Rural-urban differences in antibiotic prescribing for uncomplicated urinary tract infection

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Introduction

- Uncomplicated UTIs are a common cause of outpatient antibiotic use and an antibiotic stewardship opportunity.[1]

- Most prescriptions do not follow current guideline recommendations of first-line agents and durations.[2, 3, 4]

- Knowledge of prescribing patterns is needed to identify disparities to target these settings for improved stewardship.

- The rural-urban health disparity has yet to be explored in UTI antibiotic prescription for possible intervention.

Methods

- We constructed a cohort from IBM® MarketScan® Commercial Database of women (18-44 years old) who filled an oral antibiotic prescription during 2011-2015 for uncomplicated UTI defined by ICD-9 diagnosis codes and in accordance with current guidelines.[2, 5, 6]

- Urban was defined as the primary beneficiary having a residence in a metropolitan statistical area, while rural was outside of such.

- We classified first-line agents as appropriate and duration as appropriate when the days' supply matched the recommended length in Table 1.[5]

- To evaluate the association between rural-urban status and inappropriate antibiotics, we used modified Poisson regression to estimate risk ratios (RRs) and confidence intervals (CIs).[7]

- We adjusted for age, year, region, provider type, and receipt of urinalysis and urine culture at index.

- To describe temporal trends in inappropriate use, we used logistic regression models to generate adjusted estimates of the proportion of rural and urban patients that received inappropriate prescriptions.

Table 1. Antibiotic therapy per guidelines

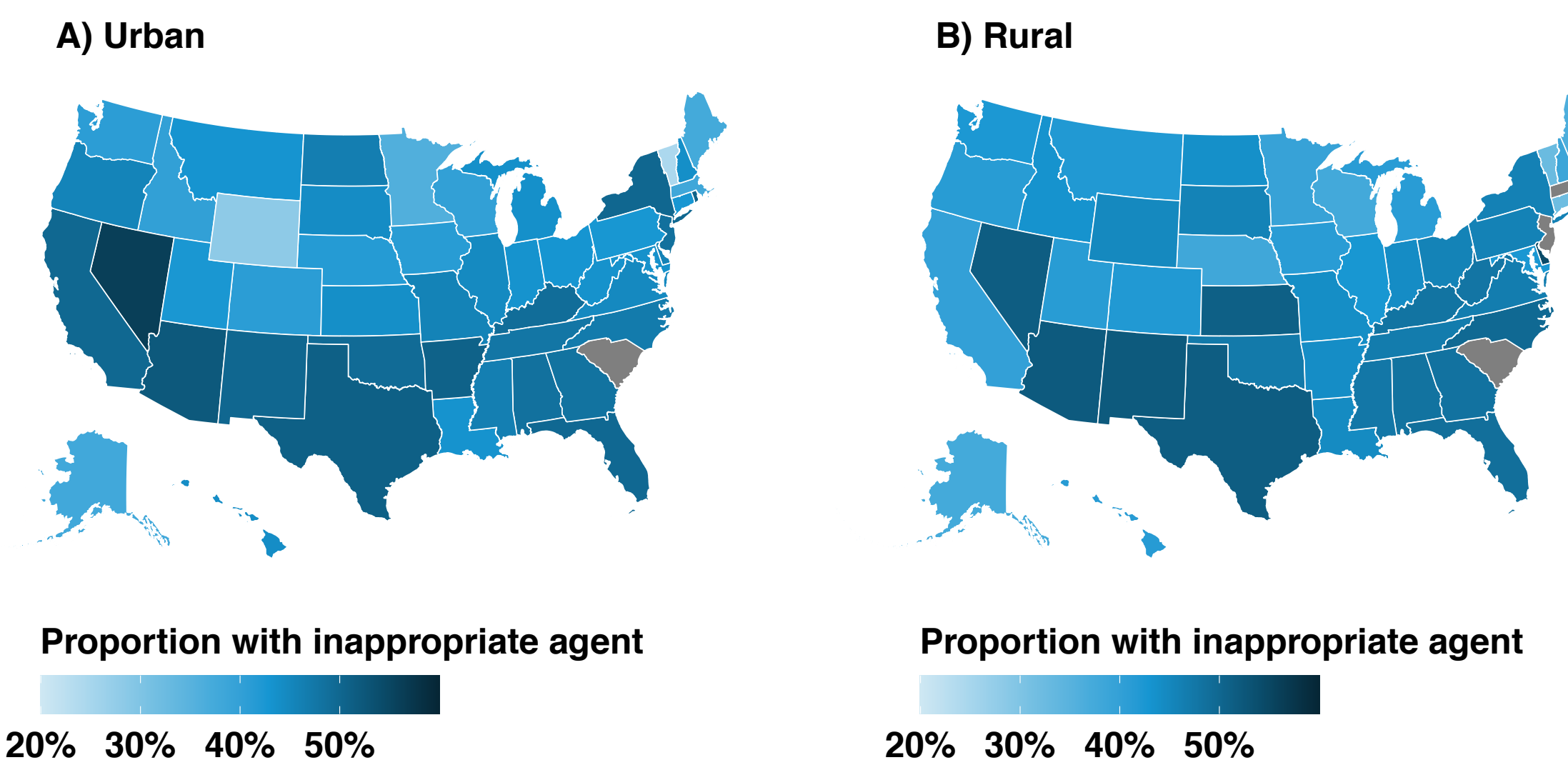| Antibiotic agent	Recommended duration
First-line regimen	
Nitrofurantoin	5 days
Trimethoprim-sulfamethoxazole	3 days
Fosfomycin trometamol	1 day
Non-first-line regimen	
Fluoroquinolones	3 days
β-Lactams	3-7 days

Results

- Of 670,450 eligible women (18-44 years old) filling an oral antibiotic prescription over 2011-15 for uncomplicated UTI, the majority (86.2%) were urban.

- Fig. 1 shows a similar proportion of inappropriate antibiotic agents to treat UTI for rural and urban women. Most prescriptions (76.1%) were written for inappropriate durations. Of those, 98.7% were for a supply longer than recommended and the remainder were for too short a supply. Rural women were prescribed inappropriate durations more often than urban (83.9% vs. 74.9%).

- Fig. 2 shows women were more likely to receive inappropriate agents in the South and West. Fig. 3 shows inappropriate durations in all regions, particularly the South and Midwest. Fig. 4 shows inappropriate agent and duration use declined slightly over the study period among urban and rural women.

- In the multivariable model, rural women were 10% more likely to receive a prescription for an inappropriate duration (adjusted RR 1.10, 95%CI, 1.10-1.10) compared to urban.
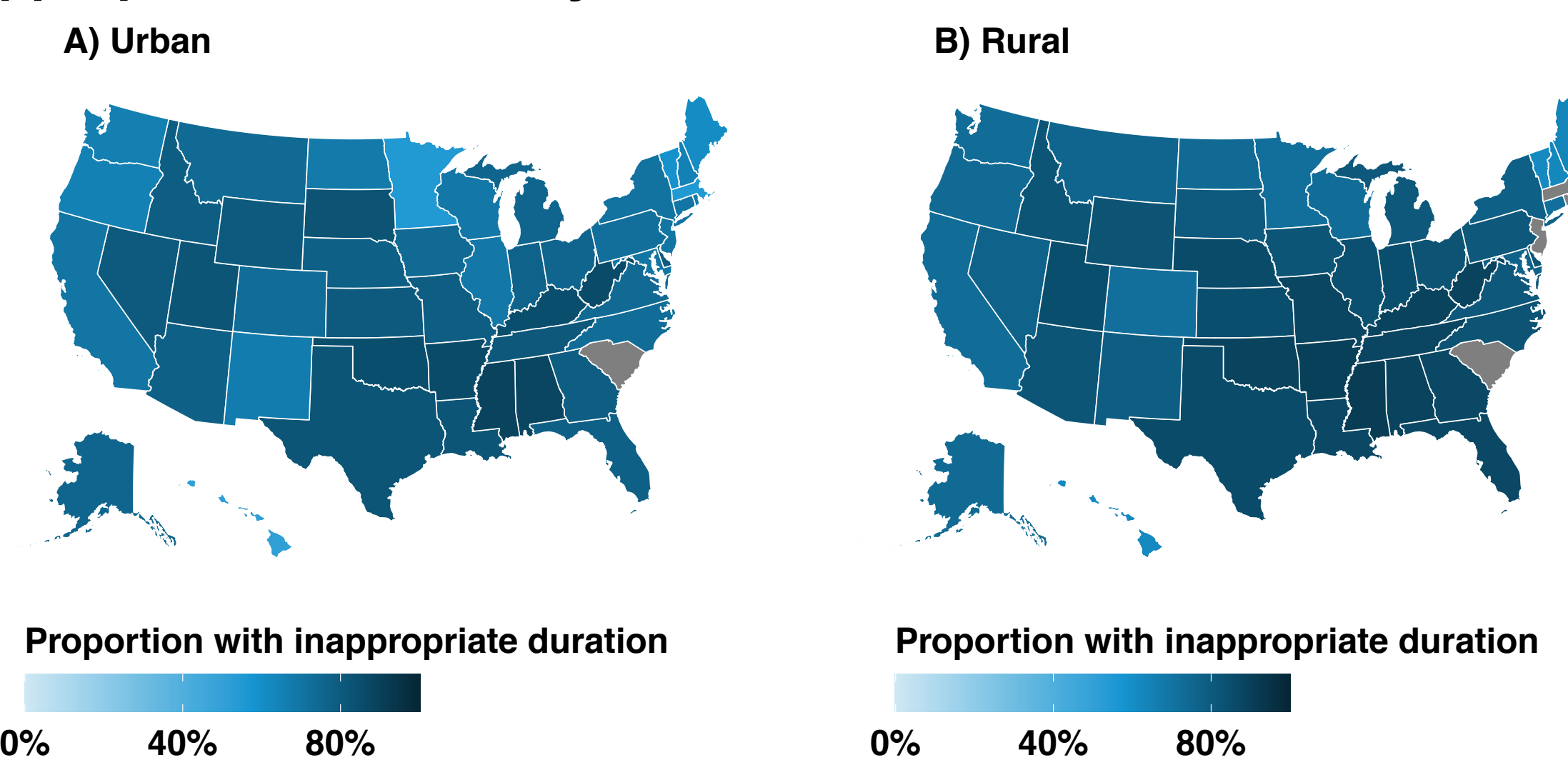
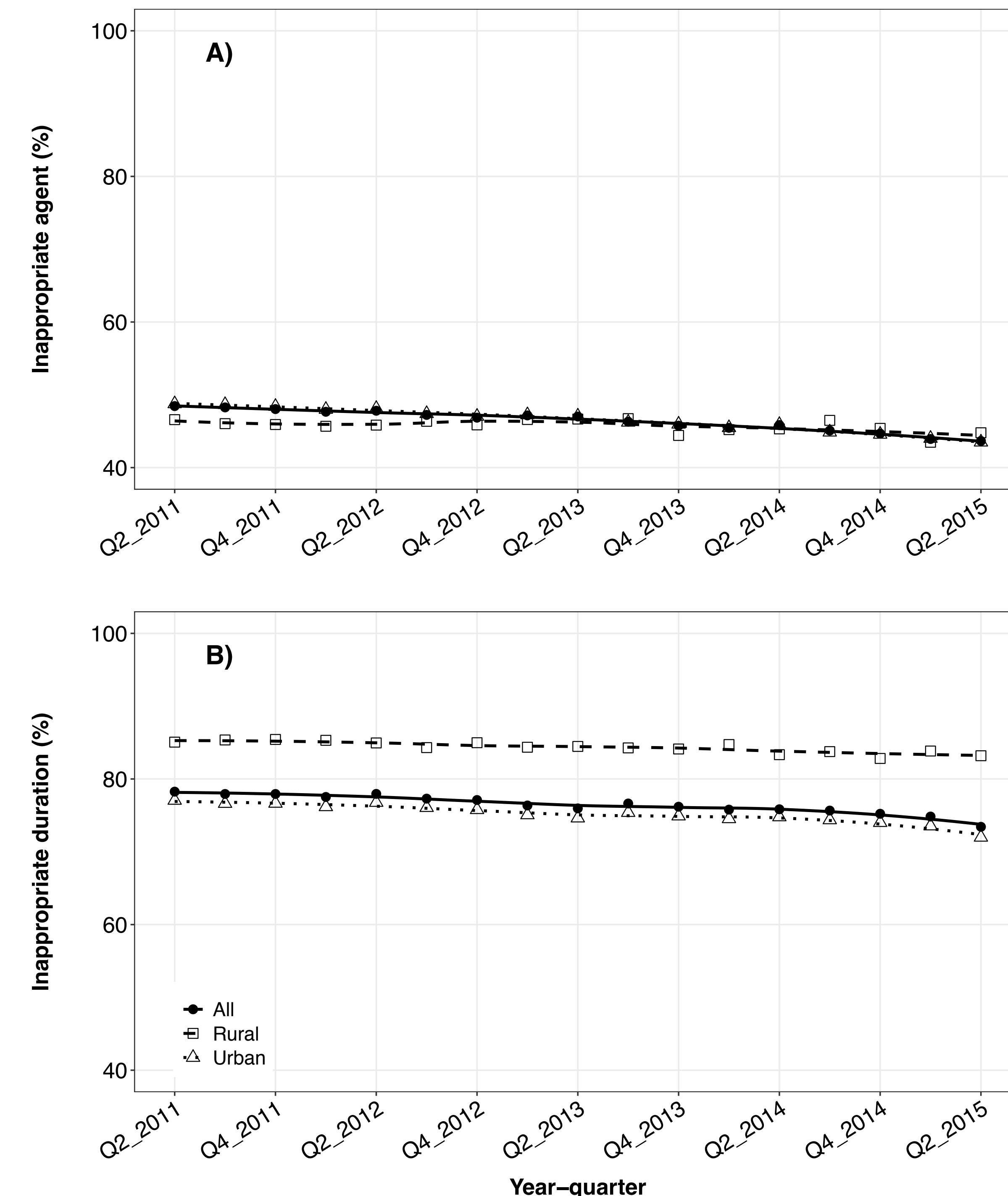**Figure 1. Antibiotic prescription days' supply distribution by rural-urban status**
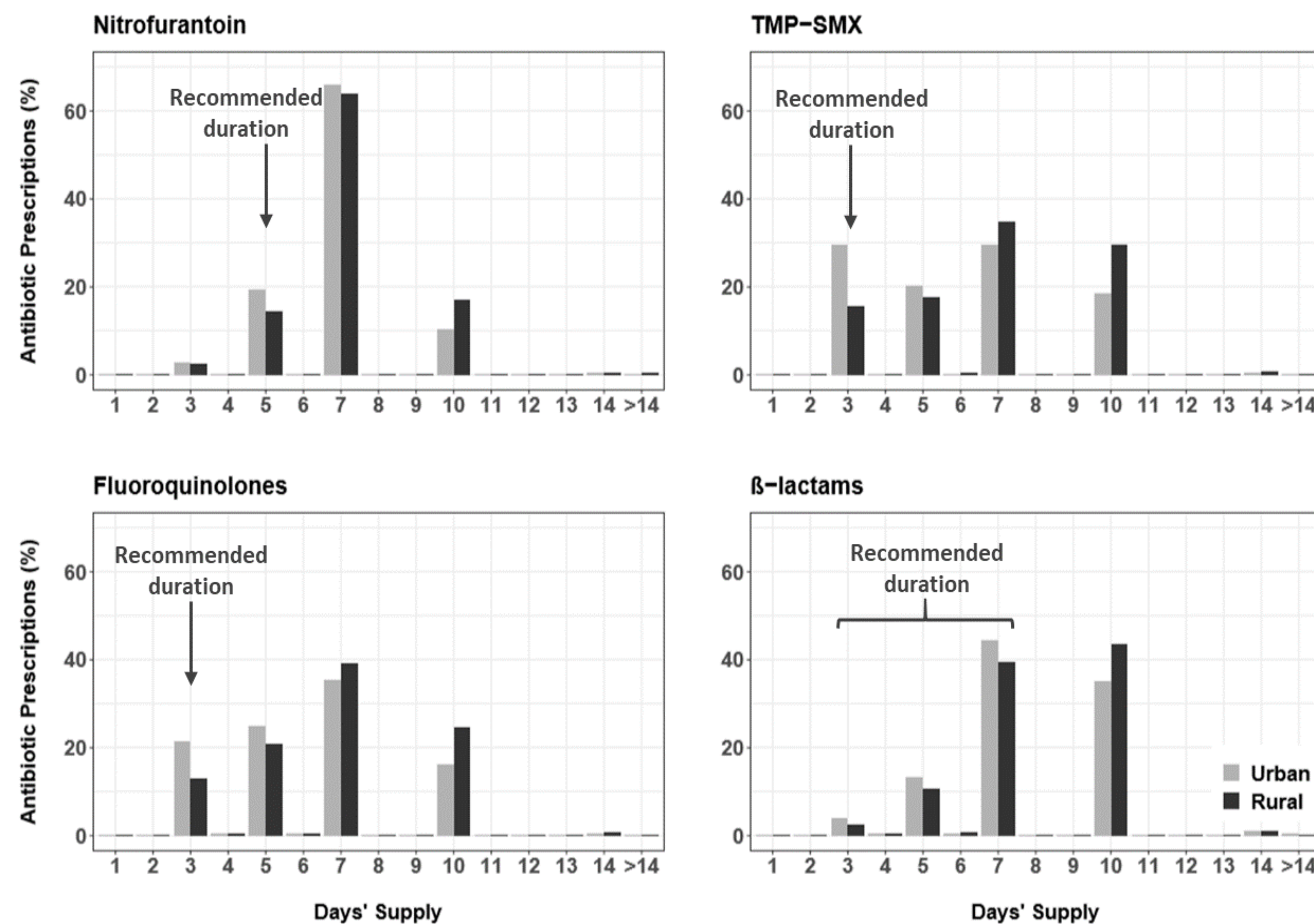
Figure 2. Geographic distribution of UTI antibiotic prescriptions with inappropriate agents by rural-urban status

Figure 4. Mean quarterly use of UTI antibiotic prescriptions with A) inappropriate agents or B) inappropriate durations by rural-urban status

Discussion

- Rural women were more likely to receive inappropriately long durations of UTI antibiotics, while there was overall little rural-urban difference in the receipt of inappropriate agents.

- There could be several explanations for these prolonged durations including local resistance patterns, patient-level travel burden if second prescription were needed, and provider-level experience differences.

- Limitations include the population solely being commercially insured and the definition of rural-urban being based on metropolitan statistical area.

- Stewardship interventions and further research are needed to improve outpatient UTI antibiotic prescribing, specifically in rural settings.

References

1. Flores-Mireles AL. Nat Rev Microbiol **2015**.; 2. Kobayashi M. Open Forum Infect Dis **2016**.; 3. Durkin MJ. Open Forum Infect Dis **2018**.; 4. Grigoryan L. Open Forum Infect Dis **2015.**; 5. Gupta K. Clin Infect Dis **2011**.; 6. Hansen LG. White Paper. IBM Watson Health **2018**.; 7. Zou G. Am J Epidemiol **2004**.

Disclosures