

Association Between Dental Prophylaxis and Pneumonia in Kentucky Medicaid Beneficiaries

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INTRODUCTION

Pneumonia is a lung infection disease that may result in life-threatening complications. The relationship of dental prophylaxis (DP) with the incidence of pneumonia among individuals with type 2 diabetes mellitus (T2DM) individuals has not been evaluated in the US. Kentucky has the fourth highest prevalence of T2DM in the US at 13.4% in 2021.

The objective of the present study is to investigate the association between DP use and pneumonia risk among Kentucky Medicaid adult beneficiaries with and without T2DM.

METHODS

Data source

The Kentucky Cabinet for Health and Family Services (CHFS) utilized a Medicaid Management Information System (MMIS) to collect provider claims and conducted a custom de-identified data pull upon approval to provide data for this retrospective study.

Study population

The study cohort were selected from the CHFS Medicaid dataset for years 2014-2019 and included 1,992,963 total beneficiaries. Subjects were included if age at entry into the study was 21 to 75 years of age (n=954,595). Individuals with less than one year of claims history prior to pneumonia were excluded from the study. After selection criteria, the total number of subjects was 780,113 beneficiaries.

Definitions and outcomes

The outcome variable was whether or not a pneumonia diagnosis occurred in a Medicaid beneficiary. The individual subjects were followed from the entry date into the study (the subjects first date of service) until the first date of pneumonia or until the study ended and they were censored from the analysis (December 31, 2019).

Independent variables

The study incorporated T2DM and other typical comorbidities associated with pneumonia, including hypertension, atrial fibrillation, chronic kidney disease, dyslipidemia, peripheral vascular disease, and periodontal disease based on ICD 9 and 10 codes. Dental prophylaxis and tooth extraction were identified using dental procedure codes (CDT).

Statistical analysis

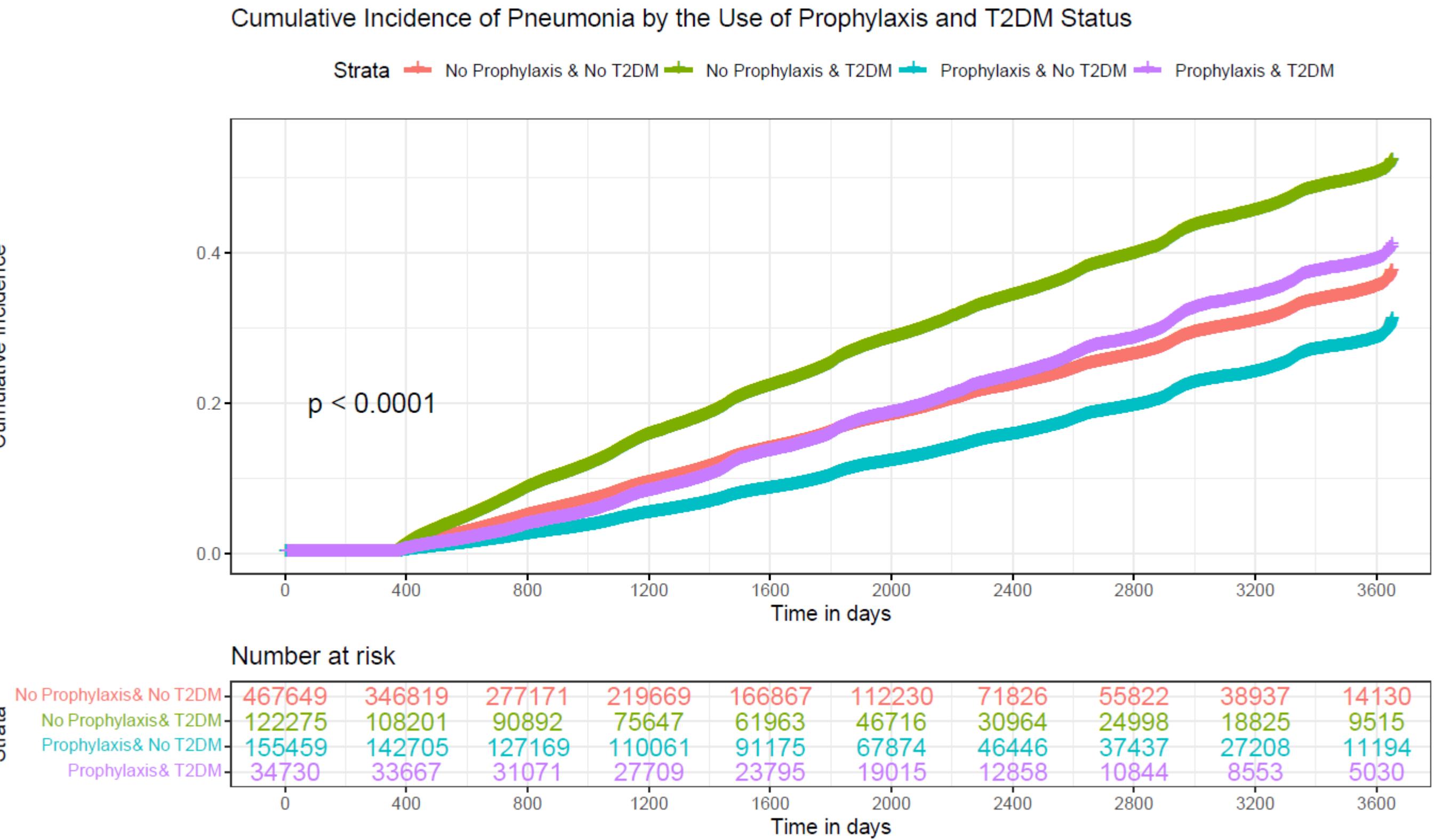
The longitudinal data were extracted and structured for survival analysis in R software. The incidence rates (IRs) of pneumonia during five-year follow-up periods for DP were analyzed. Cox regression was used to analyze the effect of DP on the incidence of pneumonia among beneficiaries with and without T2DM, adjusted for covariates.

RESULTS

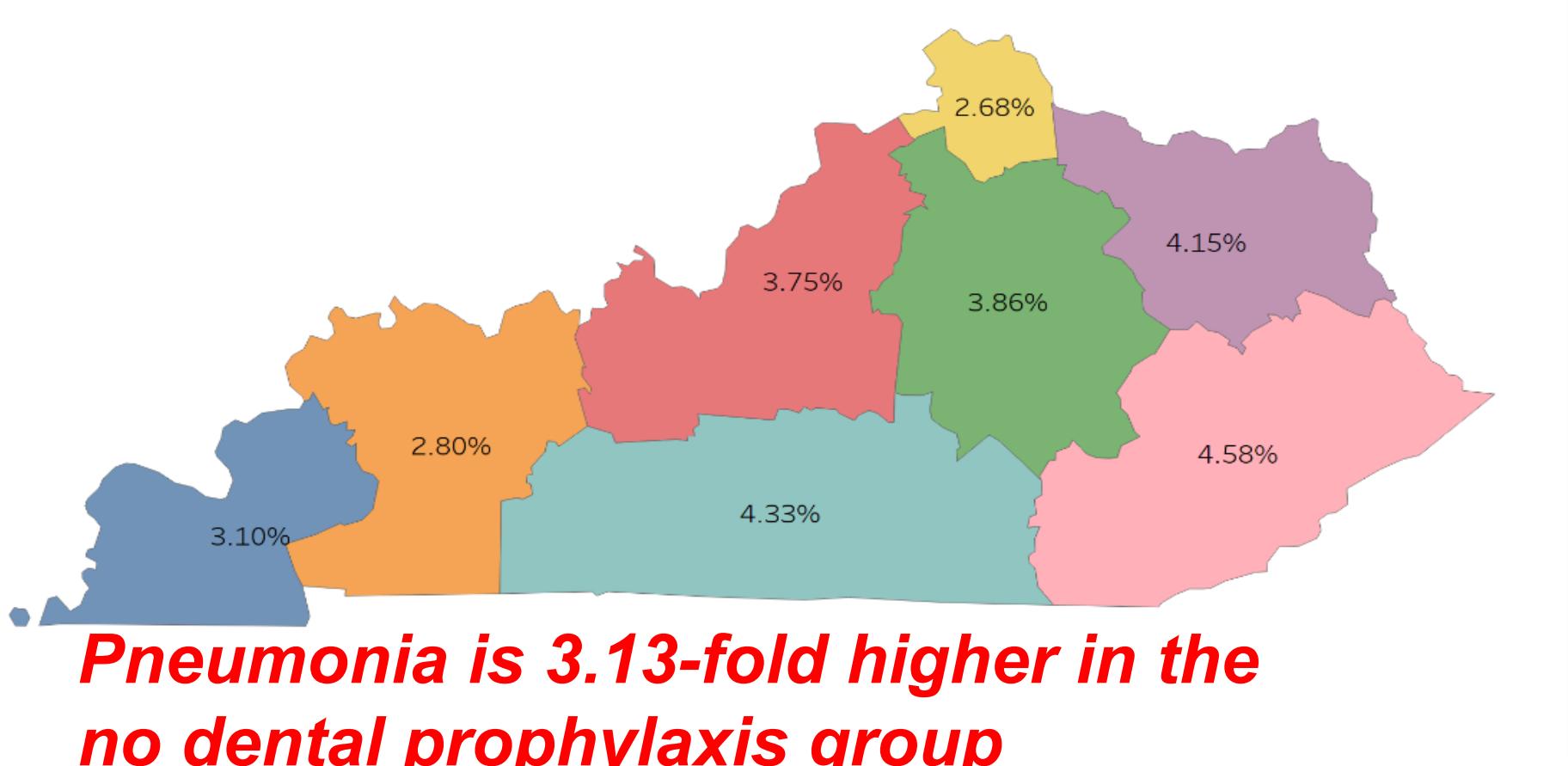
Medicaid beneficiaries (n= 780,113) were followed 2014-2019.

Bivariate analysis

- The IR of pneumonia was 3.76%/year (95% confidence interval (CI): 3.74% – 3.79%) among Kentucky Medicaid beneficiaries
- Beneficiaries without dental prophylaxis had an increased risk (3.13 fold higher) of pneumonia prevalence compared to those with dental prophylaxis.

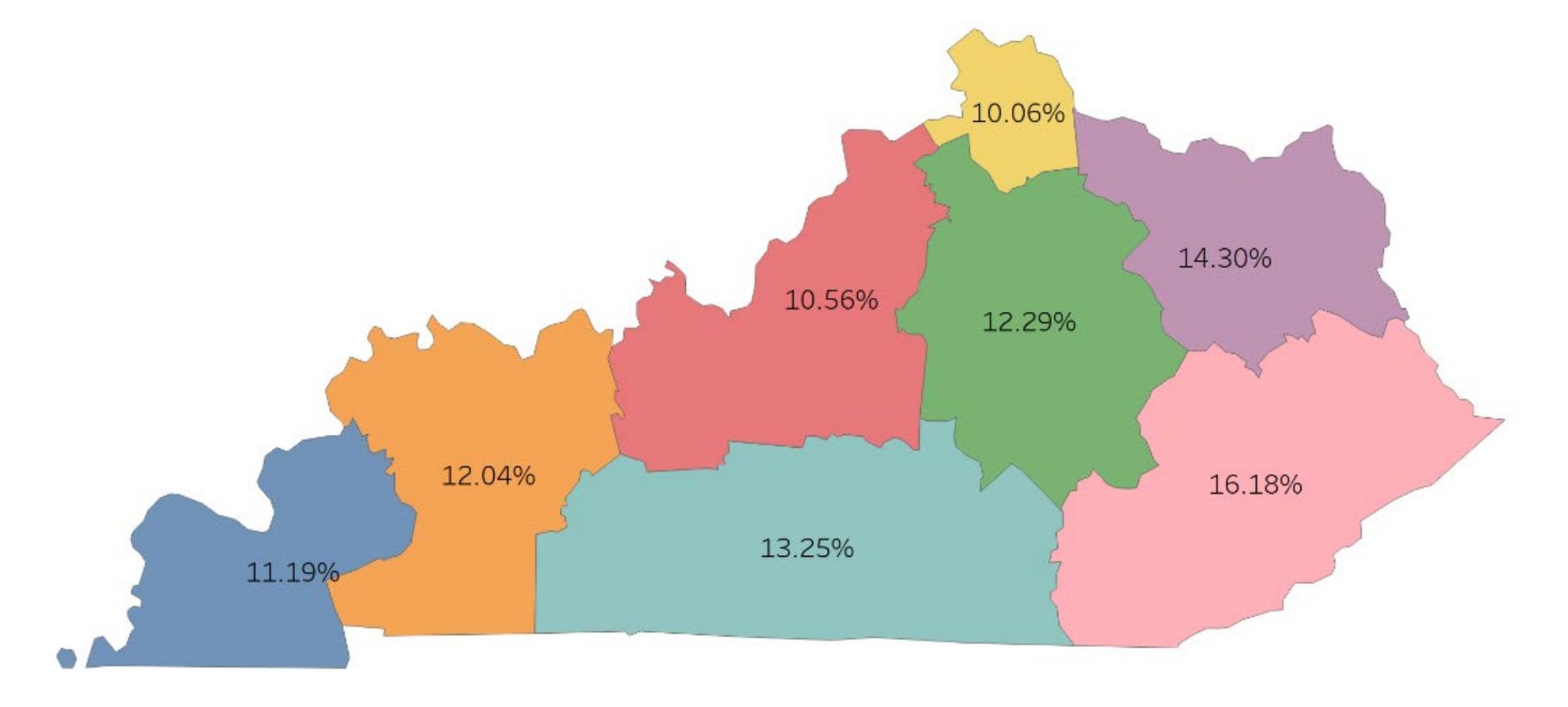


Pneumonia prevalence among beneficiaries with dental prophylaxis



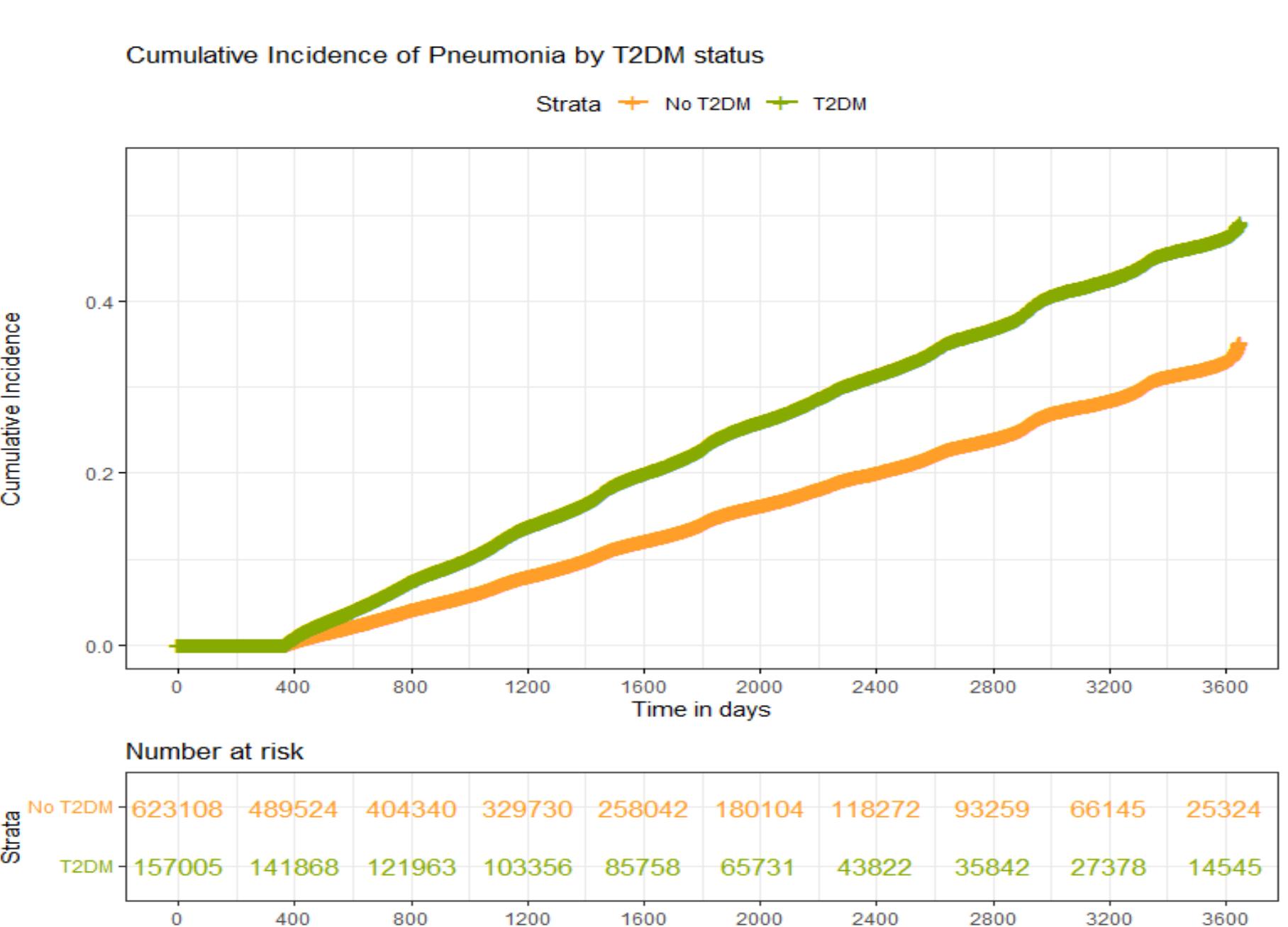
Variables	HR (95% CI)	p value
Age 45+ years	1.09 (1.08 – 1.11)	<0.001
Female	1.14 (1.13 – 1.16)	<0.001
Non-white	0.87 (0.85 – 0.88)	<0.001
Rural	0.99 (0.98 – 1.01)	0.284
T2DM	1.23 (1.21 – 1.25)	<0.001
Hypertension	1.38 (1.36 – 1.40)	<0.001
CKD	1.47 (1.44 – 1.49)	<0.001
Atrial fibrillation	1.68 (1.64 – 1.71)	<0.001
Dyslipidemia	1.21 (1.19 – 1.23)	<0.001
PVD	1.30 (1.28 – 1.32)	<0.001
Prophylaxis	0.70 (0.69 – 0.71)	<0.001
Tooth extraction	1.21 (1.20 – 1.23)	<0.001
Statin	0.55 (0.54 – 0.55)	<0.001

Pneumonia prevalence among beneficiaries without dental prophylaxis



Cox regression analysis of pneumonia

- Hazard ratios (HR) for pneumonia were increased 23% (p < 0.001) by T2DM, but dental prophylaxis was protective (HR = 0.70, p < 0.001).
- Tooth extraction(s) increased likelihood of pneumonia by 21% (p < 0.001).
- Other medical conditions such as hypertension, CKD, atrial fibrillation, dyslipidemia, PVD were also associated with increased risk of pneumonia, but statin was protective.



Summary and Conclusions

Results of the present study indicate that the risk of pneumonia is increased among adult Medicaid beneficiaries who do not use dental prophylaxis, controlling for covariates. Beneficiaries with T2DM and who lack DP have the highest rate of pneumonia.

DISCUSSION

- DP was protective against incident pneumonia and recurrent pneumonia in the present investigation of Medicaid beneficiaries in Kentucky.
- The association of oral bacteria with pneumonia has been shown, but evidence is not consistent. Large-scale studies are needed to better understand the relationship between oral pathogens and pneumonia [Brock et al., 2022].
- Lower respiratory infections (e.g., pneumonia) are conditions for which evidence of direct and indirect links to periodontitis is increasing. Many oral pathogens are associated with lung infections. Indeed, pathogens associated with periodontal disease (e.g., *Porphyromonas gingivalis*). Respiratory pathogens isolated from dental plaques were genetically identical with isolates from bronchoalveolar fluid same patients [Bui et al., 2019].
- Oral inflammation (e.g., periodontitis) is associated with systemic diseases through the inflammation pathway. Specifically, the inflammasome increases the reaction of pro-inflammatory mediators to presence of: Gram-negative lipopolysaccharides (LPSs), interleukin 1 β and interleukin 6 (IL-1 β and IL-6), and tumor necrosis factor alpha (TNF- α).
- Association of poorly controlled oral biofilms and systemic diseases, especially respiratory infectious diseases such as pneumonia, supporting a bidirectional link between periodontitis and pneumonia.

CONCLUSIONS

DP was associated with decreased risk of pneumonia among Kentucky Medicaid beneficiaries with and without T2DM. T2DM without DP had the highest incidence of pneumonia. US health policies similar to the European Joint Consensus (Herrera et al. 2023) should be adopted to provide benefits that include regular dental check-ups and DP for Medicaid beneficiaries, especially those with T2DM. This will reduce the morbidity, mortality and costs of pneumonia.

Selected References

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