Step Up to Stop Falls
Cross-Collaborative Evaluation

Addendum

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Introduction

In 2007, the Health Foundation for Western and Central New York funded the Step Up to Stop Falls initiative, which aimed to prevent falls among older adults living in the community who are frail, or at risk of becoming frail, and reside in counties served by the HFWCNY. This initiative began in Erie County in 2007. From 2010-2012, it expanded to fund the Step Up to Stop Falls Collaborative, in which six county coalitions worked in a collaborative model to address falls in their counties, by implementing a variety of fall-prevention programs, including exercise programs, home assessment and modification programs, community awareness and education programs, and health care provider educational activities.

A comprehensive cross-collaborative evaluation was conducted in order to evaluate the Step Up Collaborative's reach, impact and maintenance of programs beyond the funding period. This cross-collaborative evaluation assessed the reach and spread of falls prevention practices; determined the overall impact of Collaborative activities on fall-related outcomes; and examined the ability of the work to continue beyond the formal structure of the Collaborative. The complete report of this evaluation is available from the Foundation (Gallant & Winjum, 2014).

This addendum provides an additional evaluation of the impact of Step Up to Stop Falls by examining changes over time in county-level rates of falls. Because of the expected lag time in fall prevention activities affecting actual fall rates, and because of the lag time associated with the availability of data from New York State, this analysis could not be conducted at the time of the initial evaluation.

Methods

The question of interest is whether the rates of falls in the seven counties that participated in the Step Up to Stop Falls Collaborative decreased significantly over time. An additional question of interest is how do rates of falls in Step Up counties compare to fall rates in the rest of New York State during this time period.

The Injury Prevention Program of the New York State Department of Health provided data on hospitalizations due to falls for this analysis. The primary outcome variable was the county-specific rate of hospitalizations due to unintentional falls among adults aged 65+ per 100,000 residents. This rate was calculated as an average annual rate based on three

years of data; three-year averages were used to account for the normal year-to-year variability in rates of hospitalizations due to falls.

Three-year average rates were calculated for different time periods corresponding to pre- and post-Step Up activities in order to examine change over time. In recognition of the fact that some Step Up counties had already begun fall prevention activities before the Step Up to Stop Falls Collaborative was funded, two baseline time periods were examined for each county, corresponding to the years 2005-2007 and 2008-2010. The post-Step Up time period was 2011-2013. At this time, the most recent data available from NYS is 2013. Thus for the remainder of this analysis these time periods are referred to as:

> Time 1: 2005-2007
> Time 2: 2008-2010
> Time 3: 2011-2013

A homogeneous Poisson process was utilized to test whether there was a significant change in hospitalization rates due to falls from Time 1 to Time 2 (Rosner, 2005, p. 593). A 95% confidence interval was constructed, using the following equation, to test the null hypothesis that rates for the two time periods were equivalent. If the resulting confidence interval does not include 0, one can conclude that there is a statistically significant change over time in rates.

$$\text{Log}_e \text{ [falls rate}_{T1}\text{/falls rate}_{T2}\text{]} \pm 1.96 \sqrt{\frac{1}{\#falls\ T1} + \frac{1}{\#falls\ T2}}$$

Results

Figure 1 illustrates the rate of hospitalizations due to unintentional falls among older adults in each of the Step Up counties for three time periods that span the Step Up initiative. A further, earlier time period (2004-2006) is also included to illustrate previous fall rates; this time period will be referred to as Time 0. As this figure illustrates, falls rates stayed relatively flat or increased between the first two time periods for all counties, but most counties experienced some level of decline during one or both of the following two time intervals.

Figure 2 illustrates the average fall hospitalization rate across all seven Step Up counties compared to the rates for New York State as a whole, for the rest of upstate New York, and for the counties in the HFWCNY service area that were not part of Step Up. The upstate region includes all counties in New York State excluding the greater New York City counties (New York, Bronx, Queens, Kings, Richmond, Nassau, Suffolk, Westchester, Rockland) and the seven Step Up counties.

As shown in Figure 2, all regions experienced increases in rates of falls from Time 0 to Time 1. New York State and Upstate continued to experience increases from Time 1 to Time 2, and Upstate rates were consistently higher than rates for New York State as a whole.

During this same time interval, both the Step Up county average, and the non-Step Up HFWCNY counties experienced a decline. During the final Time 2 to Time 3 interval, all regions experienced a decline in rates of falls, but the Step Up county average rate is substantially lower than the rates of all other regions by the end of the study period.

Figures 3 – 9 illustrate the rates for each Step Up County individually, compared to the NYS, Upstate, and non-Step Up HFWCNY regions. The pattern in Erie County is somewhat similar to the non-Step Up HFWCNY region, and the county experienced the largest decline from Time 1 to Time 2 (i.e. from 2005-2007 to 2008-2010). Allegany County began with higher rates of falls than any of the comparison regions, then experienced large declines between Time 1 and Time 2, and between Time 2 and Time 3. Cattaraugus County mirrored the patterns of the other regions until Time 2, after which it experienced a larger decline. Genesee County rates largely mirrored New York State patterns across all of the examined time periods. Niagara County had higher rates of fall than the comparison regions until Time 2, then the county experienced a sharper decline. Onondaga County experienced a large decline from Time 1 to Time 2, then a more gradual decline in rates. Finally, Tompkins County experienced increases in rates of falls until Time 2, somewhat mirroring the Upstate region, then experienced a sharper decline from Time 2 to Time 3.

Table 1 provides the actual mean annual frequency of falls and falls rates for each county plus the NYS, Upstate, and non-Step Up HFWCNY comparison regions, as well as the results of the test of significant change over time in fall rates. The change in rates from Time 1 to Time 3 was statistically significant for five counties (Erie, Allegany, Cattaraugus, Niagara, and Onondaga), while the change in rates from Time 2 to Time 3 was statistically significant for two counties (Cattaraugus, Niagara). Additionally, the change from Time 2 to Time 3 in Tompkins County approached significance.

By comparison New York State, after adjusting for size, did not demonstrate a significant change in rates over either time period, but the change in rates in Upstate was statistically significant over both of those time periods. The non-Step Up HFWCNY region experienced a significant decline from Time 1 to Time 2, but the Time 2 to Time 3 decline was not significant. Additional analyses (data not shown) indicate that from Time 1 to Time 3, 40 of the 56 non-Step Up counties in NY demonstrated no significant change in rates, and one county demonstrated an increase in rates. From Time 2 to Time 3, 38 of New York's 56 other counties demonstrated no significant change in rates and two counties demonstrated an increase in rates.

Discussion

These results demonstrate that all Step Up counties, to varying degrees, exhibited decreased rates of hospitalizations due to unintentional falls among adults aged 65 and above when comparing annualized fall rates across the time periods 2005-2007, 2008-2010, and 2011-2013. Furthermore, on average, New York State as a whole did not demonstrate similar declines, and in fact remained relatively flat across time in fall rates. The non-Step UP HFWCNY service area also exhibited decreased rates of falls over these

time periods, and the rest of Upstate New York exhibited a decrease over the second time period, but on average, the decrease in the Step Up counties was larger.

For nearly all Step Up counties, these rate decreases represent statistically significant decreases in rates over time, during the time intervals examined here. Thus it can be concluded that most counties that were part of the Step Up to Stop Falls initiative experienced significant decreases in falls rates over the time periods examined in this analysis, while New York State as a whole did not. Furthermore, the majority of the rest of individual counties in the state (approximately 72%) did not experience significant decreases in fall rates.

The fact that the rest of Upstate and the non-Step Up HFWCNY service area also exhibited some significant decreases in rates of falls during this time period may reflect the fact that other regions and counties were undoubtedly also doing some falls prevention work during these same time periods. In fact, the NYS Health Department was conducting a CDC-funded falls prevention initiative during these years, and was promoting falls prevention throughout the state in their communications with local health departments and by hosting statewide meetings on the topic. Thus, there was substantial falls prevention work occurring throughout the state that was not captured in this analysis.

However, recent evidence indicates that fall prevalence increased nationally from 1998 to 2010, and that this increase was greater than what would be expected given the increasing age of the population (Cigolle et al., 2015). Given this, the decreases in rates of falls across the Step Up counties during this time period are particularly noteworthy.

It should be noted Tompkins County's rate decrease did not emerge as statistically significant, even though the absolute size of their rate decrease was larger than that of some other counties. For example, Tompkins County's rate decreased by 356.5 falls per 100,000 from Time 2 to Time 3, while Cattaraugus County's rate decrease, which was significant, was 343.8 falls per 100,000 over the same time period. This is because the significance calculation is somewhat dependent on the number of falls that occur; rate decreases in smaller counties that experience a fewer number of falls overall will be less likely to reach statistical significance. Because these counties differ in size and fall incidence, comparisons across counties must therefore be made with caution.

A challenge in evaluating the Step Up to Stop Falls Collaborative was that for some of these counties, the Step Up initiative represented a brand-new focus on falls prevention, while for other counties, Step Up provided support for expansion of falls prevention efforts that had started earlier and were well underway. The inclusion of three time periods in this analysis, the first of which precedes Step Up by several years, is an attempt to recognize that fall prevention efforts may have begun at different times in these counties, and any effects that resulted may have occurred at different times as well.

There are two limitations to this analysis that must be acknowledged. First, time period 3 may not represent the best time period to use to examine the effects of Step Up to Stop Falls. There is undoubtedly a time lag between the implementation of fall prevention

activities and the time at which one could reasonably expect the effect of those activities to actually impact fall rates at the county level. However, it is unclear what that time lag is. Because 2013 data was the most recent data available, the 2011 – 2013 time period was the latest time period that could be examined. But given that Step Up didn't end until Fall 2012, this window of time is probably not the ideal one to truly see any reflected effects of the Step Up to Stop Falls collaborative. Future monitoring of fall rates is advised.

Second, one cannot conclude from these analyses that any significant decreases in fall rates in Step Up counties over time were caused by the Step Up to Stop Falls Collaborative. Because the data used in this analysis comes from the entire county population, and not just from those individuals that participated in Step Up activities, it is impossible to specifically link any changes in fall rates with actual Step Up activities. The results reported here demonstrate decreases in most Step Up counties from before Step Up began to the end of its implementation and just beyond. But one must use caution in drawing causal conclusions from these results.

References

Cigolle, C.T., Ha, J, Min, L.C., Lee, P.G., Gure, T.R., Alexander, N.B., & Blaum, C.S. (2015). The epidemiologic data on falls, 1998-2010: More older americans report falling. *JAMA Internal Medicine, 175*, 443-445.

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Rosner, B. (2005). Fundamentals of Biostatistics (4th ed.). Boston, MA: Brooks/Cole, Cengage Learning.
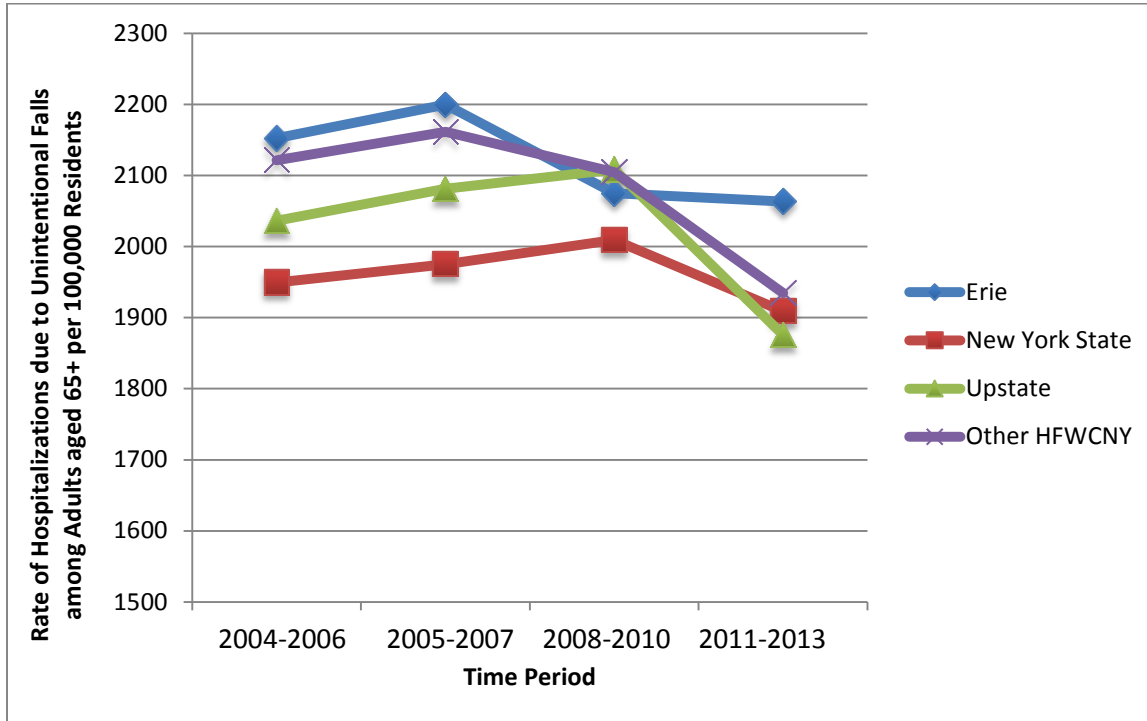
Figure 1. Rate of hospitalizations due to unintentional falls over time in all Step Up Counties.
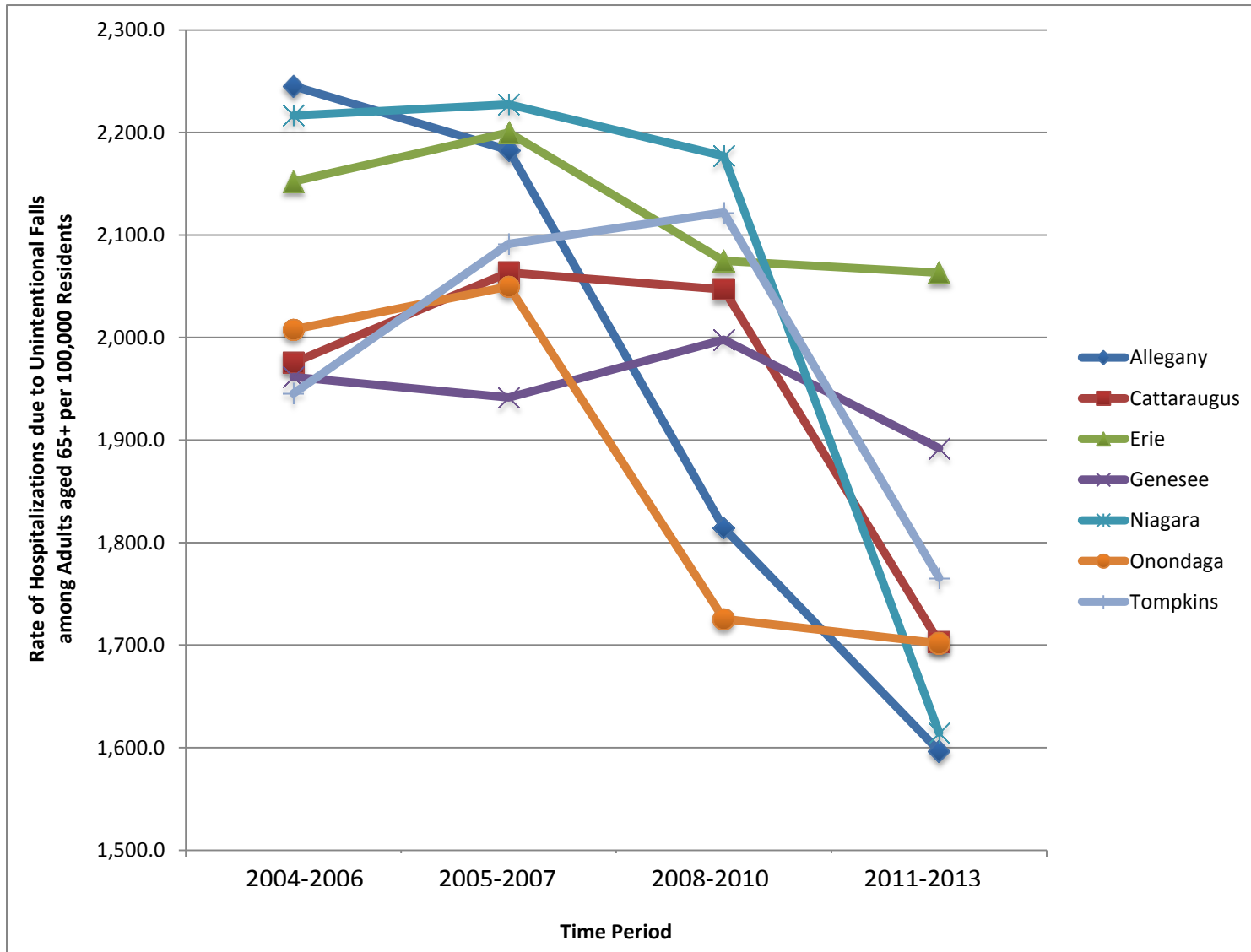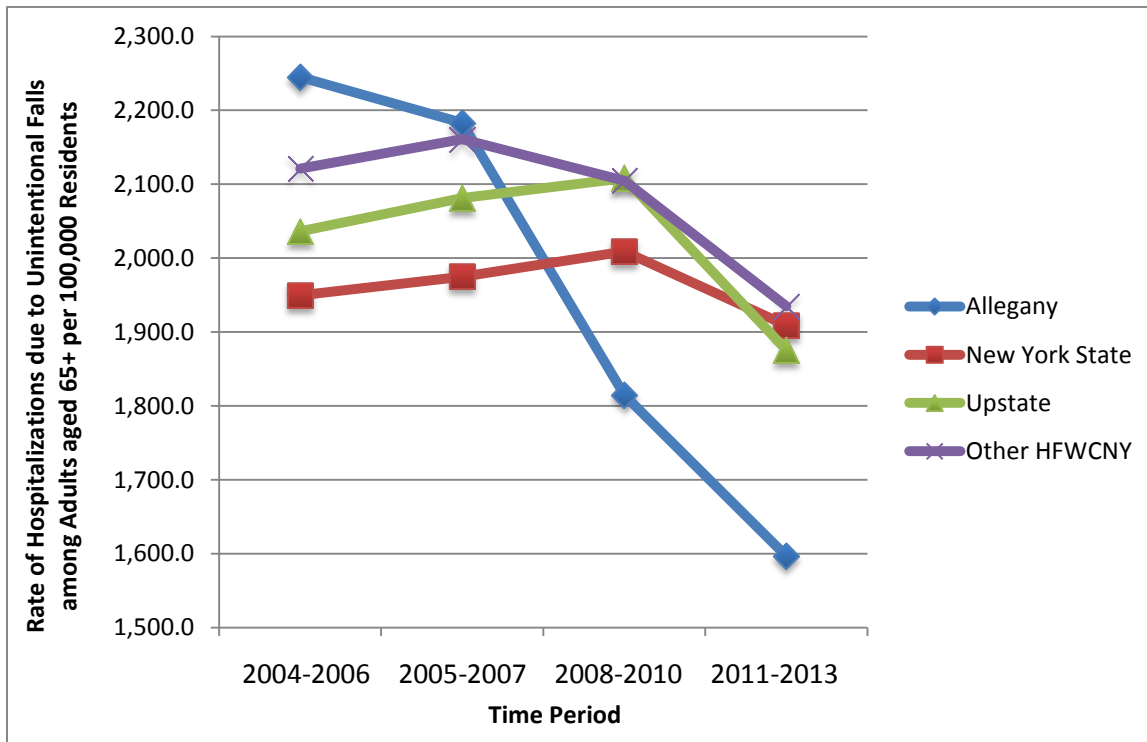
Figure 2. Rate of hospitalizations due to unintentional falls over time: Step Up County average compared to NYS, Upstate, and non-Step Up HFWCNY counties.
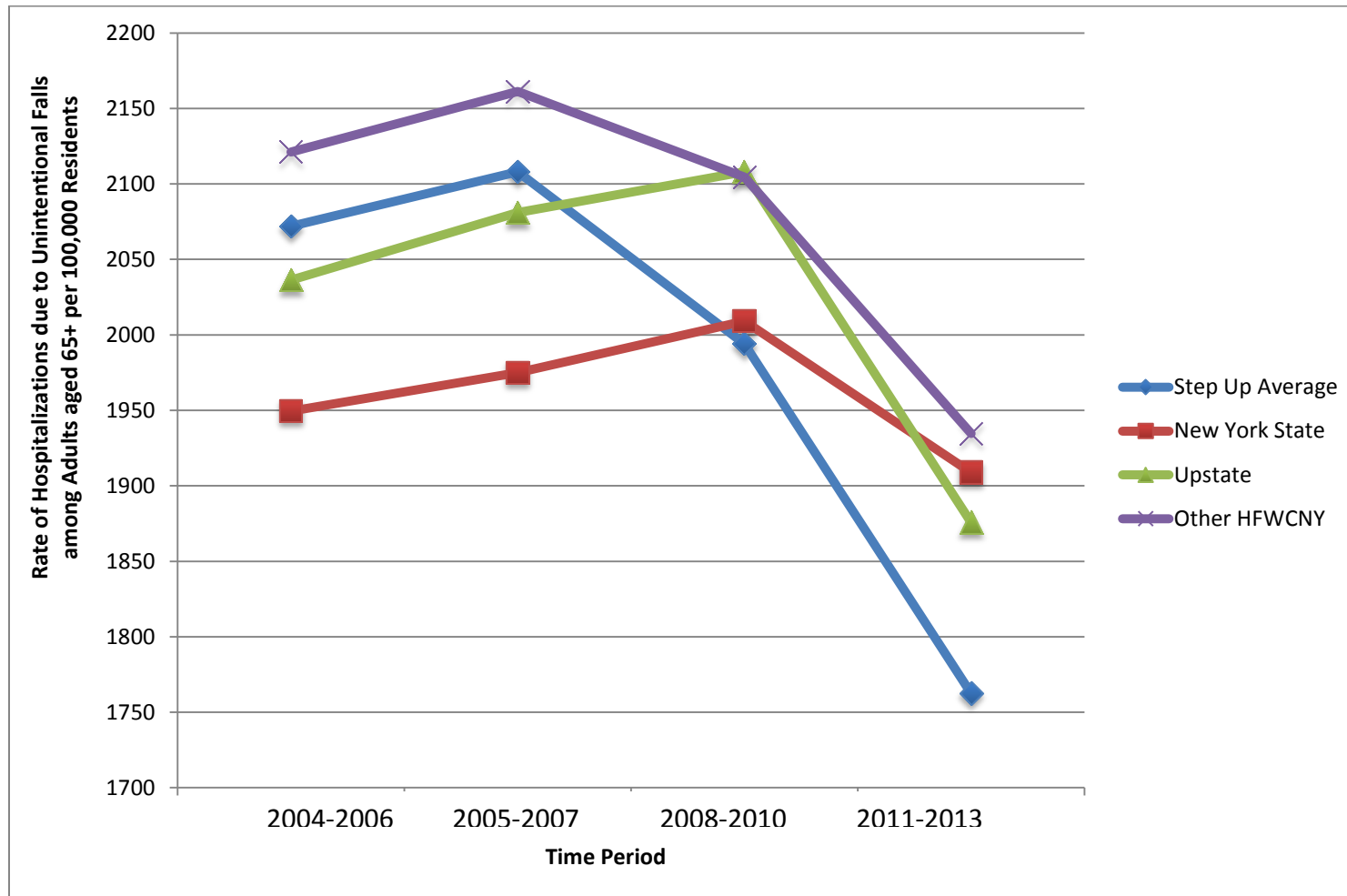
Figure 3. Rate of hospitalizations due to unintentional falls over time: Erie County compared to NYS, Upstate, and non-Step Up HFWCNY counties.
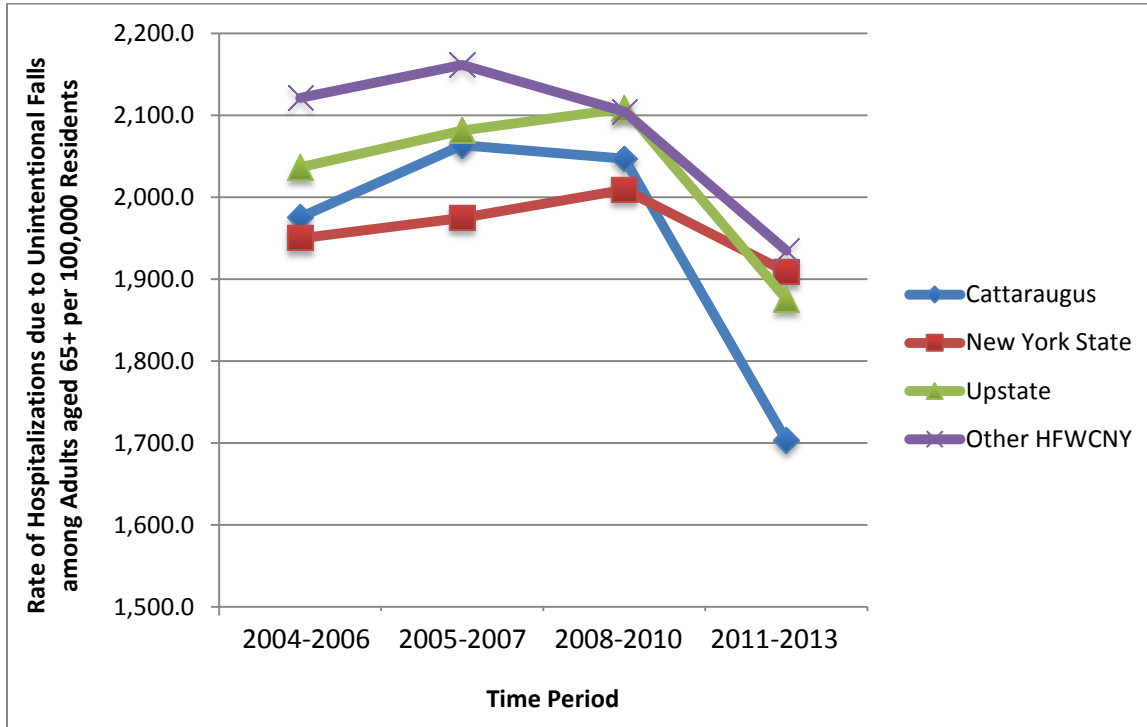

Figure 4. Rate of hospitalizations due to unintentional falls over time: Allegany County compared to NYS, Upstate, and non-Step Up HFWCNY counties.
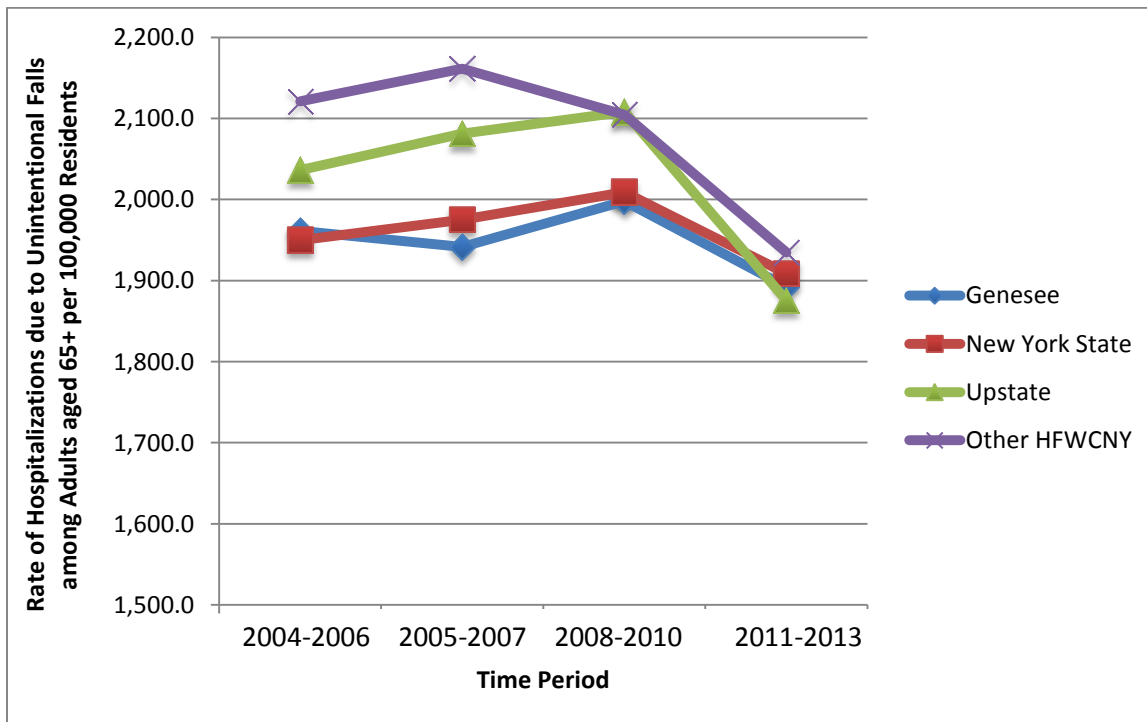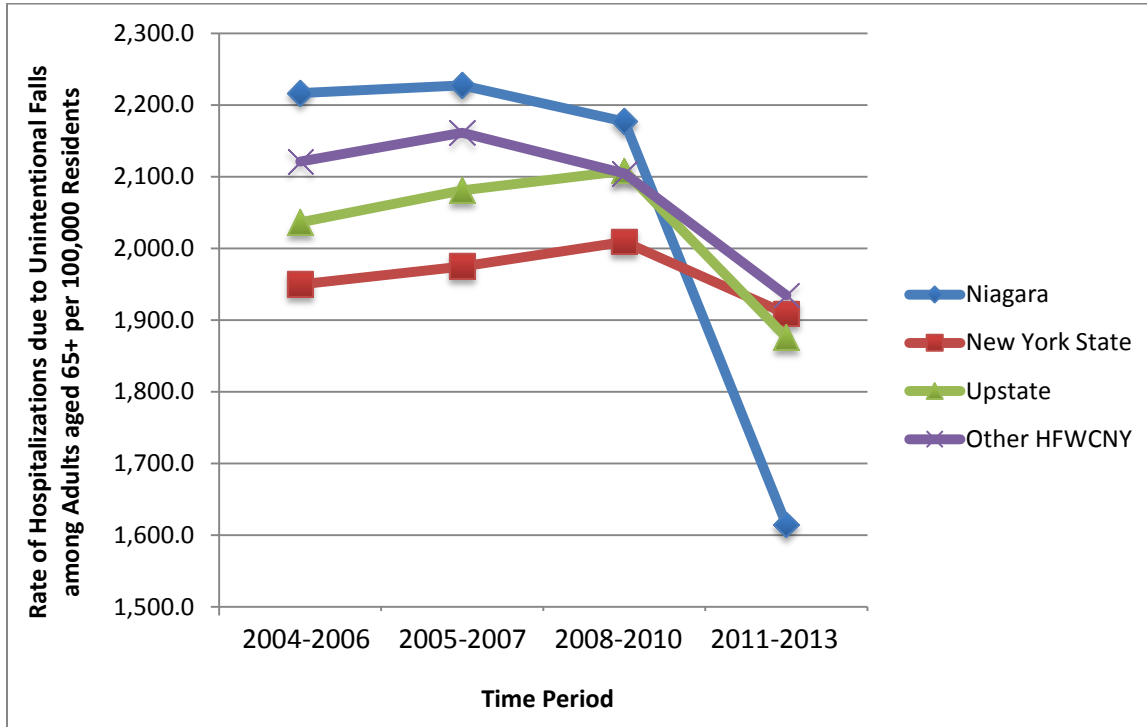
Figure 5. Rate of hospitalizations due to unintentional falls over time: Cattauraugus County compared to NYS, Upstate, and non-Step Up HFWCNY counties.
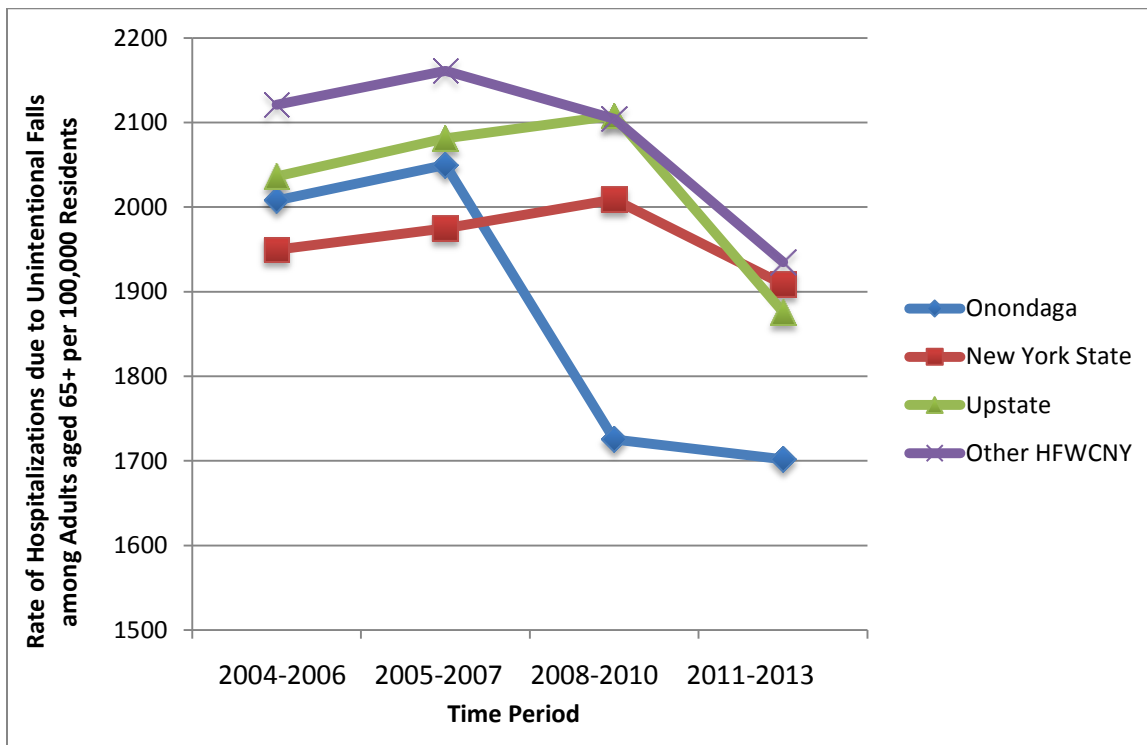

Figure 6. Rate of hospitalizations due to unintentional falls over time: Genesee County compared to NYS, Upstate, and non-Step Up HFWCNY counties.
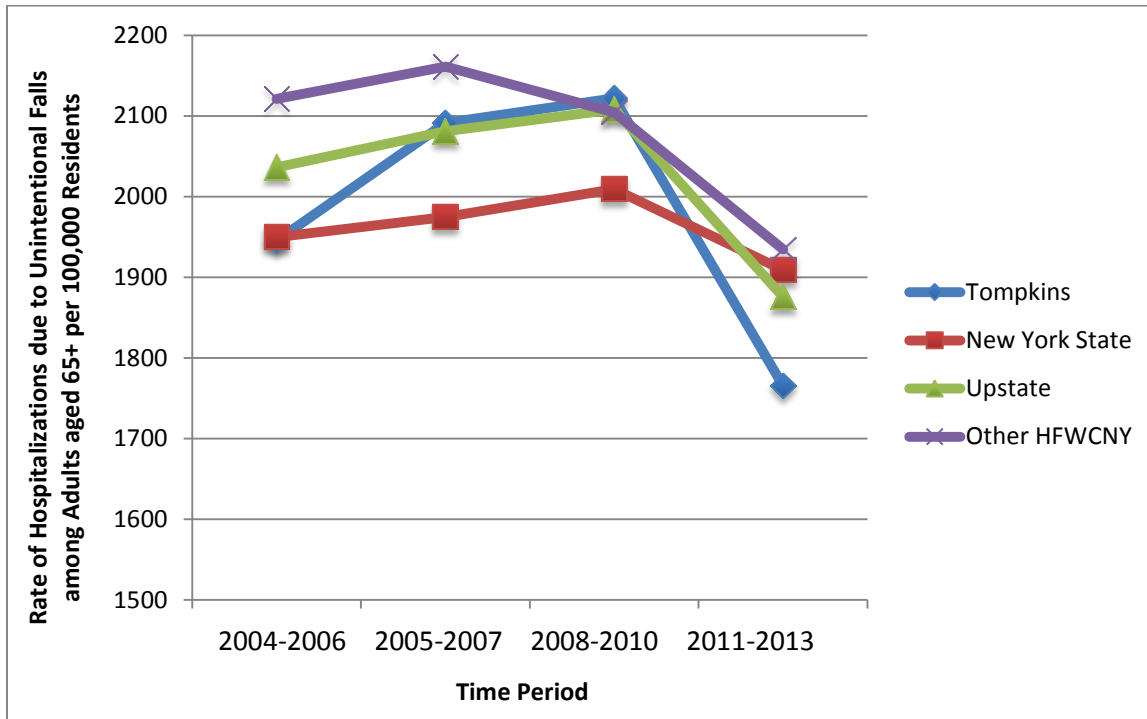
Figure 7. Rate of hospitalizations due to unintentional falls over time: Niagara County compared to NYS, Upstate, and non-Step Up HFWCNY counties.

Figure 8. Rate of hospitalizations due to unintentional falls over time: Onandaga County compared to NYS, Upstate, and non-Step Up HFWCNY counties.

Figure 9. Rate of hospitalizations due to unintentional falls over time: Tompkins County compared to NYS, Upstate, and non-Step Up HFWCNY counties.

Table 1. Mean annual frequency of falls, falls rates, and tests of change over time in fall rates

County or Region	Hospitalizations due to Unintentional Falls Aged 65+						Time 1 – Time 3 Log$_e$(Rate Ratio) 95% Confidence Interval	Time 2 – Time 3 Log$_e$(Rate Ratio) 95% Confidence Interval
	Time 1: 2005-2007		Time 2: 2008-2010		Time 3: 2011-2013			
	Mean Annual Frequency	Rate per 100,000 Residents	Mean Annual Frequency	Rate per 100,000 Residents	Mean Annual Frequency	Rate per 100,000 Residents		
Erie	3144	2,199.8	2972	2,074.8	3047	2,063.3	0.114, 0.014*	0.056, -0.045
Allegany	157	2,182.9	133	1,814.3	124	1596.6	0.548, 0.077*	0.372, -0.117
Cattaraugus	248	2,063.4	254	2,046.9	218	1703.1	0.374, 0.010*	0.365, 0.003*
Genesee	172	1,941.5	187	1,997.9	185	1892.1	0.233, -0.182	0.258, -0.149
Niagara	732	2,227.4	725	2,176.9	574	1614.6	0.431, 0.212*	0.408, 0.189*
Onondaga	1,276	2,049.8	1,110	1,725.5	1,161	1701.8	0.266, 0.107*	0.096, -0.068
Tompkins	204	2,091.4	221	2,122.0	208	1765.5	0.363, -0.024	0.373, -0.005
New York State	49,927	1,974.9	52,813	2,009.1	52,521	1908.8	0.113, -0.045[2]	0.129, -0.027[2]
Upstate[1]	14,641	2081.1	15,418	2108.1	14,903	1875.7	0.189, 0.019*[2]	0.201, 0.033*[2]
Other HFWCNY counties	2,608	2161.2	2,599	2,192.3	2,576	1,974.5	0.197, 0.024*[2]	0.171, -0.003[2]

* = statistically significant decrease in falls rate over time

[1] This region includes all counties in NYS excluding the greater New York City counties (New York, Bronx, Queens, Kings, Richmond, Nassau, Suffolk, Westchester, Rockland) and excluding the seven Step Up counties.

[2] The confidence interval for this statistic is affected by the number of events (i.e. the mean annual frequency of falls) such that as the number of events increases, smaller changes in rates are more likely to be statistically significant. Therefore, to account for the fact that the mean annual frequency of falls is many times greater in New York State and in Upstate, confidence intervals for these regions were calculated after adjusting the mean annual frequency to correspond to the size of the largest Step Up County. In other words, these confidence intervals test whether the change over time in falls rates in these two regions would be statistically significant if these regions were of similar population size to Onondaga County.