

# **Methods of Measuring Migration: Are the Results Similar**

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## **Methods of Measuring Migration: Are the Results Similar?**

No single data source describes accurately and completely the migration experience of Americans. An ideal measure of migration would track each individual over time, noting the time and the exact location of the starting and ending point of each move. We do not have anything close to such a measure. Instead, what we have are approximations based on a variety of census, vital statistics, and tax records.

On the positive side, though no single source of migration data tells us everything we want to know, there are a variety of good data sources available. In this report, these data sources are compared to see if they produce similar results. Comparisons are made at both the state and county level and for two time periods: 1980 to 1990 and 1985 to 1990.

Migration is an important and often volatile component of population change. In projections of future population, a relatively small difference in migration rate assumptions can have a large effect over a long period of time. A comparison of migration measures can help make us more aware of the strengths, weaknesses, and characteristic biases of each method.

### **Comparison of Statewide Migration Numbers Using Different Methods**

#### **I. Migration from 1980 to 1990.**

Three methods were used to estimate net migration for Minnesota between 1980 to 1990: the residual method, the IRS method, and the survival rate method. These methods are described at the end of this report.

The results of the survival rate and residual methods were similar. Net migration over the decade was -29,515 for the residual method and -23,021 for the survival rate method (averaging the forward and reverse methods.) The similarity in numbers reflects the fact that both methods use population change, births, and deaths to estimate migration.

The slight difference in the results of the survival rate and residual methods suggests that the life table we used, which was based on an average of 1980 and 1990 age-specific survival rates, may have slightly overestimated the average mortality rates during the decade. One way this could have happened is if mortality rates fell faster during the first half of the decade than in the last half.

STATE LEVEL MIGRATION USING DIFFERENT  
METHODS OF ESTIMATING MIGRATION

I. MIGRATION FROM 1980 TO 1990

Residual Method Net Migration	(29,515)		
IRS Method			
Net migration	(68,746)		
	In-migration	746,290	
	Out-migration	815,036	
Survival Rate Method Net Migration			
Average	(23,021)		
Reverse	(20,841)		
Forward	(25,201)		

II. MIGRATION FROM 1985 TO 1990

Residual Method Net Migration	24,049		
IRS Method			
Net migration	(2,730)		
	In-migration	393,731	
	Out-migration	396,461	
Census, including foreign migrants			
Net migration	40,537		
	In-migration	356,900	
	Out-migration	316,363	
Census, excluding foreign migrants			
Net migration	4,362		
	In-migration	320,725	
	Out-migration	316,363	

The residual and survival methods both give substantially different results from the IRS method. The IRS method shows considerably higher net out-migration from Minnesota during the 1980s, - 68,746. Since the IRS data is based on a totally different approach, using matched tax returns rather than birth or death data, it is not surprising to see a larger discrepancy.

Theoretically, the residual method should be the most accurate. The residual migration figure is correct by definition if the population, birth, and death numbers are all accurate. Changes in the degree of census undercount or in the completeness of vital statistics coverage would affect the accuracy of the residual migration estimate.

Each of the other two methods requires additional assumptions. For example, the survival rate method requires us to assume not only that the population counts by age and the birth data are correct, but also that age-specific survival rates are accurate. The IRS data introduces even more questionable assumptions, for example that the number of exemptions reported on tax returns can be equated with the number of people who move. Many people do not file tax returns, or do not file in consecutive years, or file under different social security numbers. Though the IRS data provide a valuable source of information, they clearly give an incomplete count of migrants.

If we assume the residual method is in fact the most accurate, it appears the IRS data underestimate in-migrants relative to out-migrants. This in turn implies that in-migrants to Minnesota are less likely to file matchable tax returns than are out-migrants. Examples of people who would not file matchable tax returns or would otherwise not show up in the IRS file include refugees and other immigrants, low income people who do not make enough to file a return, young people filing on their own for the first time, newly divorced or separated people filing on their own instead of under a spouse's Social Security number, and so forth.

The different time period may also affect the comparison among the three methods. The IRS data are based on aggregating year-to-year migration, while the other two methods are based on a ten-year period.

Considering the variation in the sources of the migration data and the ways they are collected, perhaps the most impressive feature of the estimates is not how different they are, but how similar. All three methods show a moderate net out-migration during the 1980s, ranging from less than 0.5 per 100 1990 population to 1.6 per 100.

## **II. Migration from 1985 to 1990**

Three methods were used to estimate net migration for Minnesota from 1985 to 1990: the residual method, the IRS method, and data from the 1990 Census. The residual and IRS methods are the same as noted before, but are applied to the different time period.

The residual method showed net in-migration of 24,049 during the last 5 years of the decade. The Census showed net in-migration of 40,537. If foreign in-migrants are excluded from the Census data, there was net in-migration of 4,362. In contrast, the IRS data showed net out-migration of -2,730 during this period.

Results of the IRS and residual methods agree that migration patterns shifted in the last half of the decade. Compared to 1980-1985, the 1985-1990 period was characterized by either more net in-migration or less net out-migration.

As in the 10-year data, the IRS method, compared to the other two, shows either less in-migration or more out-migration. Again, it appears that in-migrants to Minnesota are disproportionately missed in the IRS data, or that out-migrants are disproportionately counted.

Like the IRS data, the census data separately estimates in- and out-migrants. This is in contrast to the residual and survival methods, which calculate only net migration. This feature allows us to compare the number of in- and out-migrants in the census and IRS methods.

The numbers of in-migrants and out-migrants in the Census and IRS are surprisingly similar, even though the sources of the data are very different and even though the Census asks about migration over a 5-year period, while the IRS tabulates its numbers annually. A person could migrate from Minnesota to Iowa in 1992 and back to Minnesota in 1994, thus showing up twice as a migrant in the IRS data but appearing as a non-migrant in the Census data. Considering the possibility of back and forth moves, one might expect the differences between the IRS and census numbers of in- and out-migrants to be far greater than they are.

The ratio of the number of domestic in-migrants in the census to the number of IRS in-migrants is .81. The ratio of all census in-migrants to all IRS in-migrants was .91. The ratio of census to IRS out-migrants was .80. Stated in the reverse way, the IRS data found 1.10 times as many in-migrants and 1.25 times as many out-migrants as the census. This pattern suggests, as did the earlier findings, that the IRS method does a more complete job of picking up out-migrants than in-migrants.

### **Summary of Statewide Migration Comparisons**

No source of migration data is perfect, but the various methods of estimating statewide migration are at least in the same ballpark. All show slight net out-migration during the 1980s, with somewhat of a turnaround in the latter part of the decade. The IRS data appears to pick up out-migration more completely than in-migration.

Though the differences in results produced by the methods are not large, over a long period of time these slight differences mount up. In doing population projections, for example, use of a migration rate based on census figures rather than IRS or residual data would have considerable

impact. For example, if we assumed a net in-migration gain of 1.5% applied to an initial population of 5,000,000, there would be a net in-migration of 228,400 over 30 years. A net in-migration rate of 0.5% would result in only 75,400 net in-migrants during the same period. The effect would be compounded by births to migrants.

## **Comparison of County Migration Numbers Using Different Methods**

### **I. Migration from 1980 to 1990**

Three methods were used to calculate net migration by county for the 1980 to 1990 period. These were the residual method, the IRS method, and the survival rate method.

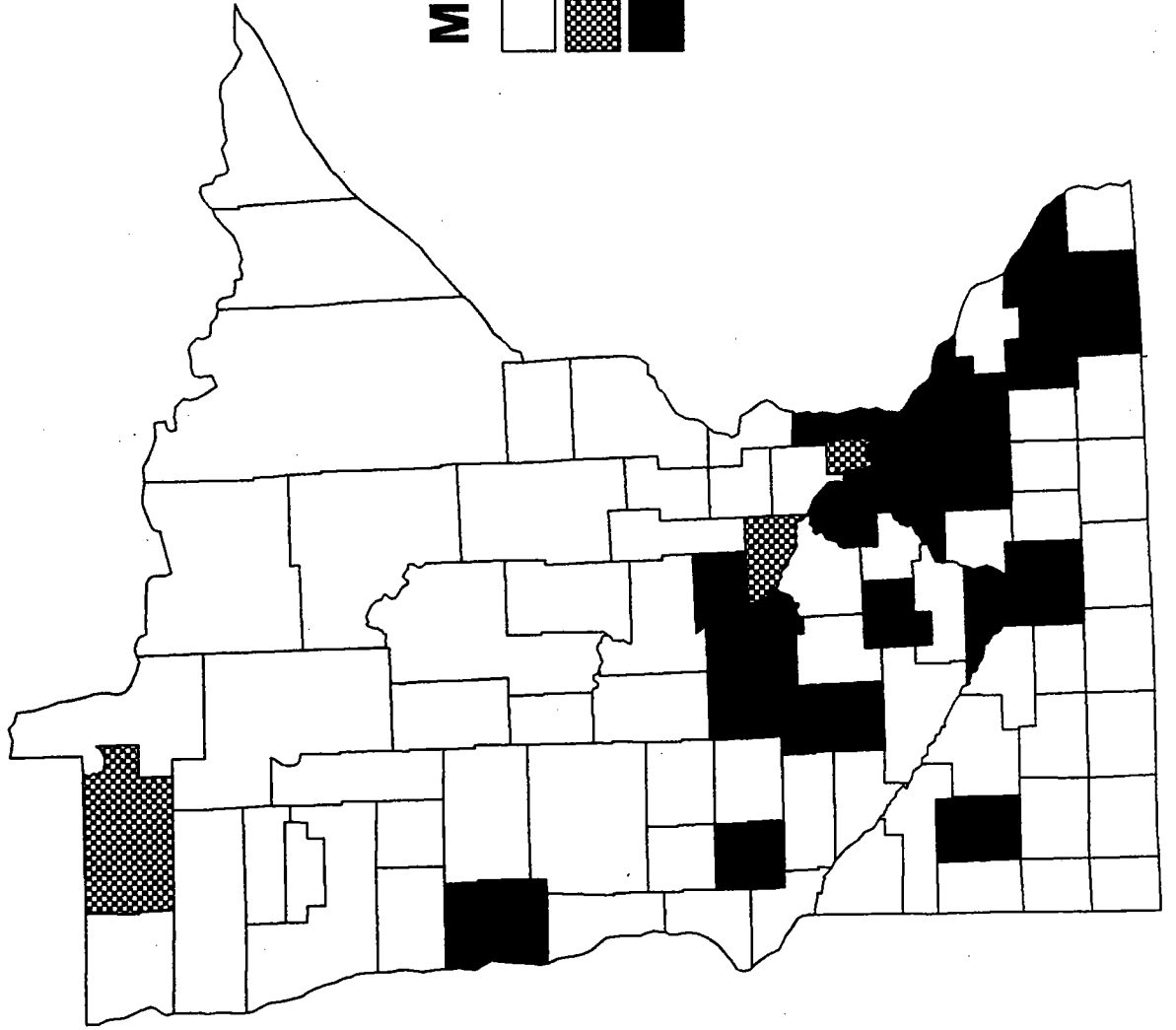
Comparison among Three Methods: Differences between the IRS and either of the other two methods are more substantial than differences between the residual and survival methods. This is true whether we look at the number of net migrants or the net migration rate. The largest difference between the number of residual net migrants and the number of survival rate net migrants was 1,919 in St. Louis County. The largest difference between the IRS and the residual method was -41,039 in Hennepin County. Discrepancies of more than a thousand between the IRS method and the residual method were common.

IRS versus Other Methods: In the great majority of Minnesota counties, the IRS method gave the most positive results for net migration during the 1980 to 1990 period (Map BWMETH10.PRJ). This means that in the majority of counties the IRS method showed higher net in-migration (or lower net out-migration) than either the residual or survival rate method. However, in southeastern Minnesota, including the Twin Cities, St. Cloud and Rochester areas, the survival rate method usually gave the most positive results. College counties such as Blue Earth, Clay, Stevens, Lyon, and Winona also had more positive net migration values with the survival rate method.

The county findings are in contrast with those at the state level, where the IRS produced more negative results (more out-migration or less in-migration) than the other two methods. This apparent contradiction occurs because the overall state numbers are heavily weighted by the results in the populous metropolitan counties.

Comparison of the results using the different methods suggests that the IRS misses disproportionate numbers of in-migrants to Minnesota's metropolitan areas and college counties. Or, conversely, the IRS may be missing disproportionate numbers of out-migrants from other parts of the state. This pattern is consistent with the migration habits of young adults, a group probably under represented in the IRS tabulations. Young adults tend to move into college counties and growing metropolitan areas and out of most other regions of the state. Since many

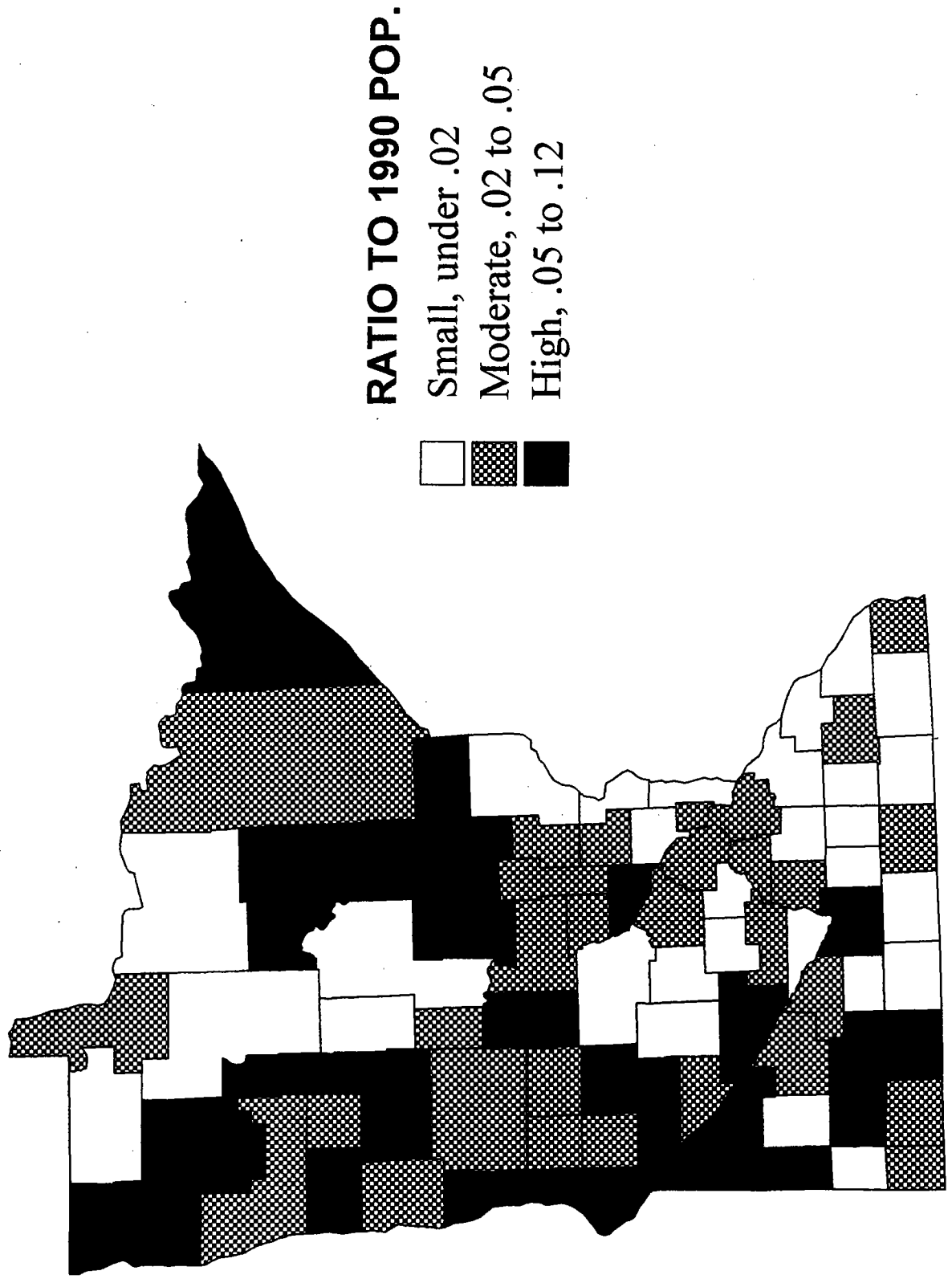
**In Majority of Counties, IRS Shows More Net In-Migrants  
1980-1990 Net Migration; Method Showing Most Net In-  
Migration or Least Net Out-Migration**



**MOST POSITIVE RESULTS**

- IRS Method
- Residual Method
- Survival Rate Method

**DISCREPANCY BETWEEN IRS AND RESIDUAL METHODS  
RELATIVE TO 1990 POPULATION**



young people have never filed a tax return under their own Social Security number, they are not picked up as migrants in the IRS data. Immigrants, another group who are not well represented in the IRS figures, are more likely to move to the large metropolitan counties.

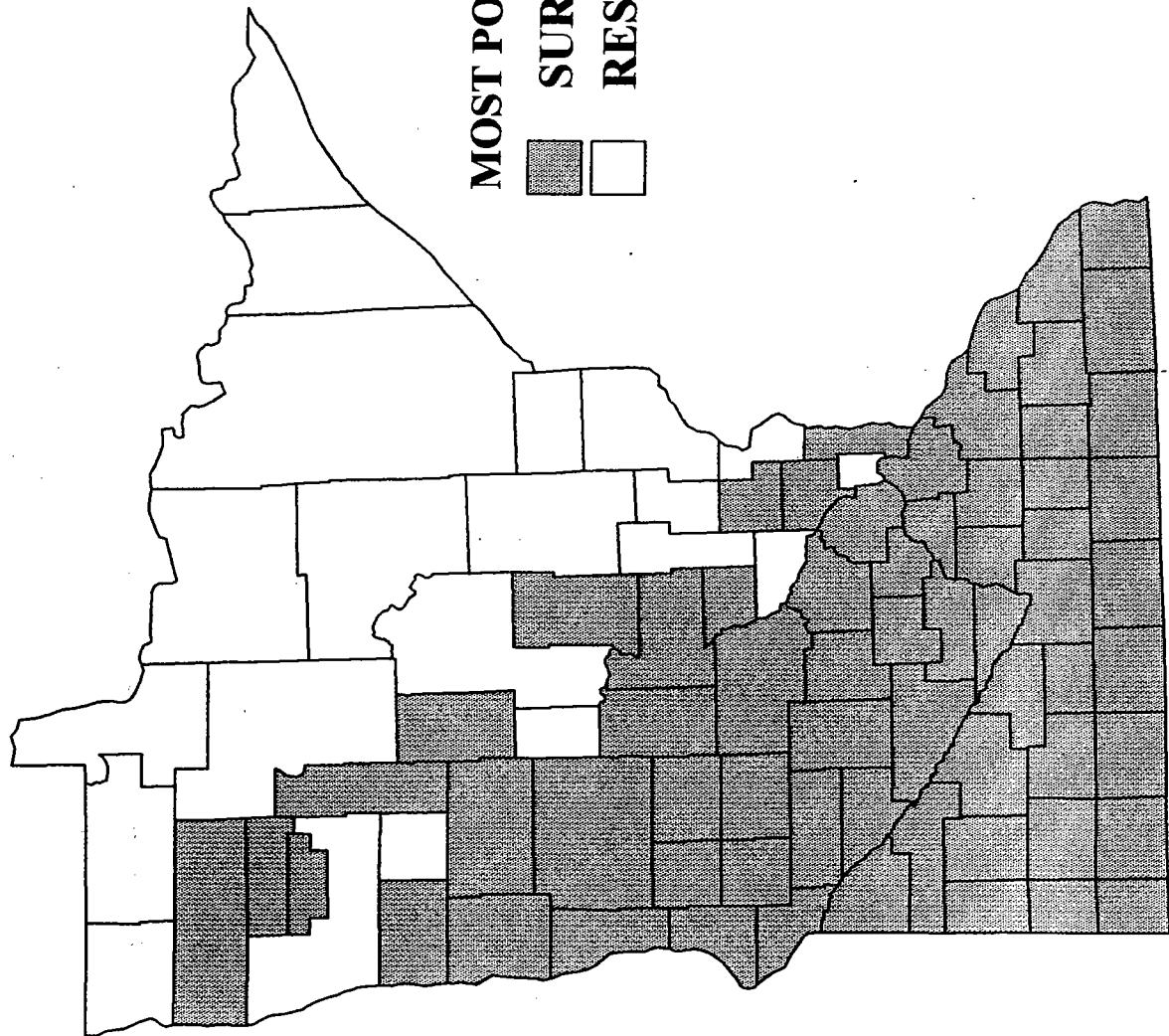
In some counties, the discrepancy in total net migration between the IRS method and the residual method was small relative to population size, but in other counties the divergence was quite large. Map BWRAT10.PRJ shows the size of the absolute discrepancy in net migrants per 100 1990 residents using the two methods. The largest discrepancy was in Todd County, where the residual method showed net out-migration of -3,230 for the decade, or -13.4 per 100. The IRS results showed net out-migration of only -447, or -1.8 per 100. At the other extreme, in Goodhue County the number of residual net migrants (113) was very similar to the IRS number (74). There was not an extreme geographic pattern, but the discrepancies in western Minnesota were almost all in the moderate to high range. In most counties in southeastern Minnesota, on the other hand, the results of the IRS and residual methods were more similar.

Survival Rate versus Residual Method: In the data for counties, results of the residual method and the survival rate method are generally very close. As with the statewide data, this probably stems from the conceptual similarity between the two methods. Though the county differences are not large, there is a definite geographical pattern. Northeast of an imaginary diagonal line stretching from Kittson County to Chisago County, the residual method gives more positive results (Map BWRSSR10.PRJ). Southwest of this diagonal, it is the survival method that shows more net in-migration or less net out-migration.

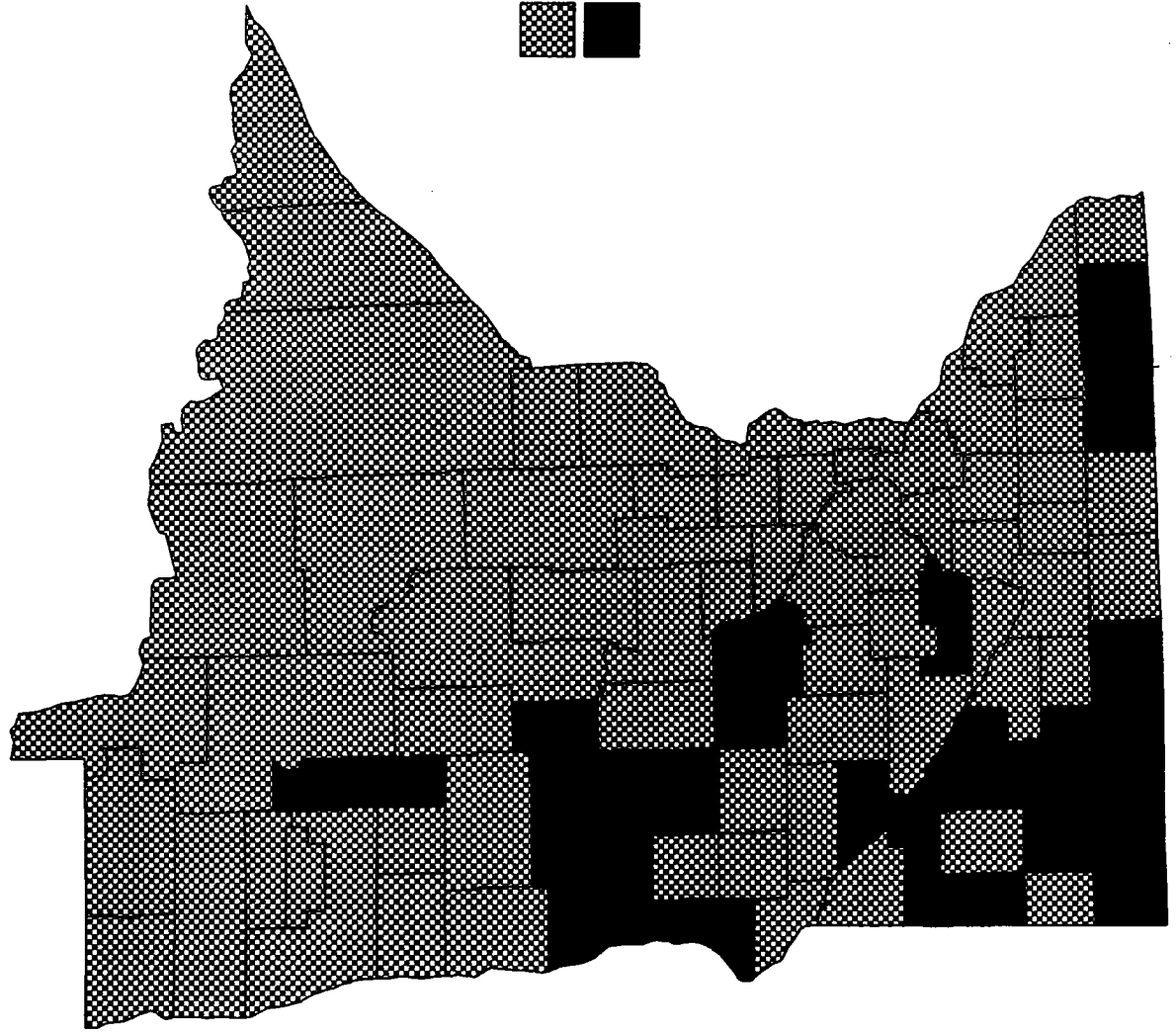
If net in-migration is higher (or out-migration is lower) using the survival rate method, this suggests that the life table used overestimated the number of deaths, i.e. that the estimated mortality rates from the life table were slightly too high (This conclusion, of course, assumes the residual method is the gold standard of accuracy among the methods.) Conversely, if the more positive results come from the residual method, it suggests the mortality rates in the life table were too low. This in turn suggests that mortality in northeastern Minnesota is above the state average, a finding consistent with the 1980 regional life tables (*Population Notes*, November, 1984).

The magnitude of the differences in migration rates produced by the residual method and the survival rate method appears to be largest in rural counties, notably in west central and southwestern Minnesota (Map BWDISC10.PRJ). Examples include Lincoln, Jackson, Nobles, and Rock counties. Western Minnesota counties have large proportions of older people. In addition, the 1980 regional life tables showed that southwestern Minnesota had the highest life expectancy. Since the probability of death is greatest among older people, small errors in the estimated survival rates will produce greater discrepancies between actual and estimated deaths in counties with a higher proportion of elderly people, especially if their survival rates are above the state average.

**RESIDUAL METHOD GIVES MORE POSITIVE RESULTS  
IN NORTHEAST; SURVIVAL METHOD ELSEWHERE  
Comparison of Net Migrant Numbers, 1980-1990**



**DISCREPANCY BETWEEN SURVIVAL AND RESIDUAL METHODS  
RELATIVE TO 1990 POPULATION**



**RATIO TO 1990 POP.**

- Small, under .01
- Large, .01 to .025

NUMBER OF NET MIGRANTS, 1980 TO 1990, USING DIFFERENT METHODS

County	IRS NET MIGRANTS	RESIDUAL METHOD NET MIGRANTS	SURVIVAL RATE METHOD NET MIGRANTS	DIFFERENCE BETWEEN:		
				IRS AND RESIDUAL	IRS AND SURVIVAL	RESIDUAL AND SURVIVAL
AITKIN	983	(840)	-948	1,823	1,931	108
ANOKA	32,428	18,239	18,353	14,189	14,075	(114)
BECKER	(12,220)	(3,316)	(3,276)	(8,904)	(8,944)	(40)
BELTRAMI	413	(166)	-279	579	692	113
BENTON	1,290	1,922	1,965	(632)	(675)	(43)
BIG STONE	(2,552)	(1,454)	(1,402)	(1,098)	(1,150)	(52)
BLUE EARTH	(1,860)	(1,956)	(1,715)	96	(145)	(241)
BROWN	(4,418)	(3,172)	(2,986)	(1,246)	(1,432)	(186)
CARLTON	(482)	(2,056)	(2,226)	1,575	1,745	170
CARVER	6,746	5,900	6,173	846	573	(273)
CASS	(1,401)	196	-16	(1,597)	(1,385)	212
CHIPPEWA	(1,993)	(2,112)	(1,924)	119	(69)	(188)
CHISAGO	3,134	2,603	2,591	531	543	12
CLAY	(2,786)	(2,319)	(1,975)	(467)	(811)	(344)
CLEARWATER	(2,368)	(788)	-686	(1,580)	(1,682)	(102)
COOK	(256)	(350)	-376	94	120	26
COTTONWOOD	(1,557)	(2,299)	(2,039)	743	483	(260)
CROW WING	3,420	440	465	2,980	2,955	(25)
DAKOTA	43,160	50,794	51,675	(7,635)	(8,516)	(881)
DODGE	(343)	(486)	-346	143	3	(140)
DOUGLAS	437	(510)	-190	947	627	(320)
FARIBAULT	(2,923)	(3,075)	(2,971)	153	49	(104)
FILLMORE	(1,591)	(1,729)	(1,478)	139	(113)	(251)
FREEBORN	(3,277)	(4,430)	(4,305)	1,154	1,029	(125)
GOODHUE	74	113	323	(39)	(249)	(210)
GRANT	(755)	(923)	-876	168	121	(47)
HENNEPIN	(29,632)	11,407	11,662	(41,039)	(41,294)	(255)
HOUSTON	(199)	(964)	-827	765	628	(137)
HUBBARD	482	239	280	243	202	(41)
ISANTI	1,361	318	402	1,043	959	(84)
ITASCA	(2,069)	(4,540)	(4,748)	2,471	2,679	208
JACKSON	(1,547)	(2,519)	(2,259)	972	712	(260)
KANABEC	282	(179)	-214	461	496	35
KANDIYOHI	(761)	(704)	-342	(57)	(419)	(362)
KITSON	(663)	(953)	-992	290	329	39
KOOCHICHING	(1,715)	(1,742)	(1,850)	28	136	108
LAC QUI PARLE	(1,292)	(1,763)	(1,699)	471	407	(64)
LAKE	(2,002)	(2,983)	(2,986)	982	985	3
LAKE OF THE WOODS	218	118	112	100	106	6
LE SUEUR	(886)	(1,632)	(1,561)	747	676	(71)
LINCOLN	(959)	(1,347)	(1,171)	389	213	(176)
LYON	(2,385)	(2,166)	(1,972)	(219)	(413)	(194)
MCLEOD	318	270	514	48	(196)	(244)
MAHONOMEN	(506)	(739)	-778	234	273	39
MARSHALL	(1,579)	(2,419)	(2,367)	840	788	(52)
MARTIN	(2,219)	(2,619)	(2,351)	401	133	(268)
MEEKER	(652)	(863)	-806	212	155	(57)
MILLE LACS	22	(595)	-627	617	649	32
MORRISON	(517)	(1,984)	(1,902)	1,467	1,385	(82)
MOWER	(3,512)	(4,214)	(3,732)	703	221	(482)
MURRAY	(1,422)	(2,262)	(2,127)	841	706	(135)
NICOLLET	(1,038)	(1,245)	-999	207	(39)	(246)
NOBLES	(2,137)	(2,768)	(2,394)	632	258	(374)
NORMAN	(629)	(1,246)	(1,229)	617	600	(17)
OLMSTED	(863)	2,793	3,730	(3,656)	(4,593)	(937)
OTTER TAIL	(306)	(2,721)	(2,196)	2,415	1,890	(525)
PENNINGTON	(1,574)	(2,544)	(2,489)	971	916	(55)
PINE	676	366	343	310	333	23
PIPESTONE	(1,288)	(1,488)	(1,406)	201	119	(82)
POLK	(3,299)	(3,987)	(4,010)	689	712	23
POPE	(397)	(1,085)	(1,029)	688	632	(56)
RAMSEY	(37,385)	(15,912)	(16,405)	(21,473)	(20,980)	493
RED LAKE	(771)	(1,172)	(1,168)	401	397	(4)
REDWOOD	(2,270)	(2,715)	(2,540)	445	270	(175)
RENVILLE	(2,273)	(3,417)	(3,249)	1,144	976	(168)
RICE	171	(22)	231	193	(60)	(253)
ROCK	(990)	(1,412)	(1,183)	422	193	(229)
ROSEAU	1,198	1,342	1,329	(144)	(131)	13
ST. LOUIS	(21,320)	(29,657)	(31,576)	8,338	10,257	1,919
SCOTT	6,039	7,529	7,711	(1,491)	(1,673)	(182)
SHERBURNE	4,866	8,285	8,100	(3,419)	(3,234)	185
SIBLEY	(1,473)	(1,790)	(1,608)	317	135	(182)
STEARNS	(316)	(1,561)	-277	1,246	(39)	(1,284)
STEELE	(1,622)	(1,966)	(1,699)	344	77	(267)
STEVENS	(1,359)	(1,104)	(1,032)	(255)	(327)	(72)
SWIFT	(1,423)	(2,379)	(2,311)	956	888	(68)
TODD	(447)	(3,230)	(3,018)	2,784	2,572	(212)
TRAVERSE	(698)	(1,136)	(1,067)	438	369	(69)
WABASHA	(395)	(731)	-651	337	257	(80)
WADENA	(1,091)	(1,451)	(1,584)	361	494	133
WASECA	(1,364)	(1,584)	(1,403)	220	39	(181)
WASHINGTON	16,855	18,329	18,576	(1,474)	(1,721)	(247)
WATONWAN	(1,099)	(1,139)	(1,102)	40	3	(37)
WILKIN	(811)	(1,336)	(1,200)	526	390	(136)
WINONA	(1,808)	(1,195)	-923	(613)	(885)	(272)
WRIGHT	5,609	2,660	2,777	2,949	2,832	(117)
YELLOW MEDICINE	(1,329)	(2,217)	(2,087)	888	758	(130)

## NET MIGRATION RATES AND DIFFERENCE IN RATES, 1980-1990

County	NET MIGRATION RATES/100 AVERAGE POP.			ABSOLUTE DIFFERENCE IN RATES		
	RESIDUAL METHOD	SURVIVAL METHOD	IRS METHOD	RESIDUAL VER SURVIVAL	RESIDUAL VERSUS IRS	SURVIVAL VERSUS IRS
AITKIN	-6.5	-7.3	2.6	0.8	9.1	9.9
ANOKA	8.3	8.3	9.0	0.1	0.7	0.6
BECKER	-11.6	-11.5	-0.4	0.1	11.2	11.1
BELTRAMI	-0.5	-0.9	0.7	0.3	1.2	1.5
BENTON	6.9	7.1	2.3	0.2	4.7	4.8
BIG STONE	-20.8	-20.0	-9.5	0.7	11.3	10.6
BLUE EARTH	-3.7	-3.2	-8.9	0.5	5.2	5.6
BROWN	-11.4	-10.7	-8.5	0.7	2.9	2.2
CARLTON	-6.9	-7.5	-1.8	0.6	5.1	5.7
CARVER	13.9	14.5	11.7	0.6	2.2	2.8
CASS	0.9	-0.1	2.7	1.0	1.8	2.7
CHIPPEWA	-15.0	-13.7	-12.5	1.3	2.5	1.1
CHISAGO	9.3	9.2	7.9	0.0	1.4	1.3
CLAY	-4.6	-4.0	-7.6	0.7	2.9	3.6
CLEARWATER	-9.2	-8.0	-1.6	1.2	7.7	6.5
COOK	-8.8	-9.4	-3.5	0.7	5.3	6.0
COTTONWOOD	-16.7	-14.8	-11.3	1.9	5.4	3.5
CROW WING	1.0	1.1	8.0	0.1	6.9	6.9
DAKOTA	21.6	22.0	18.4	0.4	3.3	3.6
DODGE	-3.2	-2.3	-2.2	0.9	0.9	0.0
DOUGLAS	-1.8	-0.7	1.5	1.1	3.4	2.2
FARIBAULT	-16.8	-16.2	-15.9	0.6	0.8	0.3
FILLMORE	-8.1	-6.9	-7.4	1.2	0.6	0.5
FREEBORN	-12.8	-12.4	-9.4	0.4	3.3	3.0
GOODHUE	0.3	0.8	0.2	0.5	0.1	0.6
GRANT	-13.8	-13.1	-11.3	0.7	2.5	1.8
HENNEPIN	1.2	1.2	-3.0	0.0	4.2	4.2
HOUSTON	-5.2	-4.5	-1.1	0.7	4.1	3.4
HUBBARD	1.6	1.9	3.3	0.3	1.7	1.4
ISANTI	1.3	1.6	5.5	0.3	4.2	3.9
ITASCA	-10.8	-11.3	-4.9	0.5	5.9	6.4
JACKSON	-19.9	-17.8	-12.2	2.0	7.7	5.6
KANABEC	-1.4	-1.7	2.3	0.3	3.7	4.0
KANDIYOHI	-1.9	-0.9	-2.0	1.0	0.2	1.1
KITSON	-15.3	-15.9	-10.7	0.6	4.7	5.3
KOOCHICHING	-10.3	-10.9	-10.1	0.6	0.2	0.8
LAC QUI PARLE	-18.1	-17.4	-13.2	0.7	4.8	4.2
LAKE	-25.4	-25.5	-17.1	0.0	8.4	8.4
LAKE OF THE WOODS	3.0	2.9	5.6	0.2	2.6	2.7
LE SUEUR	-7.0	-6.7	-3.8	0.3	3.2	2.9
LINCOLN	-17.8	-15.5	-12.7	2.3	5.1	2.8
LYON	-8.7	-7.9	-9.5	0.8	0.9	1.7
McLEOD	0.9	1.7	1.0	0.8	0.2	0.6
MAHNOMEN	-14.0	-14.7	-9.6	0.7	4.4	5.2
MARSHALL	-20.1	-19.7	-13.1	0.4	7.0	6.6
MARTIN	-11.0	-9.9	-9.3	1.1	1.7	0.6
MEEKER	-4.2	-3.9	-3.1	0.3	1.0	0.7
MILLE LACS	-3.2	-3.4	0.1	0.2	3.3	3.5
MORRISON	-6.7	-6.5	-1.8	0.3	5.0	4.7
MOWER	-10.8	-9.6	-9.0	1.2	1.8	0.6
MURRAY	-21.4	-20.1	-13.4	1.3	7.9	6.7
NICOLLET	-4.5	-3.6	-3.8	0.9	0.8	0.1
NOBLES	-13.2	-11.4	-10.2	1.8	3.0	1.2
NORMAN	-14.4	-14.2	-7.2	0.2	7.1	6.9
OLMSTED	2.8	3.8	-0.9	0.9	3.7	4.6
OTTER TAIL	-5.3	-4.3	-0.6	1.0	4.7	3.7
PENNINGTON	-17.8	-17.4	-11.0	0.4	6.8	6.4
PINE	1.8	1.7	3.3	0.1	1.5	1.6
PIPESTONE	-13.4	-12.7	-11.6	0.7	1.8	1.1
POLK	-11.8	-11.9	-9.8	0.1	2.0	2.1
POPE	-9.7	-9.2	-3.5	0.5	6.1	5.6
RAMSEY	-3.4	-3.5	-7.9	0.1	4.5	4.4
RED LAKE	-23.4	-23.4	-15.4	0.1	8.0	7.9
REDWOOD	-14.8	-13.9	-12.4	1.0	2.4	1.5
RENVILLE	-17.9	-17.1	-11.9	0.9	6.0	5.1
RICE	-0.0	0.5	0.4	0.5	0.4	0.1
ROCK	-13.8	-11.5	-9.7	2.2	4.1	1.9
ROSEAU	9.7	9.6	8.7	0.1	1.0	0.9
ST. LOUIS	-14.1	-15.0	-10.1	0.9	4.0	4.9
SCOTT	14.8	15.2	11.9	0.4	2.9	3.3
SHERBURNE	23.1	22.5	13.5	0.5	9.5	9.0
SIBLEY	-12.0	-10.8	-9.9	1.2	2.1	0.9
STEARNS	-1.4	-0.2	-0.3	1.1	1.1	0.0
STEELE	-6.4	-5.6	-5.3	0.9	1.1	0.3
STEVENS	-10.1	-9.4	-12.4	0.7	2.3	3.0
SWIFT	-20.1	-19.5	-12.0	0.6	8.1	7.5
TODD	-13.4	-12.5	-1.8	0.9	11.5	10.6
TRVERSE	-22.7	-21.3	-14.0	1.4	8.8	7.4
WABASHA	-3.7	-3.3	-2.0	0.4	1.7	1.3
WADENA	-10.6	-11.6	-8.0	1.0	2.6	3.6
WASECA	-8.7	-7.7	-7.5	1.0	1.2	0.2
WASHINGTON	14.1	14.3	13.0	0.2	1.1	1.3
WATONWAN	-9.5	-9.2	-9.1	0.3	0.3	0.0
WILKIN	-16.7	-15.0	-10.2	1.7	6.6	4.9
WINONA	-2.5	-2.0	-3.8	0.6	1.3	1.9
WRIGHT	4.2	4.4	8.8	0.2	4.6	4.4
YELLOW MEDICINE	-17.5	-16.5	-10.5	1.0	7.0	6.0

## II. Migration from 1985 to 1990

For the 1985-1990 period, three methods of estimating county migration were compared: the residual method, the IRS method, and the census method.

In some counties the net migration figures from the three methods are quite similar, while in others the results vary dramatically. Dakota County stands out as a case where the three procedures give very similar results for the 1985 to 1990 time span. In all three methods, net in-migration was in a range of 33,058 to 37,479. On the other hand, in Hennepin county the results were very different. The IRS method shows substantial net out-migration from 1985 to 1990; the residual method shows substantial net in-migration; the census number hovers around zero. Results in Ramsey County were also quite varied in the three methods.

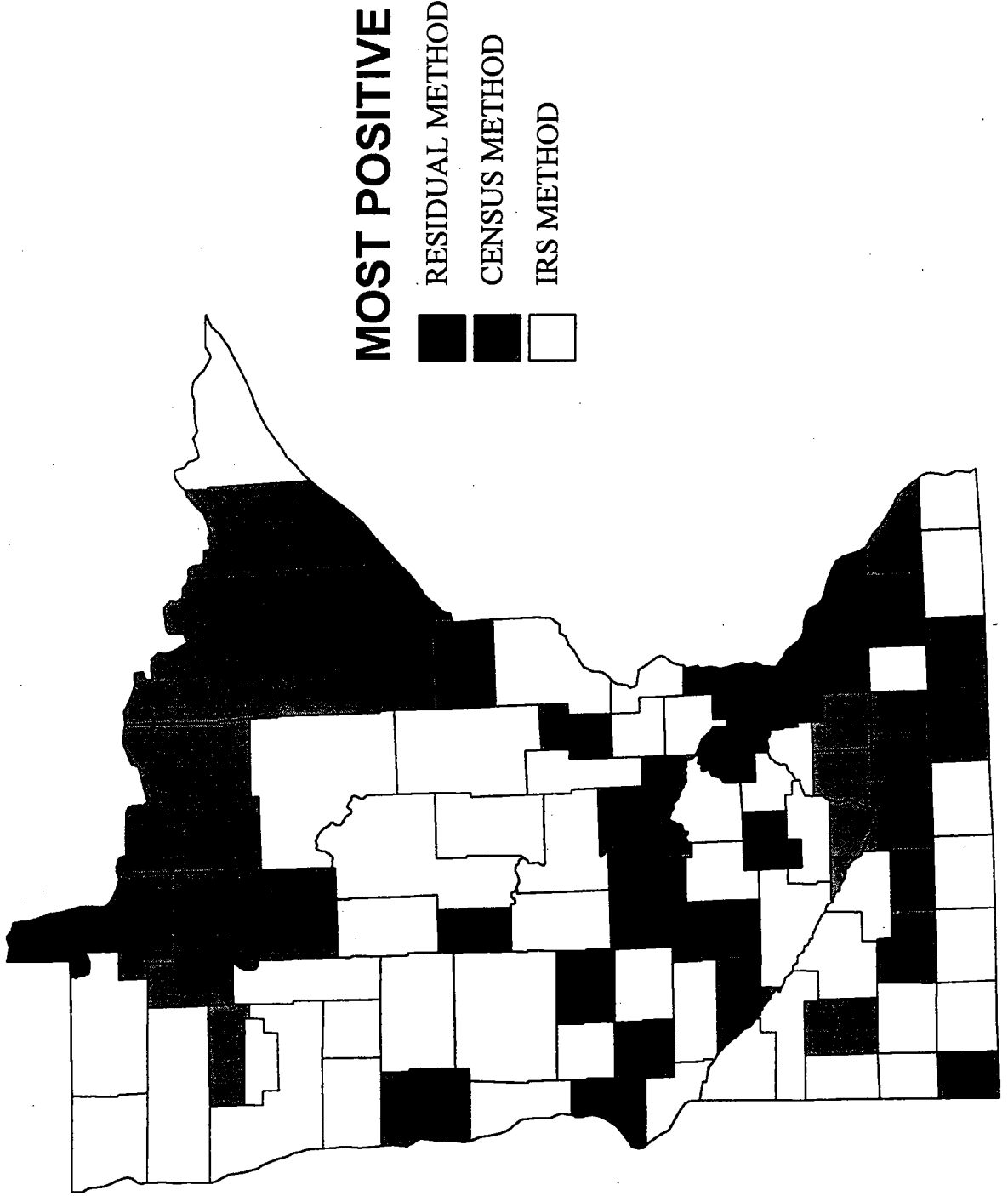
In 48 of Minnesota's counties, the IRS method shows the most positive net migration numbers, i.e. the most net in-migration or least net out-migration (Map BWPOSTV5.PRJ). The census data produced the most positive figures in 29 counties, and the residual method in only 10 counties. While the residual method was most favorable in only a small minority of counties, they included Hennepin, Ramsey, Dakota, and Washington, the most populous counties in the state.

IRS versus Census Net Migration: The smallest difference between the IRS and census net migration numbers occurred in Wabasha County, where the census showed net out-migration of -89 and the IRS showed net out-migration of -95. Relative to 1990 population, the largest discrepancies were in Aitkin and Nicollet counties (Map BWDISC5A.PRJ). In Aitkin County the IRS showed net in-migration of 107, but the census found net out-migration of -1,015. In Nicollet County, there was net in-migration of 2,214 using census data, while the IRS found net out-migration of -456.

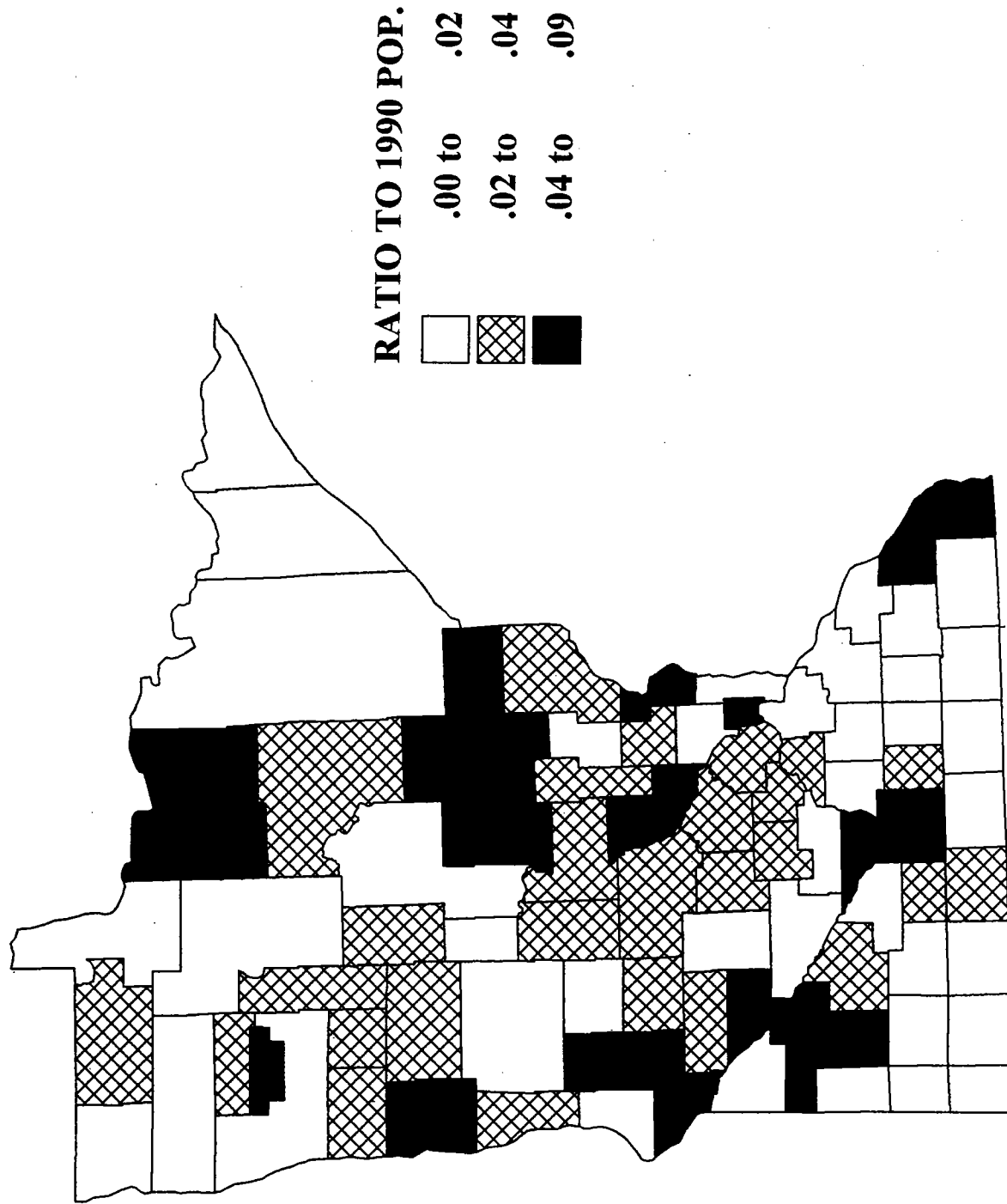
The findings for Aitkin and Nicollet counties appear to be representative. In college counties such as Nicollet, the IRS usually found more out-migration or less in-migration than the census, indicating the tax data fail to pick up many arriving students. Counties with large elderly populations, for example Aitkin County, usually showed the reverse. The number of in-migrants was higher (or out-migrants lower) with the IRS method than with the census data. In part, this may be attributable to mortality among elderly migrants. Those who die a year or two after moving might be picked up by the IRS but missed in the census data because of the longer 5-year migration window. Out-migration of young people from rural areas is another likely factor.

IRS versus Census In- and Out-Movers A comparison of the number of in-movers and out-movers in the census and IRS shows that in most counties the census finds many more movers than does the IRS. In some counties the difference is extremely large (Maps BWINS5.PRJ, BWOUTS5.PRJ). For example, in Koochiching County, the ratio of IRS in-migrants to Census in-migrants was only .39, and in St. Louis and Winona counties it was only .40. For out-

**MIGRATION METHOD GIVING MOST  
POSITIVE RESULTS, 1985-1990**  
(Most Net In- or Least Net Out-Migration)



**DISCREPANCY BETWEEN IRS AND CENSUS  
MIGRATION RELATIVE TO 1990 POPULATION**  
1985 to 1990 Net Migration



migration, the IRS to census ratio was under .50 in Koochiching, St. Louis and Roseau counties. College counties appear to have generally small ratios, suggesting again that many college-age migrants are missed in the IRS method. However, low ratios are also found in many counties where there are no colleges, for instance Kittson and Roseau.

The closest agreements on in- and out-migration between Census and IRS were found in some of the suburban and exurban counties around the Twin Cities. For instance, in Isanti County the ratio of IRS to Census in-migrants is .93, and in Benton County it is .90. The areas with the closest agreement have large proportions of working-age adults and married-couple households. In these types of counties, the IRS data may serve fairly well as a proxy for census numbers.

IRS versus Residual Method In some cases, net migration numbers in the residual and IRS methods were very similar. For example, in Martin County, 1985 to 1990 net migration was -1,650 using the residual method and -1,623 using IRS data. In Stevens County, the respective figures also were very close, -716 for the residual method and -740 with IRS data. At the opposite extreme, Hennepin and Ramsey counties both showed substantial net in-migration using the residual method but registered strong out-migration when the IRS data were used.

When the discrepancies between the IRS and residual methods are measured relative to 1990 population, it appears that west central Minnesota generally has high discrepancies, while southeastern Minnesota has smaller differences (Map BWRAT5A.PRJ). This is consistent with the findings comparing these two methods for the 1980 to 1990 period.

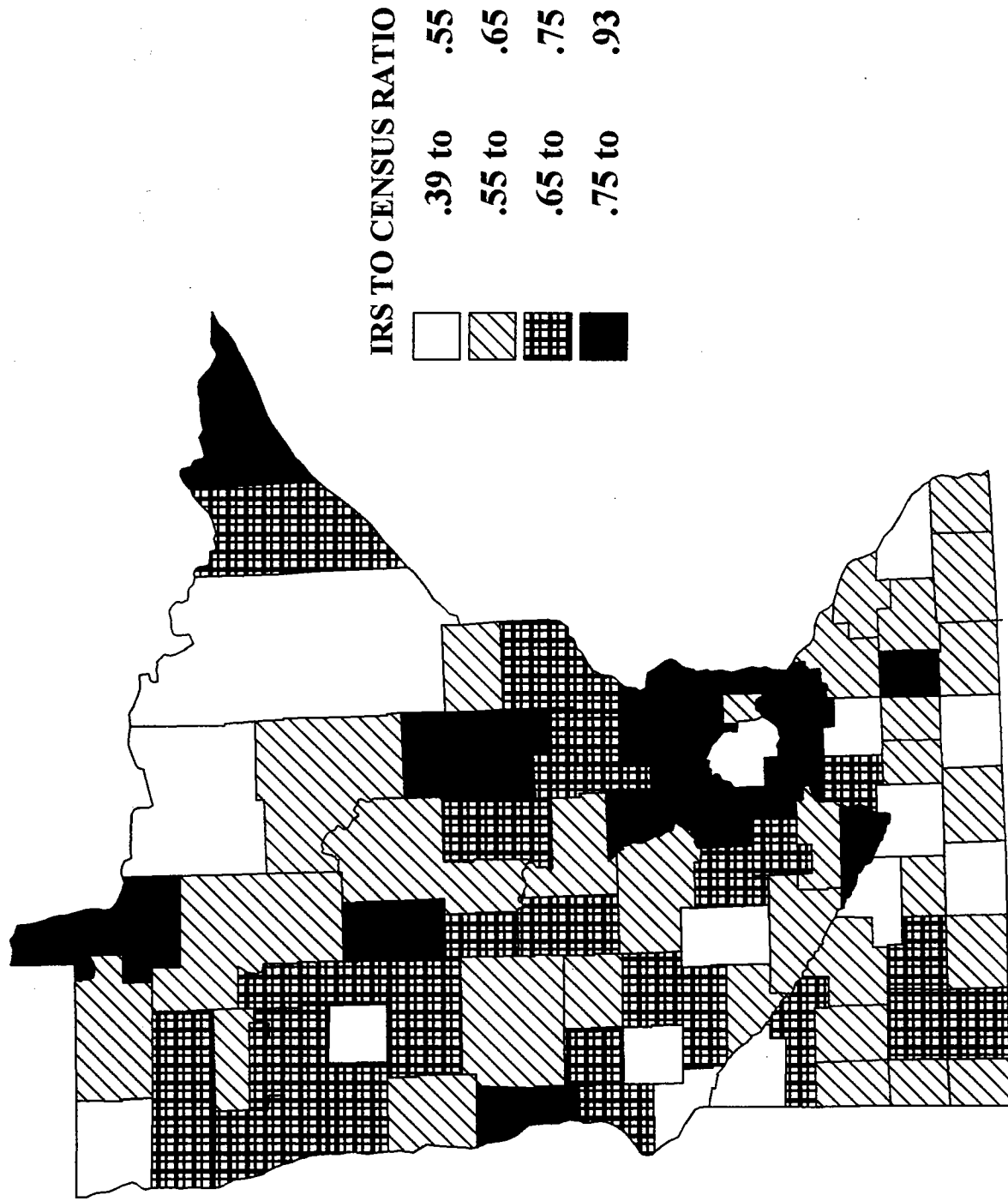
Residual versus Census Method: In rural Grant County, the number of net migrants from 1985 to 1990 was virtually identical in the residual method (-863) and the census method (-855). At the other extreme, Hennepin County had near-zero net in-migration with the census method (368) but strong net in-migration with the residual method (28,920).

Relative to 1990 population, the largest discrepancies between the residual and census methods occurred in west central Minnesota. Suburban Twin Cities counties and counties southeast and north of the Twin Cities generally had small discrepancies.

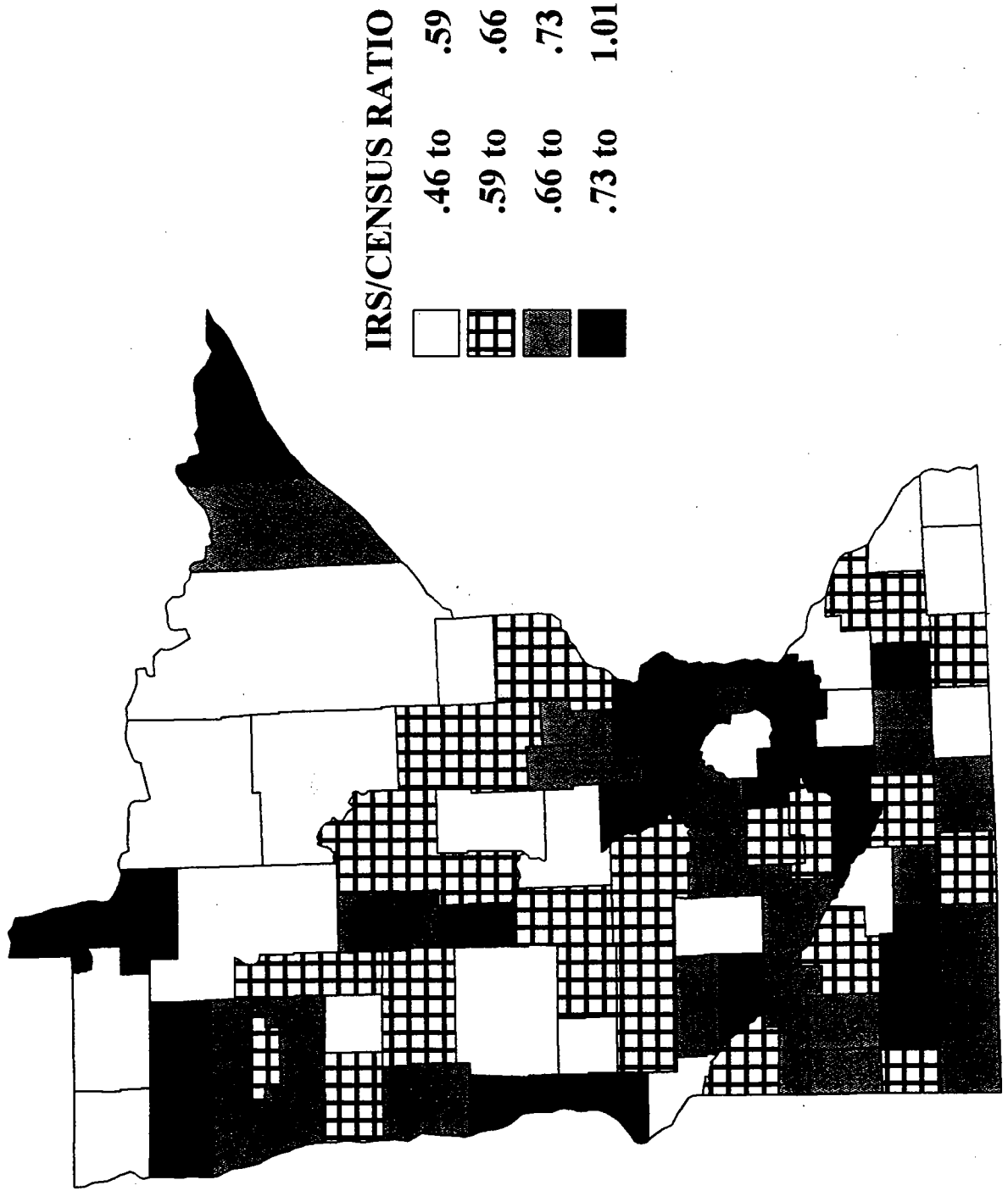
Age/Gender Net Migration: Survival Rate Method versus Census Method: Because the census data become available so late in the decade, the Demographer's Office has traditionally used net migration rates based on the survival rate method as the basis for the migration rates used in the projections. Given the importance of migration rates in the population projections, I decided to compare the age/gender-specific migration numbers from the census to the numbers derived from the survival rate method.

I did not compare all counties, but selected seven varying in size and other characteristics. Since the census migration covers five years and the survival rate migration is for a ten-year period, the numbers from the two methods would not be expected to be identical, but a look at the results is

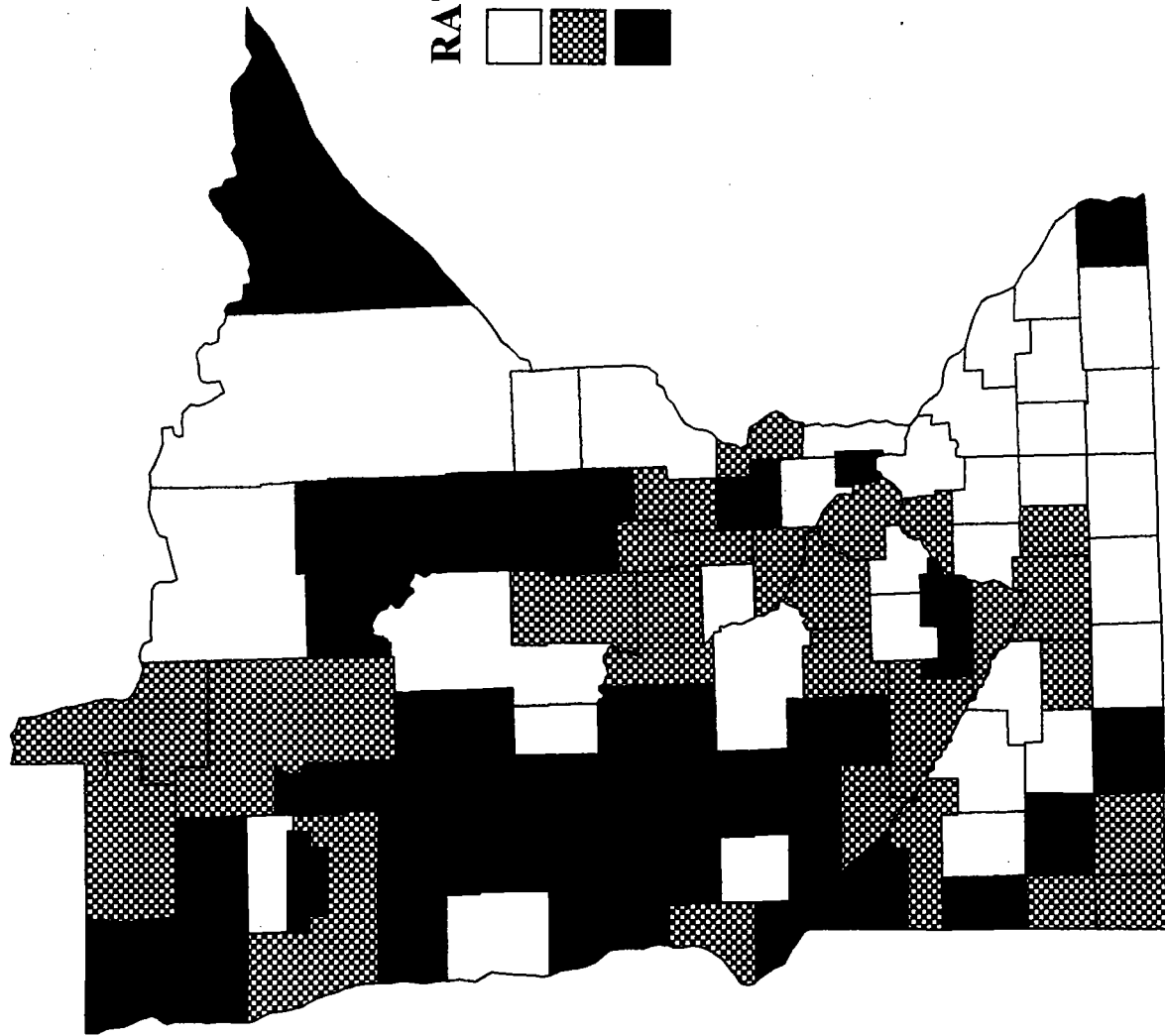
# RATIO OF IRS IN-MIGRANTS TO CENSUS IN-MIGRANTS: 1985 TO 1990



**RATIO OF IRS OUT-MIGRANTS TO  
CENSUS OUT-MIGRANTS: 1985 TO 1990**



**DISCREPANCY BETWEEN IRS AND RESIDUAL  
MIGRATION RELATIVE TO 1990 POPULATION  
(1985 To 1990 Absolute Net Migration)**





NUMBER OF NET MIGRANTS 1985 TO 1990, USING DIFFERENT METHODS

COUNTY	RESIDUAL	CENSUS	IRS	DIFFERENCE IN NUMBER OF NET MIGRANTS		
	NET MIGRATION 1985-90	NET MIGRATION 1985-90	NET MIGRATION 1985-90	RESIDUAL MINUS CENSUS	RESIDUAL MINUS IRS	CENSUS MINUS IRS
AITKIN	-780	-1015	107	235	-887	-1122
ANOKA	12913	12876	14702	37	-1789	-1826
BECKER	-4000	-739	295	-3261	-4295	-1034
BELTRAMI	-1237	-238	-407	-999	-830	169
BENTON	1850	2468	1195	-618	655	1273
BIG STONE	-1588	-810	-448	-778	-1140	-362
BLUE EARTH	-767	1589	-2271	-2356	1504	3860
BROWN	-1786	-1607	-1300	-179	-486	-307
CARLTON	264	-1401	165	1665	99	-1566
CARVER	4479	3327	4554	1152	-75	-1227
CASS	270	325	414	-55	-144	-89
CHIPPEWA	-1625	-431	-1089	-1194	-536	658
CHISAGO	1091	855	2189	236	-1098	-1334
CLAY	-900	2055	-1611	-2955	711	3666
CLEARWATER	-919	-542	-298	-377	-621	-244
COOK	-515	-155	-114	-360	-401	-41
COTTONWOOD	-1080	-817	-900	-263	-180	83
CROW WING	477	-475	2391	952	-1914	-2866
DAKOTA	37479	33157	33058	4322	4421	99
DODGE	-124	-36	2	-88	-126	-38
DOUGLAS	-1679	109	-32	-1788	-1647	141
FARIBAUT	-1815	-1849	-1676	34	-139	-173
FILLMORE	-1005	-995	-856	-10	-349	-339
FREEBORN	-2333	-1641	-1649	-692	-684	8
GOODHUE	50	892	567	-842	-517	325
GRANT	-863	-855	-321	-8	-542	-534
HENNEPIN	28920	368	-21962	28552	50882	22330
HOUSTON	-1026	-846	-75	-180	-951	-771
HUBBARD	-651	-249	336	-402	-987	-585
ISANTI	-1054	181	1164	-1235	-2218	-983
ITASCA	-3944	-2018	-913	-1926	-3031	-1105
JACKSON	-1915	-1063	-1028	-852	-887	-35
KANABEC	-131	196	178	-327	-309	18
KANDIYOHI	-2319	338	-199	-2657	-2120	537
KITSON	-945	-523	-434	-422	-511	-89
KOOCHICING	-387	106	-661	-493	274	767
LAC QUI PARLE	-1345	-947	-830	-398	-515	-117
LAKE	-1206	-492	-627	-714	-579	135
LAKE OF THE WOODS	87	273	230	-186	-143	43
LE SUEUR	-1040	-96	-525	-944	-515	429
LINCOLN	-827	-482	-386	-345	-441	-96
LYON	-1727	-437	-1520	-1290	-207	1083
MCLEOD	699	-263	440	962	259	-703
MAHNOMEN	-843	-415	-274	-228	-369	-141
MARSHALL	-1876	-1003	-886	-873	-990	-117
MARTIN	-1650	-2194	-1623	544	-27	-571
MEEKER	-731	-578	-129	-153	-602	-449
MILLE LACS	-289	-328	197	39	-486	-525
MORRISON	-1461	-1194	-245	-267	-1216	-949
MOWER	-2568	-1778	-2192	-790	-376	414
MURRAY	-1643	-992	-865	-651	-778	-127
NICOLLET	-1152	2124	-456	-3276	-696	2580
NOBLES	-2017	-1223	-1171	-794	-846	-52
NORMAN	-1082	-565	-316	-517	-766	-249
OLMSTED	2487	1392	108	1095	2379	1284
OTTER TAIL	-4830	-930	20	-3900	-4850	-950
PENNINGTON	-751	-376	-714	-375	-37	338
PINE	-13	-195	355	182	-368	-550
PIPESTONE	-932	-573	-462	-359	-470	-111
POLK	-2239	-1498	-1480	-741	-759	-18
POPE	-1042	-365	-29	-677	-1013	-336
RAMSEY	3693	-4478	-24206	8171	27899	19728
RED LAKE	-650	-548	-333	-102	-317	-215
REDWOOD	-1679	-1952	-1430	273	-249	-522
RENVILLE	-1932	-1525	-1359	-407	-573	-166
RICE	352	1582	684	-1230	-332	898
ROCK	-942	-333	-528	-609	-414	195
ROSEAU	727	692	1110	35	-383	-418
ST LOUIS	-9095	-5005	-6835	-4090	-2460	1630
SCOTT	3057	2961	4819	96	-1562	-1658
SHERBURNE	5406	5854	3648	-448	1758	2206
SIBLEY	-1591	-925	-669	-666	-922	-256
STEARNS	-1845	3766	776	-5611	-2621	2990
STEELE	-932	48	-244	-978	-688	290
STEVENS	-716	-9	-740	-707	24	731
SWIFT	-1843	-1103	-803	-740	-1040	-300
TODD	-2828	-1285	-616	-1563	-2212	-649
TRAVERSE	-688	-422	-479	-266	-209	57
WABASHA	1	-89	-95	90	96	6
WADENA	-838	-527	-561	-311	-277	34
WASECA	-1118	-246	-701	-872	-417	455
WASHINGTON	13272	14011	14001	-739	-729	10
WATONWAN	-237	-323	-596	86	359	273
WILKIN	-1006	-747	-544	-259	-462	-203
WINONA	-340	2322	-1238	-2662	898	3560
WRIGHT	1834	3034	4625	-1200	-2791	-1591
YELLOW MEDICINE	-1094	-1294	-705	200	-389	-589

COMPARISON OF MIGRATION METHODS, 1985 TO 1990

RATIO OF IRS TO CENSUS MIGRANTS: RATIO OF ABSOLUTE DISCREPANCY TO 1990 POPULATION

COUNTY	IN-MIGRANTS	OUT-MIGRANTS	RESIDUAL MINUS CENSUS	RESIDUAL MINUS IRS	CENSUS MINUS IRS
AITKIN	0.8001	0.8214	0.019	0.071	0.090
ANOKA	0.8101	0.7619	0.000	0.007	0.007
BECKER	0.6723	0.5978	0.117	0.154	0.037
BELTRAMI	0.5506	0.5695	0.029	0.024	0.005
BENTON	0.9066	1.0159	0.020	0.022	0.042
BIG STONE	0.5384	0.5431	0.124	0.181	0.058
BLUE EARTH	0.5170	0.6449	0.044	0.028	0.071
BROWN	0.5464	0.5904	0.007	0.018	0.011
CARLTON	0.5830	0.4988	0.057	0.003	0.054
CARVER	0.9251	0.8358	0.024	0.002	0.028
CASS	0.6487	0.6232	0.003	0.007	0.004
CHIPPEWA	0.6195	0.8094	0.090	0.041	0.050
CHISAGO	0.8880	0.7587	0.008	0.036	0.044
CLAY	0.5519	0.6896	0.059	0.014	0.073
CLEARWATER	0.6501	0.8309	0.045	0.075	0.029
COOK	0.7927	0.7872	0.093	0.104	0.011
COTTONWOOD	0.6968	0.7726	0.021	0.014	0.007
CROW WING	0.6600	0.5146	0.022	0.043	0.065
DAKOTA	0.8697	0.8277	0.016	0.016	0.000
DODGE	0.7947	0.7892	0.006	0.008	0.002
DOUGLAS	0.6366	0.6459	0.062	0.057	0.005
FARIBAULT	0.5881	0.6799	0.002	0.008	0.010
FILLMORE	0.5639	0.5766	0.000	0.017	0.016
FREEBORN	0.5214	0.5860	0.021	0.021	0.000
GOODHUE	0.5927	0.5899	0.021	0.013	0.008
GRANT	0.6543	0.5655	0.001	0.087	0.085
HENNEPIN	0.5081	0.5537	0.028	0.049	0.022
HOUSTON	0.6326	0.5654	0.010	0.051	0.042
HUBBARD	0.8120	0.7053	0.027	0.066	0.039
ISANTI	0.9307	0.8161	0.048	0.086	0.038
ITASCA	0.5539	0.5405	0.047	0.074	0.027
JACKSON	0.6485	0.7235	0.073	0.076	0.003
KANABEC	0.7183	0.7096	0.026	0.024	0.001
KANDIYOHI	0.5479	0.5748	0.069	0.055	0.014
KITSON	0.4829	0.5667	0.073	0.089	0.015
KOOCHICING	0.3951	0.4927	0.030	0.017	0.047
LAC QUI PARLE	0.5379	0.6364	0.045	0.058	0.013
LAKE	0.6646	0.7363	0.069	0.056	0.013
LAKE OF THE WOODS	0.8934	0.9058	0.046	0.035	0.011
LE SUEUR	0.7319	0.7960	0.041	0.022	0.018
LINCOLN	0.6379	0.6725	0.050	0.064	0.014
LYON	0.5549	0.6783	0.052	0.008	0.044
MCLEOD	0.6779	0.6223	0.030	0.008	0.022
MAHNOMEN	0.5324	0.5643	0.045	0.073	0.028
MARSHALL	0.6785	0.7383	0.080	0.091	0.011
MARTIN	0.5483	0.5922	0.024	0.001	0.025
MEEKER	0.7385	0.6944	0.007	0.029	0.022
MILLE LACS	0.7354	0.6715	0.002	0.026	0.028
MORRISON	0.5997	0.5511	0.009	0.041	0.032
MOWER	0.5771	0.6606	0.021	0.010	0.011
MURRAY	0.6833	0.7397	0.067	0.081	0.013
NICOLLET	0.7575	0.9686	0.117	0.025	0.092
NOBLES	0.6513	0.7008	0.040	0.042	0.003
NORMAN	0.6724	0.6472	0.065	0.096	0.031
OLMSTED	0.5922	0.6078	0.010	0.022	0.012
OTTER TAIL	0.5795	0.5479	0.077	0.096	0.019
PENNINGTON	0.5947	0.6888	0.028	0.003	0.025
PINE	0.7205	0.6550	0.009	0.017	0.026
PIPESTONE	0.6166	0.6448	0.034	0.045	0.011
POLK	0.6610	0.7018	0.023	0.023	0.001
POPE	0.7101	0.6444	0.063	0.094	0.031
RAMSEY	0.6106	0.7079	0.017	0.057	0.041
RED LAKE	0.6744	0.6519	0.023	0.070	0.048
REDWOOD	0.5904	0.6325	0.016	0.014	0.030
RENVILLE	0.6391	0.7036	0.023	0.032	0.009
RICE	0.5176	0.5246	0.025	0.007	0.018
ROCK	0.5867	0.6861	0.062	0.042	0.020
ROSEAU	0.6431	0.4975	0.002	0.025	0.028
ST LOUIS	0.4026	0.4631	0.021	0.012	0.008
SCOTT	0.8842	0.7884	0.002	0.027	0.029
SHERBURNE	0.8308	0.9245	0.011	0.042	0.053
SIBLEY	0.6357	0.6533	0.046	0.064	0.018
STEARNS	0.5954	0.6284	0.047	0.022	0.025
STEELE	0.6395	0.6635	0.032	0.022	0.009
STEVENS	0.4426	0.6161	0.066	0.002	0.069
SWIFT	0.6504	0.6721	0.069	0.097	0.028
TODD	0.6942	0.6616	0.067	0.095	0.028
TRAVERSE	0.6510	0.7944	0.060	0.047	0.013
WABASHA	0.6343	0.6401	0.005	0.005	0.000
WADENA	0.7352	0.7696	0.024	0.021	0.003
WASECA	0.6081	0.6957	0.048	0.023	0.025
WASHINGTON	0.8940	0.8636	0.005	0.005	0.000
WATONWAN	0.5942	0.6956	0.007	0.031	0.023
WILKIN	0.7717	0.7611	0.034	0.061	0.027
WINONA	0.4039	0.5242	0.056	0.019	0.074
WRIGHT	0.8092	0.7169	0.017	0.041	0.023
YELLOW MEDICINE	0.7311	0.6738	0.017	0.033	0.050

illuminating. It appears that the net migration numbers for certain age groups, noticeably young adults and those 85 and over, are very different in the two methods.

To make the comparisons, I halved the net migration numbers from the 1980 to 1990 survival rate method and compared them to net migration numbers from the census for the 1985 to 1990 period. I then took the difference between the estimates produced by the two methods and looked at the ratio of this discrepancy to the 1990 population in each age/gender group.

In most age groups in most counties, the two methods give fairly similar numbers. For young adults and the very old, however, the numbers are often far apart. The largest differences in the seven counties examined were in Blue Earth and Lake counties.

Blue Earth County was selected as a representative of a college county, and the results of the analysis confirm how difficult it is to estimate and project migration in college counties. Large discrepancies occurred in all age groups from 15 to 34.

Lake County was included because I suspected its migration patterns might be sharply different in the first and second half of the decade, since the major impact of the decline in the taconite industry was probably felt before 1985. This interpretation is consistent with results showing much higher net out-migration using half of the 1980 to 1990 survival rate data than using the 1985 to 1990 census data. The differences are particularly large in the 25- to 29-year-old age group.

In all the counties examined, there were large deviations in the migration numbers for very old people. This could be attributable to a number of factors. The 85 and older population is the usually the smallest age group, so sampling variation in the census data will be larger. Regional differences in survival rates also have the most effect in this age group.

## Conclusions

Each technique of estimating migration has advantages and disadvantages in terms of availability, ease of use, and likely sources of error. The results of this analysis suggest at least two areas of concern. First, the IRS data show numbers and rates of migration that are wildly different from those produced by other methods. Overall, the IRS data are probably the least accurate and must be massaged considerably to make them comparable with other numbers. The IRS data are very valuable for looking at trends, but they need to be benchmarked to figures derived from other methods, for example census data. If census data are no longer available, the IRS data will become increasingly misleading with the passage of time.

A second major problem uncovered here are the large discrepancies between the survival rate and census rates for individual age/gender groups. Though exact comparisons between these two methods are not possible because of the different time periods, the variations are often substantial

COMPARISON OF NET MIGRATION BY AGE, SURVIVAL RATE VS. CENSUS, SELECTED COUNTIES

County:	Anoka	Census Migration 1985-1990				Survival Rate Net Migration 1980-1990					Absolute Ratio of Discrepancy to 1990 Pop.
		Non-movers	In-movers	State Out-movers	County Out-movers	Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival		
Age:											
0-4	Male	10821	0	0	0	0	819	410	na	na	
0-4	Female	10554	0	0	0	0	966	483	na	na	
5-9	Male	8003	3390	442	1481	1467	2139	1070		398	0.035
5-9	Female	7475	3070	386	1387	1297	1859	930		368	0.035
10-14	Male	8233	1951	434	902	615	1377	689		-74	0.007
10-14	Female	7911	1951	371	867	713	1287	644		70	0.007
15-19	Male	7759	1576	654	974	-52	-153	-77		25	0.003
15-19	Female	7408	1340	462	1381	-503	-401	-201		-303	0.035
20-24	Male	6110	2327	971	2353	-997	-1883	-942		-56	0.007
20-24	Female	5658	2739	937	3156	-1354	-1491	-746		-609	0.072
25-29	Male	5988	5512	666	2449	2397	1525	763		1635	0.142
25-29	Female	5854	5991	592	2667	2732	1889	945		1788	0.151
30-34	Male	8036	4976	449	2415	2112	4164	2082		30	0.002
30-34	Female	7980	4477	567	2009	1901	3578	1788		113	0.009
35-39	Male	7721	3161	506	1674	981	2093	1047		-66	0.006
35-39	Female	8082	2414	482	1388	544	1400	700		-156	0.015
40-44	Male	7738	1893	377	1018	498	637	319		180	0.019
40-44	Female	8681	1625	427	776	422	227	114		309	0.030
45-49	Male	6587	953	237	641	75	-88	-44		119	0.016
45-49	Female	6492	895	229	553	113	-167	-84		197	0.027
50-54	Male	5095	787	184	387	216	-145	-73		289	0.049
50-54	Female	4960	669	135	500	34	-168	-84		118	0.021
55-59	Male	4010	417	148	369	-100	-148	-74		-26	0.006
55-59	Female	3972	341	136	367	-162	-249	-125		-38	0.009
60-64	Male	3091	240	152	330	-242	-422	-211		-31	0.009
60-64	Female	2853	368	93	338	-65	-226	-113		48	0.015
65-69	Male	2343	221	74	284	-137	-389	-195		58	0.022
65-69	Female	2525	316	96	226	-6	-131	-66		60	0.021
70-74	Male	1262	161	47	133	-19	-185	-93		74	0.052
70-74	Female	1543	337	39	133	165	6	3		162	0.086
75-79	Male	791	108	18	61	29	-13	-7		36	0.039
75-79	Female	1213	247	35	161	51	79	40		12	0.008
80-84	Male	375	85	0	41	44	37	19		26	0.055
80-84	Female	669	132	0	139	-7	196	98		-105	0.131
85-115	Male	190	35	4	54	-23	-59	-30		7	0.029
85-115	Female	714	243	3	103	137	396	198		-61	0.064
Total		243641	188695	54946	10353	31717	12876	18354	9177	3699	0.015
							Net excl. 0-4	16569	8285	-8285	0.034

County: Blue Earth

Age:		Non-movers	In-movers	State Out-movers	County Out-movers	Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival	Absolute Ratio of Discrepancy to 1990 Pop.	
											0-4
0-4	Female	1635	0	0	0	1635	-71	-36	na	na	
5-9	Male	1579	511	224	376	-89	-189	-95		6	0.003
5-9	Female	1320	367	256	311	-200	-284	-142		-58	0.034
10-14	Male	1419	250	126	228	-104	-172	-86		-18	0.011
10-14	Female	1503	254	150	177	-73	-196	-98		25	0.014
15-19	Male	1309	1192	112	189	891	981	491		401	0.160
15-19	Female	1172	1579	129	244	1206	1231	616		591	0.215
20-24	Male	1260	3533	370	821	2342	2993	1497		846	0.176
20-24	Female	1027	3079	389	938	1752	2480	1240		512	0.125
25-29	Male	1203	963	728	1503	-1268	-729	-365		-904	0.417
25-29	Female	1100	837	685	1628	-1476	-1319	-660		-817	0.422
30-34	Male	1395	568	289	655	-376	-1996	-998		622	0.317
30-34	Female	1458	547	167	514	-134	-2205	-1103		969	0.483
35-39	Male	1475	420	226	301	-107	-693	-347		240	0.126
35-39	Female	1530	354	212	305	-163	-421	-211		48	0.025
40-44	Male	1293	236	117	188	-69	-216	-108		39	0.026
40-44	Female	1169	193	82	172	-61	-216	-108		47	0.035
45-49	Male	931	107	110	129	-132	-108	-54		-78	0.075
45-49	Female	1052	132	80	108	-56	-27	-14		-43	0.036
50-54	Male	923	97	66	77	-46	-40	-20		-26	0.025
50-54	Female	910	95	83	105	-93	-45	-23		-71	0.070
55-59	Male	742	62	19	56	-13	-69	-35		22	0.027
55-59	Female	819	75	29	58	-12	-87	-44		32	0.035
60-64	Male	925	74	35	48	-9	-74	-37		28	0.028
60-64	Female	934	49	10	51	-12	-116	-58		46	0.047
65-69	Male	876	27	32	55	-60	-93	-47		-14	0.015
65-69	Female	993	47	17	28	2	-62	-31		33	0.032
70-74	Male	841	18	16	40	-38	-32	-16		-22	0.033
70-74	Female	853	46	19	55	-28	-68	-34		6	0.007
75-79	Male	419	23	7	8	8	-48	-24		32	0.072
75-79	Female	785	33	16	41	-24	72	36		-60	0.073
80-84	Male	280	7	4	10	-7	-37	-19		12	0.040
80-84	Female	615	58	2	39	17	39	20		-3	0.004
85-115	Male	170	56	0	22	34	1	1		34	0.148
85-115	Female	597	39	5	47	-13	143	72		-85	0.133
Total		54044	38116	15928	4812	9527	1589	-1716	-858	2447	0.045
							Net excl. 0-4	-1602	-801	801	0.015

COMPARISON OF NET MIGRATION BY AGE, SURVIVAL RATE VS. CENSUS, SELECTED COUNTIES

Census Migration 1985-1990							Survival Rate Net Migration 1980-1990			
County:	Chippewa	Non-movers	In-movers	State Out-movers	County Out-movers	Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival	Absolute Ratio of Discrepancy to 1990 Pop.
Age:										
0-4	Male	442	0	0	0	0	-2	-1	na	na
0-4	Female	444	0	0	0	0	20	10	na	na
5-9	Male	470	90	0	71	19	-24	-12	31	0.055
5-9	Female	431	123	48	83	-8	-16	-8	0	0.000
10-14	Male	461	65	6	121	-62	-86	-43	-19	0.036
10-14	Female	440	75	9	53	13	-100	-50	63	0.122
15-19	Male	354	62	45	61	-44	-100	-50	6	0.014
15-19	Female	331	56	5	84	-33	-119	-60	27	0.068
20-24	Male	194	52	44	157	-149	-308	-154	5	0.020
20-24	Female	127	145	57	193	-105	-246	-123	18	0.066
25-29	Male	294	136	30	117	-11	-278	-139	128	0.298
25-29	Female	300	126	14	125	-13	-193	-97	84	0.196
30-34	Male	370	97	16	123	-42	-45	-23	-20	0.042
30-34	Female	369	93	54	71	-32	-75	-38	6	0.012
35-39	Male	400	66	20	53	-7	-120	-60	53	0.114
35-39	Female	409	91	21	63	7	-86	-43	50	0.100
40-44	Male	379	36	13	45	-22	-42	-21	-1	0.002
40-44	Female	370	51	11	43	-3	-11	-6	3	0.006
45-49	Male	318	48	7	28	13	-18	-9	22	0.060
45-49	Female	293	24	2	39	-17	-39	-20	3	0.008
50-54	Male	265	28	12	28	-12	-31	-16	4	0.012
50-54	Female	248	24	11	36	-23	-41	-21	-3	0.009
55-59	Male	257	33	0	14	19	-11	-6	25	0.084
55-59	Female	309	30	0	12	18	-21	-11	29	0.084
60-64	Male	287	8	2	4	2	-30	-15	17	0.058
60-64	Female	316	29	0	3	26	-17	-9	35	0.100
65-69	Male	366	53	0	9	44	-7	-4	48	0.113
65-69	Female	334	21	0	10	11	-21	-11	22	0.061
70-74	Male	185	8	0	3	5	-7	-4	9	0.044
70-74	Female	387	16	0	18	-2	13	7	-9	0.021
75-79	Male	235	5	0	14	-9	28	14	-23	0.096
75-79	Female	302	26	15	6	5	-9	-5	10	0.029
80-84	Male	171	6	0	2	4	-2	-1	5	0.028
80-84	Female	240	36	14	31	-9	12	6	-15	0.054
85-115	Male	112	16	4	29	-17	36	18	-35	0.273
85-115	Female	208	35	0	32	3	71	36	-33	0.134
		13228	11418	460	1781	-431	-1925	-963	532	0.040
						Net excl. 0-4	-1943	-972	972	0.073

County:	Crow Wing	Non-movers	In-movers	State Out-movers	Within-MN Out-movers	Net Migrants	Ave. Net Migrants	Prorated to 5 Years	Census minus 1/2 Survival	Abs. Ratio of Discrep. to 1990 Pop.
Age:										
0-4	Male	1614	0	0	0	0	21	11	na	na
0-4	Female	1557	0	0	0	0	30	15	na	na
5-9	Male	1449	352	117	269	-34	70	35	-69	0.038
5-9	Female	1412	490	107	174	209	141	71	139	0.073
10-14	Male	1475	240	69	189	-18	141	71	-89	0.052
10-14	Female	1289	286	122	180	-16	138	69	-85	0.054
15-19	Male	1227	288	218	262	-192	5	3	-195	0.128
15-19	Female	1147	275	101	244	-70	-79	-40	-31	0.021
20-24	Male	814	317	265	480	-428	-547	-274	-155	0.137
20-24	Female	691	425	271	632	-478	-576	-288	-190	0.170
25-29	Male	801	465	133	355	-23	-605	-303	280	0.221
25-29	Female	1081	474	205	390	-121	-453	-227	106	0.068
30-34	Male	1258	526	98	197	231	281	141	91	0.051
30-34	Female	1173	472	98	212	162	181	91	72	0.043
35-39	Male	1298	336	91	162	83	207	104	-21	0.013
35-39	Female	1306	269	142	175	-48	130	65	-113	0.072
40-44	Male	1160	243	107	205	-69	49	25	-94	0.067
40-44	Female	1283	219	42	150	27	23	12	16	0.010
45-49	Male	972	136	51	103	-18	-31	-16	-3	0.002
45-49	Female	1066	152	35	136	-19	21	11	-30	0.024
50-54	Male	905	156	52	58	48	45	23	26	0.024
50-54	Female	902	171	83	31	57	52	26	31	0.029
55-59	Male	930	204	67	36	101	160	80	21	0.019
55-59	Female	892	184	35	67	82	171	86	-4	0.003
60-64	Male	828	177	35	45	97	257	129	-32	0.031
60-64	Female	1015	204	42	71	91	216	108	-17	0.014
65-69	Male	855	177	79	65	33	241	121	-88	0.085
65-69	Female	993	199	69	77	53	175	88	-35	0.029
70-74	Male	821	81	66	58	-43	78	39	-82	0.091
70-74	Female	1063	68	60	41	-33	-70	-35	2	0.002
75-79	Male	612	61	15	37	9	-43	-22	31	0.045
75-79	Female	844	57	51	99	-93	-98	-49	-44	0.049
80-84	Male	336	54	25	17	12	-51	-26	38	0.096
80-84	Female	525	30	9	68	-47	-69	-35	-13	0.023
85-115	Male	260	25	25	40	-40	54	27	-67	0.235
85-115	Female	469	113	10	83	20	207	104	-84	0.143
		44249	36323	2995	5406	-475	472	236	-711	0.016
						Net excl. 0-4	421	211	-211	0.005

COMPARISON OF NET MIGRATION BY AGE, SURVIVAL RATE VS. CENSUS, SELECTED COUNTIES

Census Migration 1985-1990

Survival Rate Net Migration 1980-1990

County:	Dodge	Census Migration 1985-1990				Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival	Absolute Ratio of Discrepancy to 1990 Pop.
		Non-movers	In-movers	State Out-movers	County Out-movers					
		672	0	0	0	37	19	na	na	
Age:		667	0	0	0	60	30	na	na	
5-9	Male	550	205	21	122	62	47	24	39	0.051
5-9	Female	590	170	37	114	19	61	31	-12	0.015
10-14	Male	611	128	26	79	23	30	15	8	0.011
10-14	Female	562	92	13	104	-25	-56	-28	3	0.005
15-19	Male	448	82	23	129	-70	-62	-31	-39	0.074
15-19	Female	461	104	76	73	-45	-58	-29	-16	0.028
20-24	Male	268	140	156	109	-125	-230	-115	-10	0.025
20-24	Female	230	201	44	239	-82	-205	-103	21	0.048
25-29	Male	299	259	47	173	39	-105	-53	92	0.164
25-29	Female	379	285	23	165	77	-49	-25	102	0.158
30-34	Male	490	265	33	135	97	155	78	20	0.026
30-34	Female	461	216	32	102	82	158	79	3	0.004
35-39	Male	492	84	32	85	-33	2	1	-34	0.059
35-39	Female	517	104	20	85	-1	17	9	-10	0.015
40-44	Male	454	72	8	40	24	-5	-3	27	0.050
40-44	Female	398	53	43	47	-37	-67	-34	-4	0.008
45-49	Male	403	43	27	20	-4	-33	-17	13	0.028
45-49	Female	356	39	13	24	2	-46	-23	25	0.063
50-54	Male	300	39	12	0	27	-23	-12	39	0.114
50-54	Female	317	32	20	23	-11	-4	-2	-9	0.026
55-59	Male	264	25	0	32	-7	-28	-14	7	0.024
55-59	Female	293	22	5	20	-3	-11	-6	3	0.008
60-64	Male	252	13	15	11	-13	-16	-8	-5	0.019
60-64	Female	258	6	16	7	-17	-21	-11	-7	0.025
65-69	Male	257	12	2	32	-22	6	3	-25	0.093
65-69	Female	293	25	0	9	16	8	4	12	0.038
70-74	Male	228	36	0	4	32	17	9	24	0.089
70-74	Female	246	11	13	24	-26	-7	-4	-23	0.088
75-79	Male	155	10	0	7	3	4	2	1	0.006
75-79	Female	223	22	3	16	3	4	2	1	0.004
80-84	Male	118	9	0	7	2	27	14	-12	0.091
80-84	Female	141	19	10	21	-12	-7	-4	-9	0.053
85-115	Male	69	20	4	8	8	14	7	1	0.011
85-115	Female	184	4	8	15	-19	37	19	-38	0.199
		15731	12904	2827	782	2081	-36	-349	139	0.009
						Net excl. 0-4	-446	-223	223	0.014

County:	Hennepin	Census Migration 1985-1990				Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival	Absolute Ratio of Discrepancy to 1990 Pop.	
		Non-movers	In-movers	State Out-movers	County Out-movers						
Age:		39086	0	0	0	0	-2142	-1071	na	na	
0-4	Male	37614	0	0	0	0	-1608	-804	na	na	
0-4	Female	28338	7616	3291	4848	-523	-1842	-921	398	0.011	
5-9	Male	27675	6803	3122	4787	-1106	-1452	-726	-380	0.011	
5-9	Female	24776	4787	2334	2804	-351	-279	-140	-212	0.007	
10-14	Male	24162	4623	2095	2653	-125	-408	-204	79	0.003	
10-14	Female	24399	5719	3244	2767	-292	523	262	-554	0.018	
15-19	Male	22330	6537	3206	2866	465	619	310	156	0.005	
15-19	Female	23089	16522	6501	5463	4558	6233	3117	1442	0.036	
20-24	Male	22644	19330	6282	6220	6828	9605	4803	2026	0.048	
20-24	Female	31780	22480	7891	8852	5737	13911	6956	-1219	0.022	
25-29	Male	32750	22421	8703	10097	3621	14465	7233	-3612	0.065	
25-29	Female	40452	14866	7179	9541	-1854	4323	2162	-4016	0.073	
30-34	Male	40960	13012	7518	8968	-3474	915	458	-3932	0.073	
30-34	Female	37291	9358	4825	6229	-1696	-2564	-1282	-414	0.009	
35-39	Male	39101	8523	4844	5184	-1505	-4309	-2155	650	0.014	
35-39	Female	31904	6072	3664	3677	-1269	-2405	-1203	-67	0.002	
40-44	Male	33139	5363	3092	3053	-782	-2366	-1183	401	0.010	
40-44	Female	24312	3358	2136	1822	-600	-870	-435	-165	0.006	
45-49	Male	25674	3178	1954	1631	-407	-745	-373	-35	0.001	
45-49	Female	20143	2286	1369	1321	-404	-978	-489	85	0.004	
50-54	Male	21191	1960	1269	1216	-525	-847	-424	-102	0.004	
50-54	Female	17987	1457	1014	1063	-620	-1385	-693	73	0.004	
55-59	Male	19054	1295	1018	955	-678	-1591	-796	118	0.006	
55-59	Female	16711	981	1185	1085	-1289	-2450	-1225	-64	0.004	
60-64	Male	19636	1279	1247	1042	-1010	-2360	-1180	170	0.008	
60-64	Female	15670	821	1032	1011	-1222	-2790	-1395	173	0.010	
65-69	Male	18236	1107	1022	983	-898	-2507	-1254	356	0.018	
65-69	Female	10868	576	525	443	-392	-1972	-986	594	0.052	
70-74	Male	16102	1054	661	628	-235	-1360	-680	445	0.026	
70-74	Female	7396	482	252	249	-19	-659	-330	311	0.039	
75-79	Male	13092	976	289	483	204	-300	-150	354	0.025	
75-79	Female	4397	297	103	198	-4	-342	-171	167	0.036	
80-84	Male	9978	891	203	401	287	0	0	287	0.026	
80-84	Female	3179	413	110	186	117	58	29	88	0.024	
85-115	Male	10155	717	339	547	-169	1541	771	-940	0.086	
		1032431	835271	197160	93519	103273	368	11662	5831	-5463	0.005
						Net excl. 0-4	15412	7706	-7706	0.007	

COMPARISON OF NET MIGRATION BY AGE, SURVIVAL RATE VS. CENSUS, SELECTED COUNTIES

Census Migration 1985-1990

Survival Rate Net Migration 1980-1990

County:	Lake	Non-movers	In-movers	State Out-movers	County Out-movers	Net Migrants	Ave. Net Migrants	Prorated over 5 Years	Census minus 1/2 Survival	Absolute Ratio of Discrepancy to 1990 Pop.
Age:										
0-4	Male	316	0	0	0	0	21	11 na	na	
0-4	Female	309	0	0	0	0	28	13 na	na	
5-9	Male	296	90	19	71	0	-65	-33	33	0.084
5-9	Female	198	117	17	53	47	-57	-29	76	0.240
10-14	Male	303	54	48	82	-76	-163	-82	6	0.015
10-14	Female	322	83	25	38	20	-98	-49	69	0.170
15-19	Male	289	59	24	118	-83	-151	-78	-8	0.022
15-19	Female	258	50	31	73	-54	-143	-72	18	0.057
20-24	Male	124	50	54	128	-132	-288	-144	12	0.069
20-24	Female	132	62	66	174	-178	-342	-171	-7	0.036
25-29	Male	193	133	43	43	47	-320	-160	207	0.635
25-29	Female	190	154	33	20	101	-284	-142	243	0.706
30-34	Male	304	95	63	53	-21	-149	-75	54	0.134
30-34	Female	242	108	53	51	2	-84	-42	44	0.126
35-39	Male	351	80	27	44	9	-157	-79	88	0.203
35-39	Female	309	73	31	80	-38	-88	-44	6	0.016
40-44	Male	289	68	11	46	11	-147	-74	85	0.237
40-44	Female	278	68	28	55	-15	-79	-40	25	0.072
45-49	Male	219	27	43	63	-79	-120	-60	-19	0.077
45-49	Female	261	33	22	59	-48	-71	-36	-13	0.043
50-54	Male	301	25	21	34	-30	-49	-25	-6	0.017
50-54	Female	299	8	20	42	-54	-56	-28	-26	0.085
55-59	Male	303	42	21	24	-3	-48	-24	21	0.061
55-59	Female	302	30	21	20	-11	-25	-13	2	0.005
60-64	Male	306	46	18	14	14	-5	-3	17	0.047
60-64	Female	334	18	10	2	6	6	3	3	0.009
65-69	Male	283	26	12	16	-2	2	1	-3	0.010
65-69	Female	237	35	9	3	23	-13	-7	30	0.108
70-74	Male	196	24	0	21	3	-26	-13	16	0.073
70-74	Female	212	44	14	15	15	-2	-1	16	0.063
75-79	Male	139	11	11	7	-7	-24	-12	5	0.033
75-79	Female	173	33	0	0	33	-9	-5	38	0.182
80-84	Male	89	11	0	0	11	-7	-4	15	0.145
80-84	Female	119	15	0	0	15	21	11	5	0.034
85-115	Male	41	0	0	0	0	13	7	-7	0.159
85-115	Female	132	0	0	18	-18	-6	-3	-15	0.114
		10415	8647	1768	793	1467	-492	-2987	1002	0.086
						Net excl. 0-4	-3034	-1517	1517	0.146

and are largest in the age groups where migration rates are highest. Use of one method rather than another as a basis for projecting future population would have tremendous impact. Ideally, in doing the projections we would like to use a 5-year migration rate as a base because the projections are done for 5-year intervals. But the 5-year migration data from the census becomes available late in the decade, so traditionally we have used the 10-year survival-rate migration estimates. Clearly the projection numbers would be very different if census data were used instead. Unfortunately, in the future the migration question will probably not be on the census and it may be impossible to replicate this evaluation.

## **Description of Methods**

Residual Method The residual method, also called the vital statistics method, estimates net migration using the following formula:

$$\text{Net Migration} = \text{Population Change} - \text{Natural Increase}$$

In turn,

$$\text{Natural Increase} = \text{Births} - \text{Deaths}$$

This residual formula can be used for any time period when population, birth and death numbers are all available. For the 1980 to 1990 period, the formula looks at census population in 1980 and 1990 and the total number of resident births and deaths during the decade. Net migration can also be calculated for a single year or any other time span when the required data elements are accessible.

The advantages of the residual method are its simplicity and the minimal data requirements. By definition, this method will give the correct number of net migrants if the population counts and the birth and death data are accurate.

On the down side, the residual method provides no information about number of in- or out-migrants and does not estimate migration by age. Because of these limitations, other methods of estimating migration are often used.

Survival Rate Method The survival rate method estimates net migration by age and sex, using the population by age and sex at two time periods and estimated survival rates by age and sex. In this case the population numbers are from the 1980 and 1990 censuses. The survival rates by age and sex are based on an average of 1980 and 1990 survival rates derived from the Minnesota life tables for those years. The average survival rates are applied to the 1980 population, giving the expected 1990 population for the same cohort 10 years later. The difference between the actual 1990 population and the population expected on the basis of survival rates is attributed to

migration. The total net migration for the area is the sum of the net migration numbers in each age/gender group.

This method described in the preceding paragraph is called the forward survival method. The survival rate method can also be applied in the reverse direction, by taking the 1990 population and figuring how many people would have been expected in 1980. Again, the difference between the actual and expected population is attributed to net migration.

Migration for the youngest age groups is based on taking the births occurring during the time period and applying survival rates to these new arrivals.

An example will illustrate the forward survival rate method. Suppose the number of females ages 50 to 54 in 1980 in county X was 1000. Suppose also that the 10-year survival rate for 50- to 54-year-old women was .80 in 1980 and .90 in 1990. (Actual survival rates for Minnesota women in this age group are considerably higher.) For the entire period, the average survival rate was .85. Applying the .85 survival rate to the initial population gives an expected 1990 population of 850 women ages 60- to 64. If the actual 1990 population of 60- to 64-year-old females is 900, the difference between the actual and expected population ( $900-850=50$ ) is attributed to net in-migration. If the 1990 number is 800, the difference ( $800-850=-50$ ) is attributed to net out-migration.

The same example can be used to demonstrate the reverse survival rate method. If the 1990 population ages 60 to 64 was 900, the expected 1980 population would be the 1990 population divided by the average survival rate ( $900/.85$ ) or 1058. The actual number of 50- to 54-year-olds in 1980 was 1000. The difference between the expected and actual population ( $1,058 - 1,000=58$ ) is attributed to net in-migration.

In this example, the results of the forward and reverse methods are close but not identical. This is typical in the survival rate method. Often the forward and reverse migration numbers are averaged. The biggest differences between the forward and reverse methods occur at ages over 85, where populations are smallest and mortality rates highest.

There are many similarities between the survival rate and residual methods. Both use population counts and data on resident births. The major difference is that the survival rate method uses estimated rather than actual deaths.

Compared to the residual method, the survival rate method makes more assumptions and thus has more sources of potential error. The survival rate method assumes not only that the birth data and total population are counted correctly, but also that the survival rates by age are a good measure of average age-specific mortality during the decade and that population counts by age and gender are correct. In spite of these differences, the results of the survival rate and residual

methods are usually similar, at least in Minnesota.

Census Method The census measure of migration is based on a question in the 1990 census asking where each individual in the household lived in 1985. This question was asked of approximately one in six households. People who lived in the same housing unit in 1985 and 1990 are considered non-migrants; those who moved are counted as migrants. In this report, analysis is confined to those whose moves took them across state or county boundaries. In the statewide analysis, in-migrants are those who moved to Minnesota from another state or country, and out-migrants are those who moved out of Minnesota. In the analysis of counties, in-migrants are those who moved into a particular county between 1985 and 1990 and out-migrants are those who moved out of the county. Migration is not calculated for children under age 5.

In the census data, net migration is based on subtracting out-migrants from in-migrants. If there are more in-migrants than out-migrants, the area is said to have net in-migration. If the number of out-migrants is higher, the area has experienced net out-migration.

Census migration data provide a rich source of information, allowing separate analysis of in- and out-migration and estimation of migration rates by age, gender and other demographic characteristics. There are some drawbacks to the census data, though. First, they are only collected once per decade and cover only the last half of the decade. Year-to-year variations are lost. Second, since they are based on sample data, sampling error can be a problem, particularly in numbers for individual age/gender groups in smaller counties. Third, though the census data pick up people moving in from foreign countries, they miss those who leave the U.S. In addition, migration data may not be available in a timely manner and in the future may not be available at all. Migration data typically have been released very late in the decade, and are often released in a cumbersome format. Political pressures to shorten the census form are likely to lead to omission of the migration question in the year 2000 census.

IRS Migration Method: The Internal Revenue Service (IRS) migration data are based on matched federal income tax returns. Using the social security number of the first filer, the IRS matches tax returns from consecutive years and then compares the addresses. If the addresses are the same, the filer and all exemptions claimed on the return are considered non-movers. If the address has changed, the addresses are compared to see if the move was across county or state boundaries. Filers who moved but stayed in the same county are included in the non-mover group. The exemptions on the tax form are given the same mover or non-mover status as the first filer. The IRS then issues two files. One shows moves from state to state. The other shows in- and out-movers by county.

The IRS data are unique because they provide annual figures on in- and out-migration at both the state and county level. There are many potential shortcomings, however. The number of tax exemptions is used as a proxy for the number of people who move, but in some areas this is a poor approximation. IRS data provide no information on the demographic characteristics of movers. The exclusion of non-matched returns means many people, both movers and non-

movers, are not counted. The geographic matching scheme used to derive county of residence from the address on the tax form is convoluted and probably often inaccurate.

From a practical standpoint, IRS data must be adjusted if they are to be used in doing population projections or some other demographic application. Such an adjustment is likely to be cumbersome and to become increasingly inaccurate with the passage of time.

### **Sources of Migration Data**

Residual Method: "More People Left Minnesota than Moved in During the 1980s," *Population Notes*, December 1992 (1980 to 1990 data); Minnesota State Demographer's Office, unpublished data (1985 to 1990).

Survival Rate Method: Minnesota State Demographer's Office, unpublished data.

IRS Data: Internal Revenue Service, unpublished data.

Census Data: U.S. Census Bureau, STP28 file, Special County to County Migration Tally.

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