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# Migration signatures across the decades: Net migration by age in U.S. counties, 1950–2010

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*Descriptive Finding*

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## **Migration signatures across the decades: Net migration by age in U.S. counties, 1950–2010**

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### **Abstract**

#### **BACKGROUND**

Migration is the primary population redistribution process in the United States. Selective migration by age, race/ethnic group, and spatial location governs population integration, affects community and economic development, contributes to land use change, and structures service needs.

#### **OBJECTIVE**

Delineate historical net migration patterns by age, race/ethnic, and rural-urban dimensions for United States counties.

#### **METHODS**

Net migration rates by age for all US counties are aggregated from 1950–2010, summarized by rural-urban location and compared to explore differential race/ethnic patterns of age-specific net migration over time.

#### **RESULTS**

We identify distinct age-specific net migration ‘signatures’ that are consistent over time within county types, but different by rural-urban location and race/ethnic group. There is evidence of moderate population deconcentration and diminished racial segregation between 1990 and 2010. This includes a net outflow of Blacks from large urban core counties to suburban and smaller metropolitan counties, continued Hispanic deconcentration, and a slowdown in White counterurbanization.

#### **CONCLUSIONS**

This paper contributes to a fuller understanding of the complex patterns of migration that have redistributed the U.S. population over the past six decades. It documents the variability in county age-specific net migration patterns both temporally and spatially, as well as the longitudinal consistency in migration signatures among county types and race/ethnic groups.

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## **1. Introduction**

Geographic migration patterns vary across the life cycle, as persons at different stages of their lives, with varying needs, preferences, and experiences, make decisions about where to live (Mueser, White, and Tierney 1988; Plane and Heins 2003; Plane and Jurjevich 2009). Age is a particularly important driver of migration and its impact is reflected in the differential patterns of age-specific migration along the rural-urban continuum (Plane, Henrie, and Perry 2005). For example, young adults tend to migrate from rural to urban areas and families with children often move to suburban areas (Fuguitt and Heaton 1995; Johnson and Fuguitt 2000; Johnson et al. 2005).

Demographers in the U.S. have examined age-specific migration patterns for counties according to metropolitan proximity since the 1980s (Mueser, White, and Tierney 1988; Johnson and Fuguitt 2000; Johnson et al. 2005). Here we document the longitudinal consistency of age-specific net migration between 1950 and 2010 by delineating “migration signatures” for county groups along the rural-urban continuum (Johnson et al. 2005; Tordella 2013). The signatures represent ideal types to which individual counties can be compared to understand their development trajectories. One element of a distinct “migration signature” is the propensity of young adults to migrate from rural to urban areas (Fuguitt and Heaton 1995; Johnson and Fuguitt 2000; Johnson et al. 2005). Another signature element is reflected in the migration patterns of those at or near retirement age, which generally reflect movement toward less urban areas rich in natural amenities and recreation opportunities (Johnson and Stewart 2005; Beale and Fuguitt 2011; Brown and Glasgow 2008; Fuguitt 2013).

Race/ethnic differences in spatial migration patterns are apparent from research documenting the emergence of new Hispanic destinations (Lichter and Johnson 2009; Johnson and Lichter 2008, 2010), “white flight” (Frey 1979, 1996; Crowder 2000), and the Great Black Migration from the South and its recent reversal (Tolnay 2003; Hunt, Hunt, and Falk 2012; Beale and Fuguitt 2011; Fuguitt 2013). Though these patterns are likely to have an age-specific component, few studies have investigated geographic patterns of race/ethnic migration by age (see Fuguitt’s recent investigations of retirement migration among Blacks for an exception – Beale and Fuguitt 2011; Fuguitt 2013). Such analysis has been limited by the paucity of datasets that provide migration estimates by age and race/ethnic sub-population for individual counties. This paper is the first to investigate racial and ethnic differences in age-specific migration signatures using data from both 1990–2000 (Voss et al. 2004) and 2000–2010 (Winkler et al. 2013a).

## **1.1 Purpose**

We document longitudinal net migration patterns by age, race/ethnic, and rural-urban location for counties in the United States. The paper makes two important contributions. First, using recently released age-specific net migration data to supplement historical data, we delineate consistent migration signatures for counties grouped across the rural-urban continuum from 1950 to 2010. Second, we provide the first detailed analysis of race/ethnic variations in age-specific net migration from 1990 to 2010.

## **2. Data and methods**

### **2.1 Data**

Data include net migration estimates by five-year age group for US counties for each decade from 1950 to 2010. Each set of estimates were generated using a residual method combining US Census population enumerations at the beginning and end of the decade with estimates of natural increase based on either life tables or vital statistics (Bowles and Tarver 1965; Bowles, Beale, and Lee 1975; White, Mueser, and Tierney 1987; Fuguitt and Beale 1993; Voss et al. 2004; Winkler et al. 2013a, 2013b). These decadal estimates were aggregated into a single dataset with consistent county boundaries that is now publically available online (Winkler et al. 2013c). Our analysis of age-specific net migration signatures along the rural-urban continuum is based on these sixty years of migration data produced by six teams of demographers.

We analyze race/ethnic migration patterns using estimates for the 1990s (Voss et al. 2004) and 2000s (Winkler et al. 2013a). These estimates use more sophisticated methods and data than was available in prior decades to produce net migration estimates by five-year age group for four race/ethnic groups (non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other). For the 1990s and 2000s, net migration is computed as the residual between the census count at the end of the decade (e.g., 2010) and an ‘expected population’ for that year. The expected population takes the census count at the beginning of the decade, adjusts it for undercount/overcount and misallocations, and ‘ages’ the population forward ten years, using county-specific births and deaths by age, sex, race, and Hispanic origin provided by the National Center for Health Statistics (see Winkler et al. 2013b for methodological details). This expected population is subtracted from corresponding census counts (adjusted for undercount/overcount) at the end of decade. The difference between the two is the estimate of net migration for that particular group during the period, as demonstrated in

the formula below for age group  $i$  (in 2010), sex group  $j$ , race/ethnic group  $k$ , and county  $l$ .

$$\begin{aligned} &2000 - 2010 \text{ Net Migration} \\ &= 2010 \text{ Adjusted Census}_{ijkl} - \text{Expected Population}_{ijkl} \end{aligned}$$

Rates are then calculated as the net migration estimate divided by the expected population at the end of the decade.

## 2.2 Methods

We constructed migration signatures for four county groups, based on level of urbanity. Counties are designated as metropolitan or nonmetropolitan, using criteria developed by the U.S. Office of Management and Budget (2003). We used a constant 2003 metropolitan classification. Counties that were nonmetropolitan prior to 2003 but gained metropolitan status by that date are classified as metropolitan throughout. Using a fixed definition of metropolitan status removes the effect of reclassification from the calculation of longitudinal migration patterns. We further subdivided metropolitan counties into Large Metro Core, Suburban, and Small Metro classifications to represent population concentration along the rural-urban continuum. The terms rural and nonmetropolitan are used interchangeably here, as are the terms urban and metropolitan.

Large metropolitan “Core” counties included the major city (or twin cities) of metropolitan areas containing more than one million people in 2000. These 65 Core counties had 90.2 million residents in 2010. Most contain both the central city and some of the older, inner suburbs. The remaining 349 large metropolitan non-core or “Suburban” counties contain 73.9 million residents and encompass newer suburban areas on the periphery of large metropolitan areas. All counties in metropolitan areas that had fewer than a million residents in 2000 are classified as “Small Metro” counties. They contain 93.1 million residents dispersed across 676 counties. The 2,048 nonmetropolitan counties, which together represent nearly 75% of the land area and contain 51 million residents, are grouped together as “Nonmetro” counties.

We calculated median net migration rates by age for each county group and charted patterns of age and race/ethnic specific migration over time to examine: (1) the longitudinal consistency of these migration signatures (i.e., which age groups gain or lose the most); (2) the degree to which migration signatures are distinct between different county types; and (3) the extent to which the signatures vary by race/ethnic sub-population.

### **3. Results**

#### **3.1 Migration signatures by urbanity**

The four county types demonstrate internally consistent longitudinal migration signatures, but dramatically different signatures across types. Core counties consistently gained migrants in their 20s and early 30s, and lost migrants of virtually every other age (Figure 1a). Migration gains were more widespread during the 1950s, when many of the inner suburbs and some of the central cities in these Core counties were still growing. Core migration reached its low point during the 1970s, when the only migration gain was among those aged 20–29. Patterns from 2000 to 2010 resemble those of the 1990s. Minor variations aside, what is striking about the Core signature is its consistency across six decades. The magnitude of net migration losses or gains varies from decade to decade, but the overall pattern (which age groups gained the most or lost the most) remains remarkably stable.

Suburban counties manifest migration patterns different from and complimentary to the Cores. Suburban counties experienced substantial population growth due to net migration starting in the 1960s and 1970s and continuing at a more modest pace through the next several decades. Again, the age-specific signature is consistent over time. Gains are greatest for adults aged 30–49 and for children, suggesting an influx of households at the family stage of the life cycle. Conversely, Suburban counties experienced a consistent and moderate net outflow of people in their 20s, as young adults left parental homes to begin independent living.

Relative to Core and Suburban counties, in Small Metro counties net migration has been more subdued. Yet here again the migration signature is relatively consistent. Small Metros tended to experience moderate net outflows of young adults and moderate net inflows at other ages, particularly among children and adults in their 30s. In this regard, their migration signature resembles that in Suburban counties.

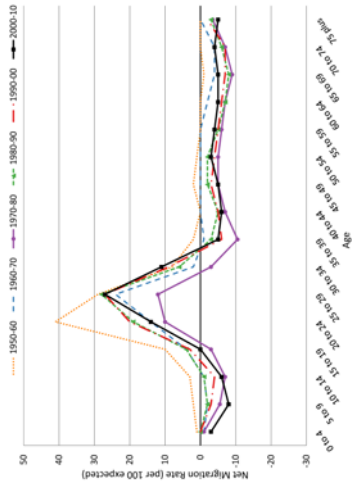
The migration signature for Nonmetro counties is distinctly different from those in metropolitan areas, particularly for young adults. In each decade, Nonmetro counties experienced a significant net outflow of young adults. This loss was greatest during the 1950s and 1960s, when the rural exodus that began in the late 19th century was still underway (Johnson 1989; Johnson and Fuguitt 2000). Young adult losses moderated considerably during the turnaround of the 1970s and have since hovered around a 25%–30% loss of the expected young adult population. There is a clear shift up or down in the overall pattern between decades when nonmetropolitan America experienced widespread out-migration (1950s, 1960s, 1980s) and those when it experienced net migration gains (1970s, 1990s, 2000s). Yet the Nonmetro migration



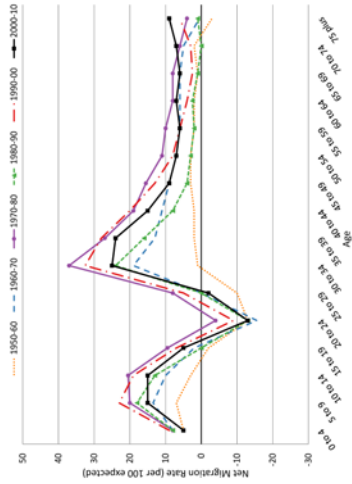
signature itself generally remains consistent, with the same age groups experiencing the largest losses or smallest gains.

**Figure 1: Median age-specific net migration rates across the rural-urban continuum, 1950–2010**

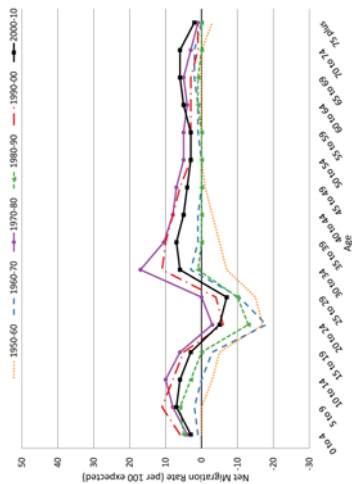
**Figure 1a: Large Metro Core counties**



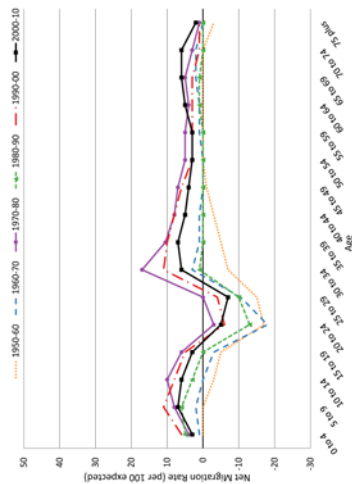
**Figure 1b: Suburban counties**



**Figure 1c: Small Metro counties**



**Figure 1d: Nonmetro counties**



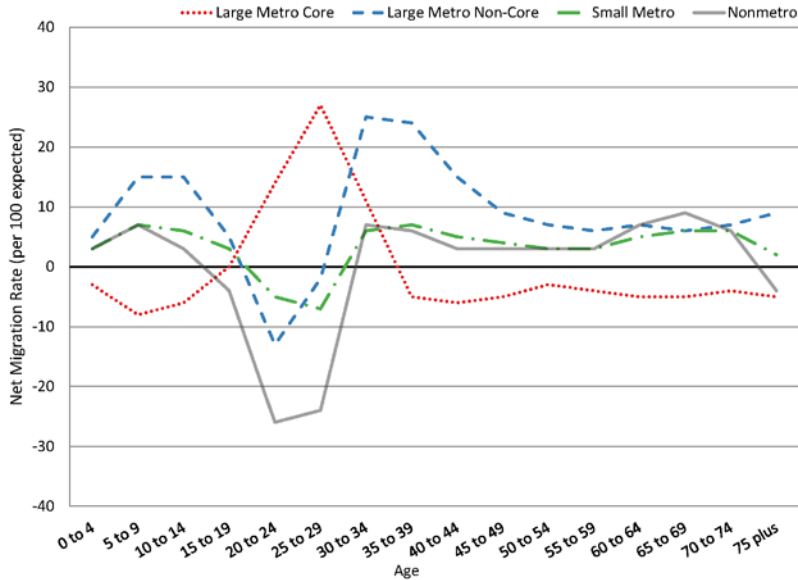
Note: The scale differs between Metro and Nonmetro counties.

There is one important exception to this consistency, and it represents the only fundamental change in any of the migration signatures we observed during the study period. Nonmetro counties have a steadily growing rate of net migration gain among older adults (55–74) from the 1950s to the 2000s. Prior research suggests this represents an influx of older migrants attracted to amenity and recreational areas in selected nonmetropolitan counties (Johnson and Stewart 2005; Johnson et al. 2005).

### **3.2 Comparison across the signatures, 2000–2010**

Comparing the migration signatures of the four county types (Core, Suburban, Small Metro, and Nonmetro) for the most recent decade illustrates how the impact of life-cycle factors on migration patterns varies geographically (Figure 2). Nonmetro counties experienced net migration loss of young adults, while urban Cores attracted them. By 2010, Core counties had nearly 30% more 25–29 year olds than would have been expected given the number of 15–19 year olds in 2000. This is an absolute gain of nearly 1.7 million 25–29 year olds. By contrast, Cores consistently experience net migration loss of children and people over age 35. The Suburban migration signature is strikingly different, with migration gains at every age except 20–29 and a pronounced inflow of family-age adults and children. In all, Suburban counties gained nearly 1.2 million children under age 15 and nearly 2.7 million 30–49 year olds between 2000 and 2010. Small Metro county migration patterns were intermediate between these extremes. While Nonmetro counties lost young adults, they saw a net influx of older adults (60–74).

**Figure 2: Median age-specific net migration rates across the rural-urban continuum, 2000–2010**



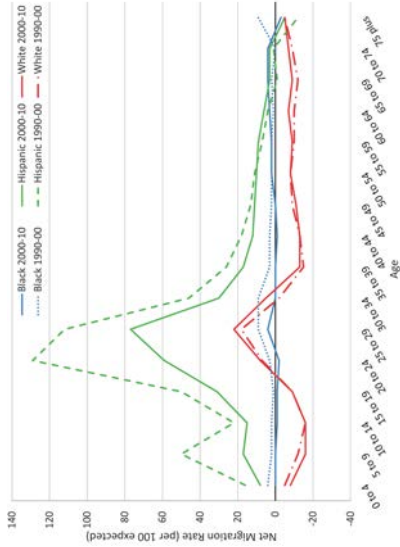
### 3.3 Age-specific migration by race and Hispanic origin

The availability of better data and techniques allow us to examine age-specific migration patterns for non-Hispanic Whites (hereafter Whites), non-Hispanic Blacks (hereafter Blacks), and Hispanics in the 1990s and 2000s. Together these three groups represented over 92% of the U.S. population in 2010.

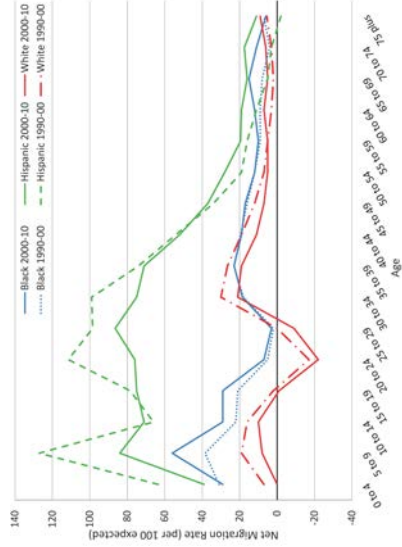
Hispanics and Whites drove the influx of young adults to Core counties in both decades: both groups have large net inflows of 20-29-year-olds (Figure 3). The magnitude of the White young adult net inflow is large (+1.1 million), particularly given the substantial net outflow of Whites at all other ages (-3.6 million). Hispanics retain positive net inflows to Core counties at all but the oldest ages, though the rate of in-migration diminished between the 1990s and 2000s. Blacks displayed minimal net migration to or from Cores in either decade at any age group and saw an overall net migration loss in 2000–2010.

**Figure 3: Median age-specific net migration rates by race and Hispanic origin, 1990–2010**

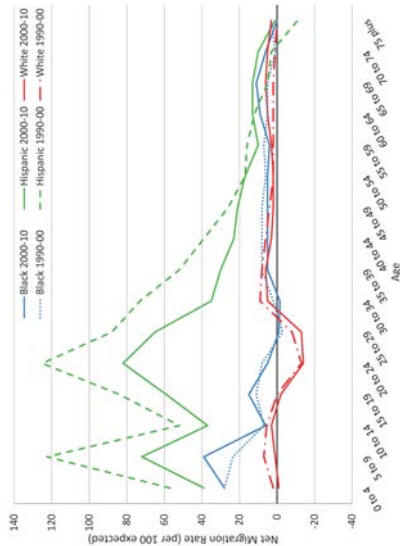
**Figure 3a: Large Metro Core counties**



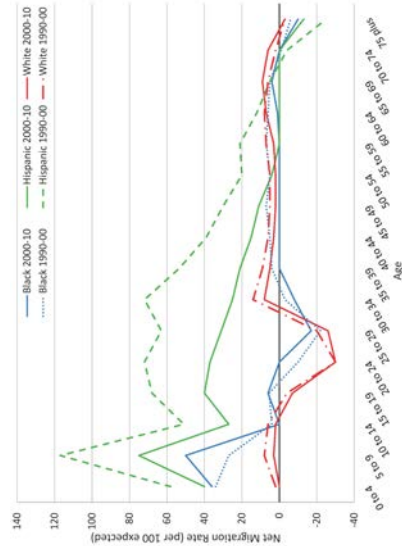
**Figure 3b: Suburban counties**



**Figure 3c: Small Metro counties**



**Figure 3d: Nonmetro counties**



In Suburban counties, the experience of Blacks mirrors the age-specific net migration pattern of Whites, while Hispanics maintain a distinct pattern. Suburban counties experienced net in-migration of Blacks at all ages in both decades, with substantial gains among children and retirees in the 2000s. The pattern for Whites is similar, though somewhat more muted. Because far more Whites than Blacks reside in the suburbs, the modest numerical inflow of Blacks has a greater impact on rates than a similar inflow of Whites. These data suggest that Blacks are now suburbanizing just as Whites have for decades.

Hispanics, particularly those under age 50, had substantial net in-migration rates to Suburban counties in both the 1990s and 2000s. Here again, small denominators accentuate migration rates, but there has certainly been a substantial influx of young Hispanics to Suburban counties. These data do not allow us to disaggregate Hispanic net migration into immigration and domestic migration, but research suggests that both factors contribute to Hispanic flows to so-called, “new destinations” (Lichter and Johnson 2009).

Trends in Small Metro counties were similar to those in Suburban counties, but were more muted among Whites. There was a broad net inflow of Blacks and Hispanics to Small Metro counties, with the highest rates among Hispanic young adults and children. There was a net outflow of young Whites, though Whites at other ages had modest net inflows.

In Nonmetro counties, there were migration losses of both young Whites and young Blacks, coupled with modest net inflows of older Whites and Blacks (60–74). This net inflow reflects the growing appeal of some nonmetropolitan counties as retirement destinations (Fuguitt 2013; Beale and Fuguitt 2011; Cromartie and Nelson 2009). Hispanic net migration patterns differ from those for Whites and Blacks, showing gains across the age spectrum and particularly for those under age 40. Because Hispanics represent a small proportion of the nonmetropolitan population, even the high rate of net migration gain among Hispanic young adults was not sufficient to offset losses among their White and Black counterparts, so the Nonmetro young adult population continues to diminish.

## **4. Conclusion**

This paper contributes to a fuller understanding of the complex patterns of migration that have shaped population redistribution in the United States over the past six decades. Our research documents considerable variability in county age-specific net migration patterns, both temporally and spatially. Yet there is also striking consistency in the overall migration signatures for particular types of counties and among

race/ethnic groups. Though these signatures might systematically shift towards more or less growth (or outright decline) as the impact of economic and non-economic factors wax and wane through the decades, there is remarkable longitudinal consistency in the overall structure.

The 2000s resemble the 1990s more than any prior decade, showing a general tendency toward population deconcentration. This recent deconcentration is more moderate than that during the 1970s or the 1990s among those under age 60. However, at older ages the migration gains in Small Metro and Nonmetro areas exceed those in prior decades. The results also reflect a stark contrast between Core counties that attracted younger adults, Suburban counties that attracted family age adults and children, and Small Metro and Nonmetro counties that attracted older adults. These differential patterns have significant policy implications, given the juxtaposition of the large millennial cohorts now in early adulthood and the large Baby Boomer cohorts now disengaging from the labor force (Cromartie and Nelson 2009). A continuation of these trends, which is entirely consistent with the migration signatures evident here, increases the likelihood of growing residential segregation by age.

The uptick in the migration rates to Small Metro counties among older adults (age 60–74) of all three race/ethnic groups between 2000 and 2010 is of particular interest. Retirement migration to Nonmetro counties is well documented (Johnson and Fuguitt 2000; Johnson et al. 2005; Brown and Glasgow 2008), but prior studies have not recognized or predicted increased retirement migration to Small Metro areas.

A unique contribution of this study is its examination of the nuances in age-specific migration for different racial groups. This underscores the utility of these data for understanding how race and age-specific migration influence population redistribution. Our investigation suggests the potential for decreasing racial and ethnic segregation. We find evidence of continuing Hispanic deconcentration towards more rural (and predominantly white) Suburban, Small Metro, and Nonmetro counties from the 1990s to the 2000s coupled with increasing population deconcentration among Blacks. In fact, data from 2000–2010 shows a general deconcentration of the Black population across a broad age spectrum, with a net outflow (-703,000) from Cores and net inflows to Suburban (+1,175,000) and Small Metro (+574,000) counties. Driven primarily by families with children, the data suggest that Blacks are now suburbanizing. This coincides with a modest reduction in the rates of White net out-migration from Cores to Suburban, Small Metro, and Nonmetro counties, where Whites represent a large majority of the population. The combination of increased minority migration to predominately White areas and a slower net outflow of Whites from Cores with large minority populations is likely to reduce segregation.

In sum, our research combines recently released age-specific net migration estimates with historical data to analyze six decades of U.S. migration. Our work

highlights the utility of such data in delineating how migration influences the redistribution of the U.S. population from densely settled urban cores to far-flung rural areas. It documents the complexity of the migration patterns that result from millions of people at different stages of the life cycle acting on their various needs, preferences, and experiences. The result is a rich tapestry of migration signatures reflecting remarkable longitudinal consistency through more than half a century of turbulent social, economic, and political change.

## **5. Acknowledgements**

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## References

- Beale, C.L. and Fuguitt, G.V. (2011). Migration of retirement-age blacks to nonmetropolitan areas in the 1990s. *Rural Sociology* 76(1): 31–43. doi:[10.1111/j.1549-0831.2010.00037.x](https://doi.org/10.1111/j.1549-0831.2010.00037.x).
- Bowles, G.K. and Tarver, J.D. (1965). *Net migration of the population 1950-60 by age sex and color*. Washington, D.C.: Economic Research Service, U.S. Department of Agriculture.
- Bowles, G.K., Beale, C.L., and Lee, E.S. (1975). *Net migration of the population 1960-70, by age, sex and color*. Washington, D.C.: Economic Research Service, U.S. Department of Agriculture.
- Brown, D.L. and Glasgow, N. (2008). *Rural retirement migration*. Dordrecht: Springer. doi:[10.1007/978-1-4020-6895-9\\_7](https://doi.org/10.1007/978-1-4020-6895-9_7).
- Cromartie, J. and Nelson, P. (2009). *Baby boom migration and its impact on rural America*. Washington, D.C.: Economic Research Service, U.S. Department of Agriculture.
- Crowder, K. (2000). The racial context of white mobility: An individual-level assessment of the white flight hypothesis. *Social Science Research* 29(2): 223–257. doi:[10.1006/ssre.1999.0668](https://doi.org/10.1006/ssre.1999.0668).
- Frey, W.H. (1979). Central city white flight: Racial and nonracial causes. *American Sociological Review* 44(3): 425–448. doi:[10.2307/2094885](https://doi.org/10.2307/2094885).
- Frey, W.H. (1996). Immigration, domestic migration, and demographic balkanization in America: New evidence for the 1990s. *Population and Development Review* 22(4): 741–763. doi:[10.2307/2137808](https://doi.org/10.2307/2137808).
- Fuguitt, G.V. (2013). Comparisons across three race/ethnic groups in rural retirement counties. In: Glasgow, N. and Berry, E.H. (eds.). *Rural aging in 21st century America*. Dordrecht: Springer: 295–310. doi:[10.1007/978-94-007-5567-3\\_16](https://doi.org/10.1007/978-94-007-5567-3_16).
- Fuguitt, G.V. and Beale, C.L. (1993). The changing concentration of the older nonmetropolitan population, 1960-90. *Journal of Gerontology: Social Sciences* 48: S278-S288.
- Fuguitt, G.V. and Heaton, T.B. (1995). The impact of migration on the nonmetropolitan population age structure, 1960-1990. *Population Research and Policy Review* 14(2): 215–232. doi:[10.1007/BF01074459](https://doi.org/10.1007/BF01074459).



- Hunt, M.O., Hunt, L.L., and Falk, W.W. (2012). 'Call to Home?' Race, region, and migration to the US South, 1970–2001. *Sociological Forum* 27(1): 117–141. doi:10.1111/j.1573-7861.2011.01304.x.
- Johnson, K.M. (1989). Recent population redistribution trends in nonmetropolitan America. *Rural Sociology* 54(3): 301–326.
- Johnson, K.M. and Fuguitt, G.V. (2000). Continuity and change in rural migration patterns, 1950–1995. *Rural Sociology* 65(1): 27–49. doi:10.1111/j.1549-0831.2000.tb00341.x.
- Johnson, K.M. and Lichter, D.T. (2008). Natural increase: A new source of population growth in emerging Hispanic destinations. *Population and Development Review* 34(2): 327–346. doi:10.1038/454174a.
- Johnson, K.M. and Lichter, D.T. (2010). The growing diversity of America's children and youth: Spatial and temporal dimensions. *Population and Development Review* 36(1): 151–176. doi:10.1111/j.1728-4457.2010.00322.x.
- Johnson, K.M. and Stewart, S.I. (2005). Amenity migration to urban proximate counties. In: Green, G.P., Marcouiller, D., and Deller, S. (eds.). *Amenities and rural development: Theory, methods and public policy*. Cheltenham: Edward Elgar Publishing: 177–196. doi:10.4337/9781845428075.00018.
- Johnson, K.M., Voss, P.R., Hammer, R.B., Fuguitt, G.V., and McNiven, S. (2005). Temporal and spatial variation in age-specific net migration in the United States. *Demography* 42(4): 791–812. doi:10.1353/dem.2005.0033.
- Lichter, D.T. and Johnson, K.M. (2009). Immigrant gateways and Hispanic migration to new destinations. *International Migration Review* 43(3): 496–518. doi:10.1111/j.1747-7379.2009.00775.x.
- Mueser, P.R., White, M.J., and Tierney, J.P. (1988). Patterns of net migration by age for U.S. counties 1950–1980: The impact of increasing spatial differentiation by life cycle. *Canadian Journal of Regional Science* 11: 57–76.
- Plane, D.A. and Heins, F. (2003). Age articulation of U.S. inter-metropolitan migration flows. *Annals of Regional Science* 37: 107–130. doi:10.1007/s001680200114.
- Plane, D.A., Henrie, C.J., and Perry, M.J. (2005). Migration up and down the urban hierarchy and across the life course. *Proceedings of the National Academy of Sciences of the United States of America* 102(43): 15313–18. doi:10.1073/pnas.0507312102.

- Plane, D.A. and Jurjevich, J.R. (2009). Ties that no longer bind? The patterns and repercussions of age-articulated migration. *The Professional Geographer* 61(1): 4–20. doi:10.1080/00330120802577558.
- Tolnay, S.E. (2003). The African American ‘Great Migration’ and beyond. *Annual Review of Sociology* 29: 209–232. doi:10.1146/annurev.soc.29.010202.100009.
- Tordella, S. (2013). Personal Communications. April, 2013.
- U.S., Office of Management and Budget (2003). *Revised definitions of metropolitan statistical areas, new definitions of micropolitan statistical areas and combined statistical areas, and guidance on use of the statistical definitions of these areas*. Washington, D.C.: Office of the President (Office of Management and Budget Bulletin, No. 03-04).
- Voss, P.R., McNiven, S., Hammer, R.B., Johnson, K.M., and Fuguitt, G.V. (2004). County-specific net migration by five-year age groups, Hispanic origin, race and sex 1990-2000. Madison: Center for Demography and Ecology, University of Wisconsin-Madison (working paper 2004-24).
- White, M.J., Mueser, P., and Tierney, J.P. (1987). *Net migration of the population of the United States 1970-1980, by age, race and sex: United States, regions, divisions, states and counties*. Ann Arbor: Interuniversity Consortium for Political and Social Research, University of Michigan.
- Winkler, R.L., Johnson, K.M., Cheng, C., Voss, P.R., and Curtis, K.J. (2013a). *County-specific net migration by five-year age groups, Hispanic origin, race and sex: 2000-2010*. Ann Arbor: Interuniversity Consortium for Political and Social Research, University of Michigan.
- Winkler, R.L., Johnson, K.M., Cheng, C., Voss, P.R., and Curtis, K.J. (2013b). County-specific net migration by five-year age groups, Hispanic origin, race and sex 2000-2010. Madison: Center for Demography and Ecology, University of Wisconsin-Madison (CDE working paper 2013-04).
- Winkler, R.L., Johnson, K.M., Cheng, C., Beaudoin, J., Voss, P.R., and Curtis, K.J. (2013c). Age-specific net migration estimates for US counties, 1950-2010. Madison: Applied Population Laboratory, University of Wisconsin-Madison. <http://www.netmigration.wis.edu>

