

## Timing, Location, and Determinants of Residential Development Types in Exurban Southeastern Michigan

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**Abstract:** Residential land-use expansion is one of the most important components of urban sprawl, with a variety of environmental and ecological implications. The timing, location, and mechanisms of such expansion, though addressed independently, have seldom been studied together due to limited availability of data and analytical methods. Using land-parcel data and aerial imagery taken between 1950 and 2000 for eight townships in southeastern Michigan, we applied a residential landscape classification and measured the geographical and environmental characteristics of each of 854 polygons, representing individual parcels or whole subdivisions. Socioeconomic characteristics from the same time frame were collected from US census data at the township level and values assigned to all polygons within each township. We then applied survival analysis to detect the temporal trends of the hazards of different residential development types, and how these hazards were linked to socioeconomic, biophysical, and geographic factors. We found that (1) the hazards varied over time and between development types; and (2) the evolution of these development types over time and space can be explained by different types of factors. Analyses regarding the dual classification of rural lots and subdivisions show that rural lots were near county roads and in places with higher slopes, and had increasing occurrences over time; while the subdivisions as a whole were far away from county roads, occurred in low population density areas, and close to the five mid-level cities with varying effects over time for some variables such as soil. When only subdivision types were considered (exclusive of rural lots), they varied in drivers, signs, and temporal effects. This research suggests that further differentiation between these subdivision types and analyzing the associated time-variant patterns can shed useful light on residential land-use expansions in exurban areas.

Key words: land-use and land-cover changes; residential typology; survival analysis; temporal patterns; GIS; remote sensing imagery.