped to 163 per 100,000 in 2001 before increasing to 176 per 100,000 in 2002. In general, the age- and sex-adjusted PCI rate was lower in the Capital Health Authority (region 10) than in the Calgary Health Region (region 4). However, the rate in the Calgary Health Region increased until 1998 before showing a slight decline, whereas in the Capital Health Authority, the rate increased dramatically from 120 per 100,000 to 179 per 100,000 between 1997 to 2000. As a result, the rates in these two regions were comparable in 2002 (190 per 100,000 in the CHR vs 175 per 100,000 in the CHA). Figures 4 and 5 indicate PCI rates increased in all regions, and that some regions had marked increases in PCI rates. In 1995, regional health authorities without treatment facilities generally had lower PCI rates than did regions 4 and 10. Substantial increases were evident in most

regions, and by 2002 there appears to be little disparity in PCI rates across the regional health authorities.

CABG Rates

The age- and sex-adjusted CABG rates for each regional health authority are presented in Table 3 and Figures 6 and 7. The overall age- and sex-adjusted CABG rates for Alberta increased sharply from 70 per 100,000 in 1995 to 85 per 100,000 in 1996. This increase appears to be due to an increase in CABG procedure rates in the CHR (region 4) but is also evident in regional health authorities that relied on either the CHR or the CHA for CABG procedures. From 1996 to 2002, there was a small but steady increase in CABG rates in Alberta from 86 per 100,000 in 1996 to 91 per 100,000 in 2002. As with other procedure rates, rates in regional health authorities without treatment facilities tend to fall below rates in regions 4 and 10, but the disparities among regions appear to diminish over time.

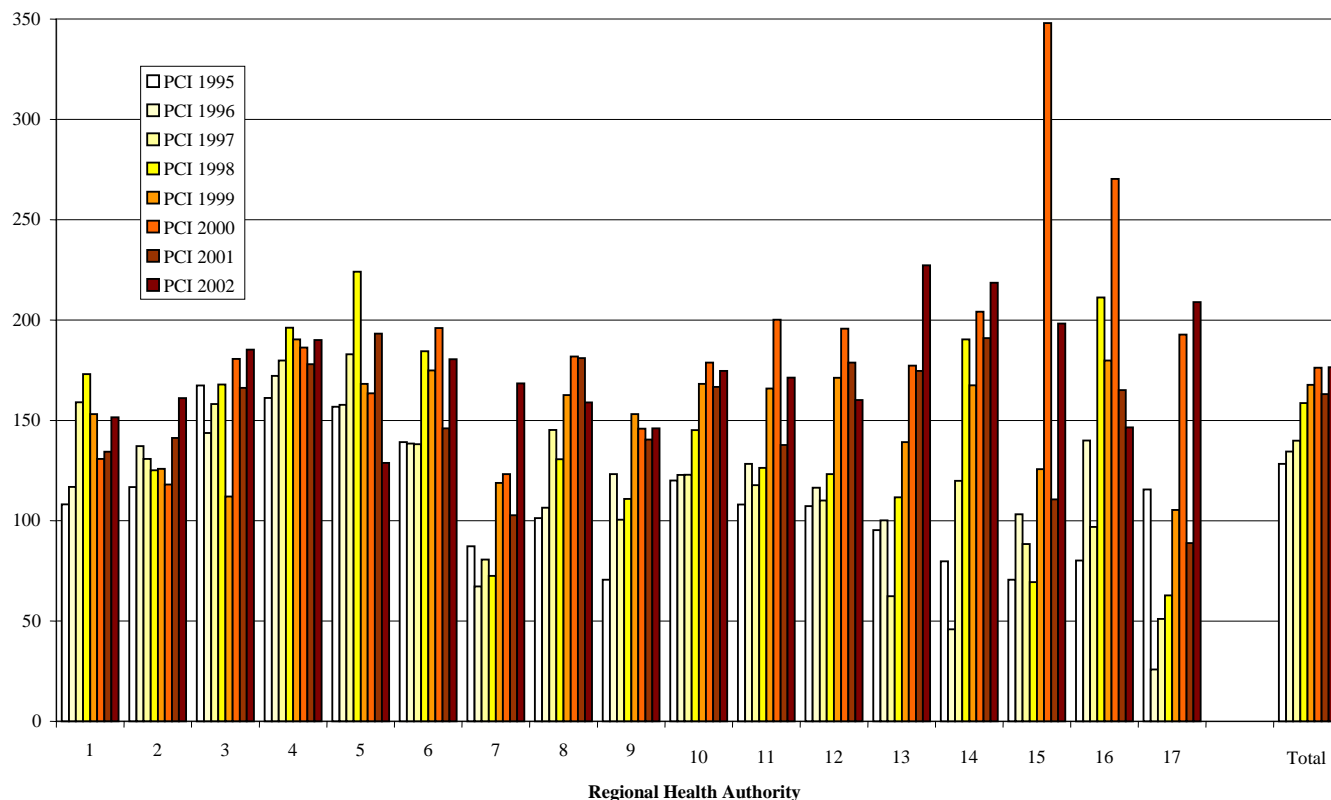


Figure 4: Age- and Sex-Adjusted PCI Rates per 100,000 Population Aged >=20 Years

Table 4. Age- and Sex-Adjusted PCI Rates Per 100,000 Population Aged >=20

		1995	1996	1997	1998	1999	2000	2001	2002
Region 1	Chinook	108	117	159	173	153	131	134	152
Region 2	Palliser	117	137	131	125	126	118	141	161
Region 3	Headwaters	167	144	158	168	112	181	166	185
Region 4	Calgary	161	172	180	196	190	186	178	190
Region 5	RHA #5	157	158	183	224	168	164	193	129
Region 6	David Thompson	139	138	138	184	175	196	146	181
Region 7	East Central	87	67	81	72	119	123	103	168
Region 8	Westview	101	107	145	131	163	182	181	159
Region 9	Crossroads	71	123	101	111	153	146	140	146
Region 10	Capital	120	123	123	145	168	179	167	175
Region 11	Aspen	108	128	118	126	166	200	138	171
Region 12	Lakeland	107	116	110	123	171	196	179	160
Region 13	Mistahia	95	100	62	112	139	177	175	227
Region 14	Peace	80	46	120	190	168	204	191	219
Region 15	Keeweenok	71	103	88	69	126	348	111	198
Region 16	Northern Lights	80	140	97	211	180	270	165	146
Region 17	Northwestern	116	26	51	63	105	193	89	209
All Alberta		128	135	140	159	168	176	163	176

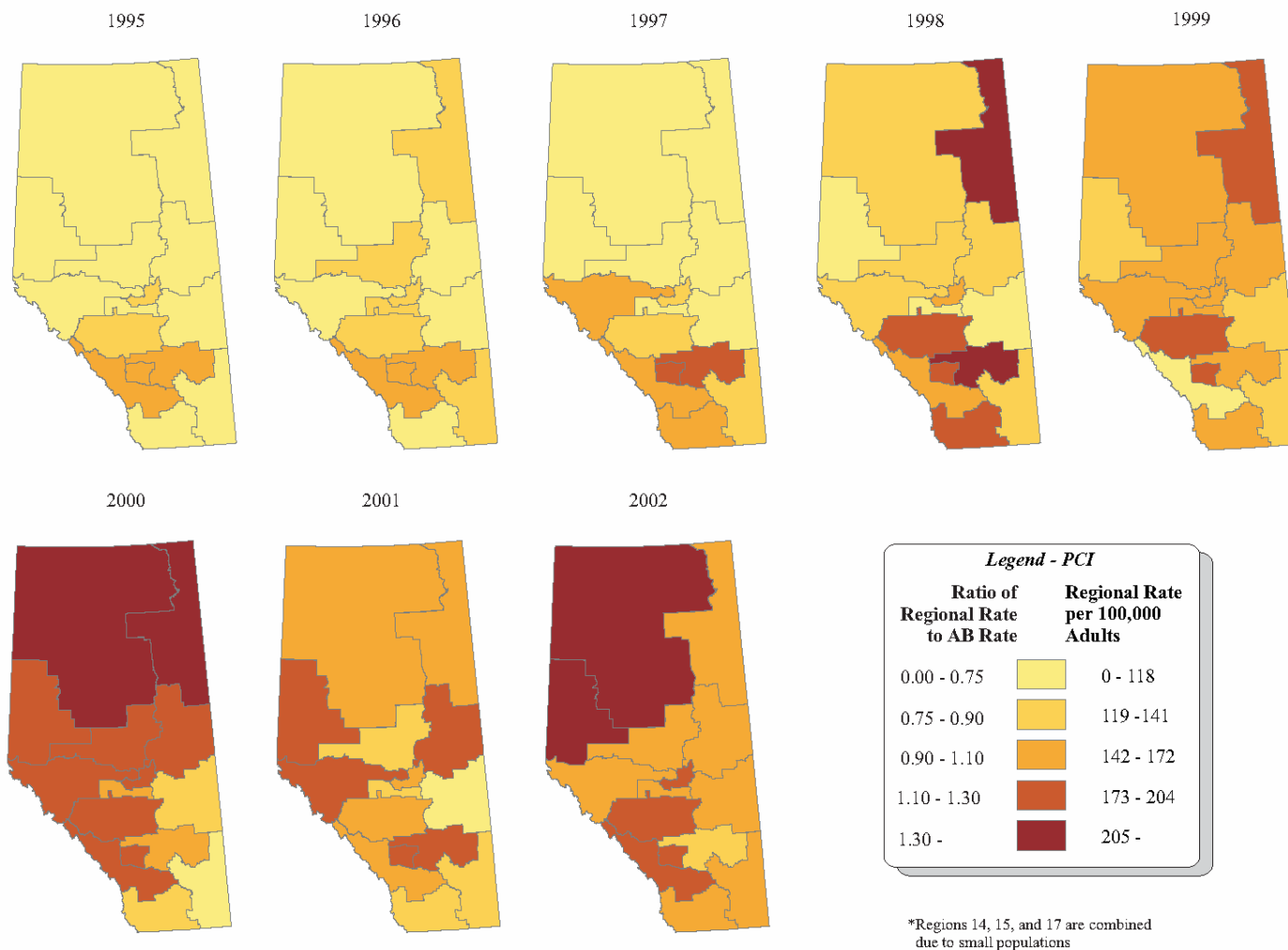


Figure 5: Maps of Age- and Sex-Adjusted PCI Rates by Alberta Health Regions

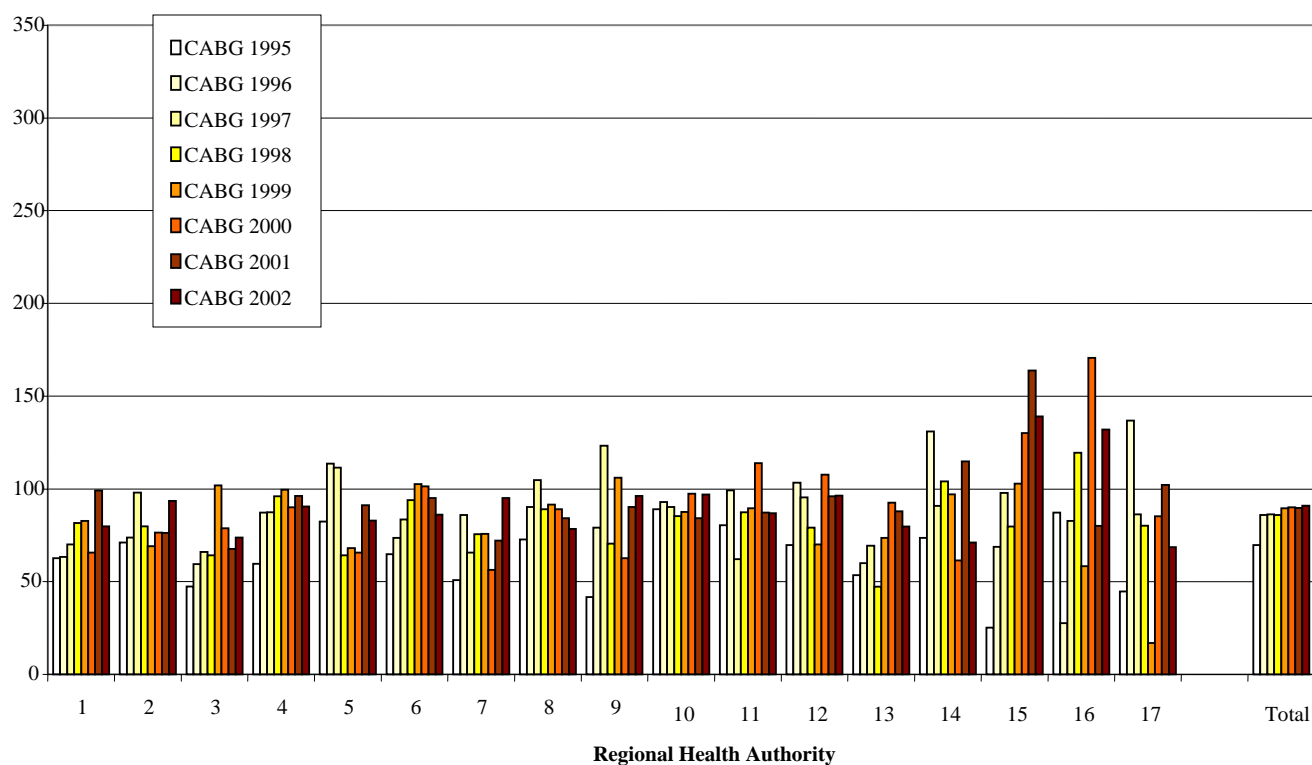


Figure 6: Age- and Sex-Adjusted CABG Rates per 100,000 Population Aged >20 Years

Table 5. Age- and Sex-Adjusted CABG Rates Per 100,000 Population Aged >=20

		1995	1996	1997	1998	1999	2000	2001	2002
Region 1	Chinook	63	63	70	82	83	66	99	80
Region 2	Palliser	71	74	98	80	69	76	76	94
Region 3	Headwaters	47	59	66	64	102	79	68	74
Region 4	Calgary	60	87	87	96	100	90	96	90
Region 5	RHA #5	82	114	111	64	68	66	91	83
Region 6	David Thompson	65	73	83	94	103	101	95	86
Region 7	East Central	51	86	66	75	76	56	72	95
Region 8	Westview	73	90	105	89	92	89	84	78
Region 9	Crossroads	42	79	123	71	106	63	90	96
Region 10	Capital	89	93	90	85	88	97	84	97
Region 11	Aspen	80	99	62	87	90	114	87	87
Region 12	Lakeland	70	103	95	79	70	108	96	96
Region 13	Mistahia	54	60	69	47	73	93	88	80
Region 14	Peace	74	131	91	104	97	61	115	71
Region 15	Keeweenok	25	69	98	80	103	130	164	139
Region 16	Northern Lights	87	28	83	119	58	171	80	132
Region 17	Northwestern	45	137	86	80	17	85	102	69
All Alberta		70	86	86	86	89	90	90	91

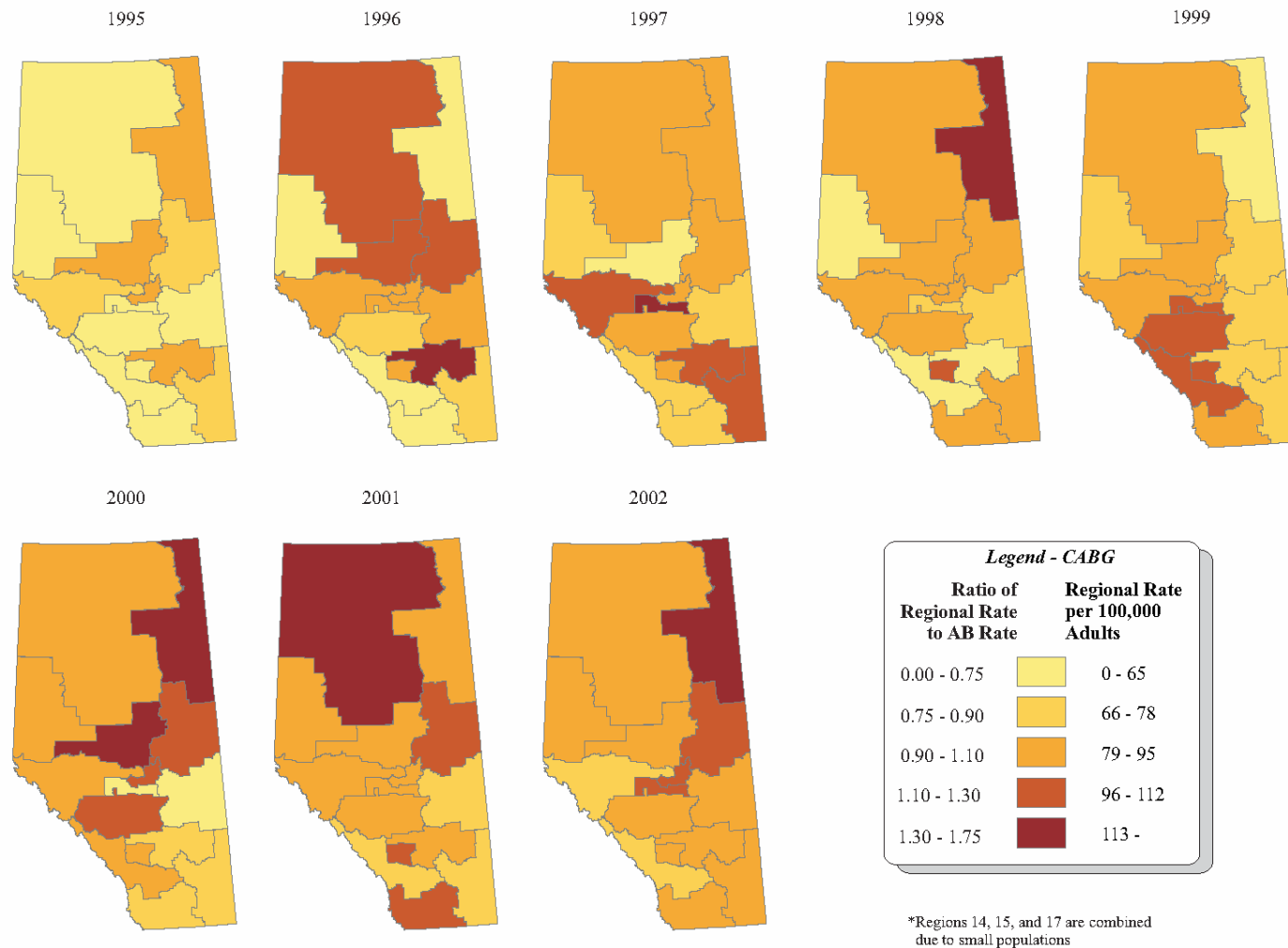


Figure 7: Maps of Age- and Sex-Adjusted CABG Rates by Alberta Health Regions

DISCUSSION

In 1995, there was significant variation in procedure rates across regional health authorities. Regardless of the procedure rates examined, however, the disparities among regions appeared to diminish over time. This is surprising, given that only two of the health regions (the CHA and CHR) provide cardiac procedures for the entire province, and several of the health regions are remote and sparsely populated.

In general, the age- and sex-adjusted catheterization rates in regional health authorities that relied on the CHA for services initially had lower age- and sex-adjusted catheterization rates than the regional health authorities that relied on the CHR for procedures. By 2002, however, the catheterization rates were similar across all regions.

With the exception of 1996, the increases in CABG procedure rates in Alberta were modest, especially in comparison to the increases in rates or PCI. CABG rates in Alberta are generally lower than other provinces and in Alberta, the ratio of PCI procedures to CABG procedures is much greater than one, and this ratio appears to be increasing. Although this general trend is evident throughout Canada, the ratio of PCI to CABG is much closer to one in other provinces. For example, Nova Scotia also has good outcomes for cardiac care patients, but between 1997 and 2001, had rates of CABG and PCI that were approximately equal.

Interpretive Cautions

Age- and sex-standardization allows the comparison of rates across the regional

health authorities while controlling for differences in rates due to the variation in age- and sex- distributions across the regions. However, this method of adjustment does not account for regional differences in disease severity, other clinical risk factors and comorbid conditions and other demographic factors. Therefore, high or low regional rates may have reflected differences in the patient populations that could not be accounted for in the present analysis. While the present study examined variations in procedure rates among regional health authorities, it is also likely that there are variations in rates within Health Authorities. However, the sparseness of data from more remote regions would pose problems for any investigation of procedure rates within regions.

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