Differences in antibiotic prescribing quality in Belgian out-of-hours primary care services

Differences in Antibiotic Prescribing Quality in Belgian Out-Of-Hours Primary Care Services

Abstract

Objectives

This study aims to compare trends in antibiotic prescribing behaviour for lower urinary tract infections among different out-of-hours primary care services.

Methods

Cross-sectional study using routine prescription data extracted from electronic health records from six out-of-hours services. The study population included 5888 cases diagnosed with an uncomplicated lower urinary tract infection from 2016 to 2020. Prescriptions were assessed based on the national guidelines.

Results

Considering the total study period, an antibiotic was prescribed in 98.9% of cases. Among these cases, 55.0% was prescribed a guideline recommended antibiotic, 21.0% was prescribed fosfomycin, 17.4% was prescribed a quinolone and 1.8% was prescribed more than one antibiotic. Guideline recommended prescribing improved substantially over time. However, there were significant differences among out-of-hours services in terms of proportion over the total study period (between 49.0% and 66.7%) as well as in terms of time-trend pattern.

Conclusion

Substantial differences among out-of-hours services suggest a potential for further improvement in the quality of antibiotic prescribing. Monitoring prescribing behaviour per out-of-hours primary care service can guide focused interventions.

Keywords: urinary tract infection, antimicrobial therapy, primary care out-of-hours services, prescribing behavior, adherence to guidelines

Introduction

Antimicrobial resistance is among the biggest threats to global health and development [1]. Misuse of antibiotics (ABs) in humans has been flagged as a crucial factor in the accelerating prevalence of antimicrobial resistance[1]. Prescribing behaviour among health workers in primary care has been shown to play an important role in the development of antimicrobial resistance [2][3]. Monitoring of prescribing behaviour is therefore crucial as it may guide interventions to instil appropriate prescribing behaviour among health care workers.

Lower urinary tract infection (LUTI) is regarded as a common bacterial infection in primary care and a frequent reason for prescribing ABs. Diagnosis of LUTI can be established on patient history and, if needed, confirmed by a nitrite test. The straightforward guidelines for diagnosis and treatment of LUTI support it as a choice to monitor guideline adherence for AB prescribing in the primary care setting.

Out-of-hours (OOH) services have been set up to ensure access to primary care at times when general practitioners` surgeries are closed and have been established in many European countries.

A study on data collected in 2016-2018 among five Belgian OOH primary care services found only 69% of patients with LUTI receiving the guideline recommended AB [3]. A study on similar data extracted from the same 'iCAREdata' database [4] identified a radical decrease in the prescription of fluoroquinolones after modification of the reimbursement criteria on 1 May 2018 [5].

The aim of this study is to bring an update on AB prescribing behaviour for LUTI. More specifically, we will compare time trends in prescribing behaviour across different OOH services. Our hypothesis is that it may be useful to analyse OOH services

specific trends to guide tailored interventions to improve the quality of AB prescribing in OOH primary care services.

Methods

Data collection

This cross-sectional study was based on routinely collected electronic health record data from six of the seven existing OOH services in the province of Antwerp between 02/2016 to 12/2020, extracted from the iCAREdata database [4]. The consulting health worker at the OOH primary care service is a general practitioner (GP). Patients reason for encounter and diagnoses are routinely registered using the International Classification of Primary Care 2 (ICPC2) codes. Patients were recruited if LUTI (ICPC2 code U71; uncomplicated urinary tract infection) was entered as the diagnosis, when patients were female and aged between 18 and 80.

Analysis

Calculation of proportion of recommended AB over total number of prescriptions of systemic AB for LUTI according to the Belgian guidelines. Current national guidelines for LUTI are in line with European guidelines and recommend nitrofurantoin or trimethoprim, with or without sulfamethoxazole [6]. Proportions were compared over time and across OOH primary care services. Confidence intervals of the point estimates were calculated based on the incomplete beta function while taking into account clustering by GPs using the survey package in R [7–9]. The analyses did not consider autocorrelation or other timetrends.

Ethics

This study was approved by the Ethics Committee of the Antwerp University Hospital (reference 13/34/330).

Results

The total number recorded LUTI cases over the entire study period was 5888. Median age of patients was 41 (interquartile range 29-57). Most patients (85.2%) were recorded only once with LUTI, 14.8% were recorded twice or more. The number of cases recorded per OOH varied between 667 and 2850 (see table 1).

The number of consulting GPs was 1175. The median number of LUTI cases per GP was 4 (min.: 1 – max.: 53). The number of GPs per OOH varied between 146 and 333 and the ratio of the number of cases per GP varied between 8.56 and 3.34 (see table 1).

When considering totals over the whole study period (2016-2020), 66 (1.1%) of the recorded LUTI cases did not receive a systemic AB. For the cases receiving an AB prescription, 55% was prescribed a guideline recommended AB among whom 96.6% received nitrofurantoin and 3.4% trimethoprim. For all cases receiving an AB, 21% was prescribed fosfomycin, 17.4% was prescribed a quinolone and 1.8% was prescribed more than one antibiotic (see figure 1 for a detailed breakdown). The average percentage estimates receiving a guideline recommended AB prescription increased from 50.5% in 2016 to 59.8 % in 2020 (see figure 2A). This could be mainly attributed to a strong decrease in the prescription of quinolones from an average of 27.5% in 2016 to 10.9% in 2020 (see figure 2B).

[figure 1]

Figure 1: Percentages of non-recommended antibiotics prescribed among cases receiving an antibiotic.

[figure 2]

Figure 2: Yearly percentages of prescribed guidelines recommended antibiotics (PANEL A) and fluoroquinolones (PANEL B) with 95 % confidence intervals of the point estimates.

Comparison of the different OOH services shows a substantial difference in prescribed guideline recommended AB ranging from 49.0 % to 66.7% (see figure 3A). Time trends per OOH primary care service are displayed in figure 3B showing variable patterns over time including an increasing trend (service 1 & 3), a plateauing trend (service 2, 4 & 5) and a decreasing trend (service 6). An exploration of associations between the percentage of prescribed guideline recommended AB and characteristics of the OOH suggests a significant negative correlation (p=0.04) with the ratio number of cases per GP, but not with the total number of cases or the total number of consulting GPs per OOH (see table 1).

[figure 3]

Figure 3: Percentages of guideline recommended antibiotic prescriptions per out-of-hours service (OOHS) with 95 % confidence intervals totalled over the whole study period (PANEL A); as time trends per year (PANEL B).

OOH service	1	2	3	4	5	6	Correlation (95% CI) with guideline recommended AB
Percentage guideline recommended AB	49	50.3	57.7	61.1	64	66.7	
N° of patients	2850	879	969	814	667	729	-0.68 (-0.962, 0.286)
N° of GPs	333	156	150	206	146	218	-0.39 (-0.91, 0.62)
patient/GP ratio	8.56	5.63	6.46	3.95	4.57	3.34	-0.84 (-0.98, -0.09)

Table 1: OOH = out-of-hours service, GP= General Practitioner, AB= antibiotics

Discussion

Comparison of the different OOH services revealed a significant difference in average prescribing behaviour for the whole study period as well as different time-trend patterns. These differences suggest a feasible potential for improvement in some of the OOH services. Communication of these differences might encourage GPs to better adhere to the guidelines. Our analyses also revealed that it is useful to monitor individual OOH services; doing this may identify OOH services that can benefit from interventions and it can monitor the potential effect of such interventions. We believe that using such data to steer focused interventions will benefit efficiency.

Although the number of OOH services was relatively small, we found a negative correlation between prescribing behaviour and the ratio of the number of cases with LUTI per GP. This suggests that in OOH services with proportionally less physicians per patient, prescribing behaviour is worse. We recommend this finding to be tested in

samples with more OOH services. As the number of consulting GPs and the opening hours of the OOH services differ, it was also not possible to know if the ratio of the number of patients per GP could be explained by a higher consultation rate or by a proportionally lower number of GPs spending more time at the OOH services. Further exploration of the factors causing the different trends (e.g. GP's age and experience, turn-over of staff, etc.) is recommended as they may provide crucial information to guide interventions and training.

Non-adherence was for a substantial part due to prescription of fosfomycin, which may have been prescribed for reasons of patient adherence as it requires only one dose. Moreover, while nitrofurantoin has remained the first choice, fosfomycin was proposed as an alternative choice in the 2019 national guidelines[10]. In their 2016 guidelines, fosfomycin as well as trimethoprim have been recommended as second choice by Domus Medica, an initiative that represents the Flemish GPs for scientific, societal and trade union matters [11]. Therefore it is arguable that fosfomyin prescription may also be guideline-concordant. We conclude that it is primarily the use of fluoroquinolones that needs to be scaled down. Adherence to guidelines showed an improvement over the timeframe of our study, which could be attributed to the implementation of stricter reimbursement criteria for fluoroquinolones in 2018 as was shown by others [5].

In 2020, OOH services had to deal with the COVID-19 pandemic. In Belgium, this prompted the implementation of telephone consultations. While a substantial decrease in AB prescribing for respiratory tract infections was shown during the first waves of the pandemic, no significant change was found for nitrofurantoin[12], which is in line with our findings for each of the different OOH services.

Potential reasons for non-adherence have been identified by others. For example, Colliers et al. found that, besides objective arguments, GPs also make assumptions (for example, about the patients' reason for encounter or expectations for antibiotics) without objectifying this with the patient[13]. Moreover, safety-netting, which includes the communication of uncertainty and plans for follow-up seems to be often hindered by the lack of a trustworthy long term doctor–patient relationship, limited diagnostic and follow-up options, language difficulties, etc. [13].

Options to increase prescribing adherence include: 1) decision support systems which could make suggestions to the physician based on specific criteria (e.g. diagnosis, patient's characteristics etc.); 2) personal feedback to physicians, which could be possibly based on benchmarking; 3) taking into account suggestions from the distributing pharmacist. A previous study showed that it was possible to change prescription behavior in the setting of OOH services [14], although, the effect disappeared after the intervention. Others showed it to be challenging to change prescription behavior from the start [15]. New insights from implementation and behavioral research (e.g. the normalization process model [16]) may offer promising avenues to change prescriber’s behavior at the longer term.

A limitation of this study is that only 1 of the 10 Belgian provinces was included and that interprovincial differences are likely. Data on the dose and suggested treatment duration were ignored as these are usually not accurately recorded. Accurate estimation of the parameters of the trends displayed as graphs in this paper requires more sophisticated techniques that take into account phenomena such as autocorrelation and seasonality. This is beyond the scope of our work.

Conclusion

Substantial differences in the quality of AB prescribing between OOH primary care services suggest a potential for further improvement. Monitoring of individual OOH services could guide the implementation of focused interventions.

Disclosure of interest

The authors declare no conflict of interest.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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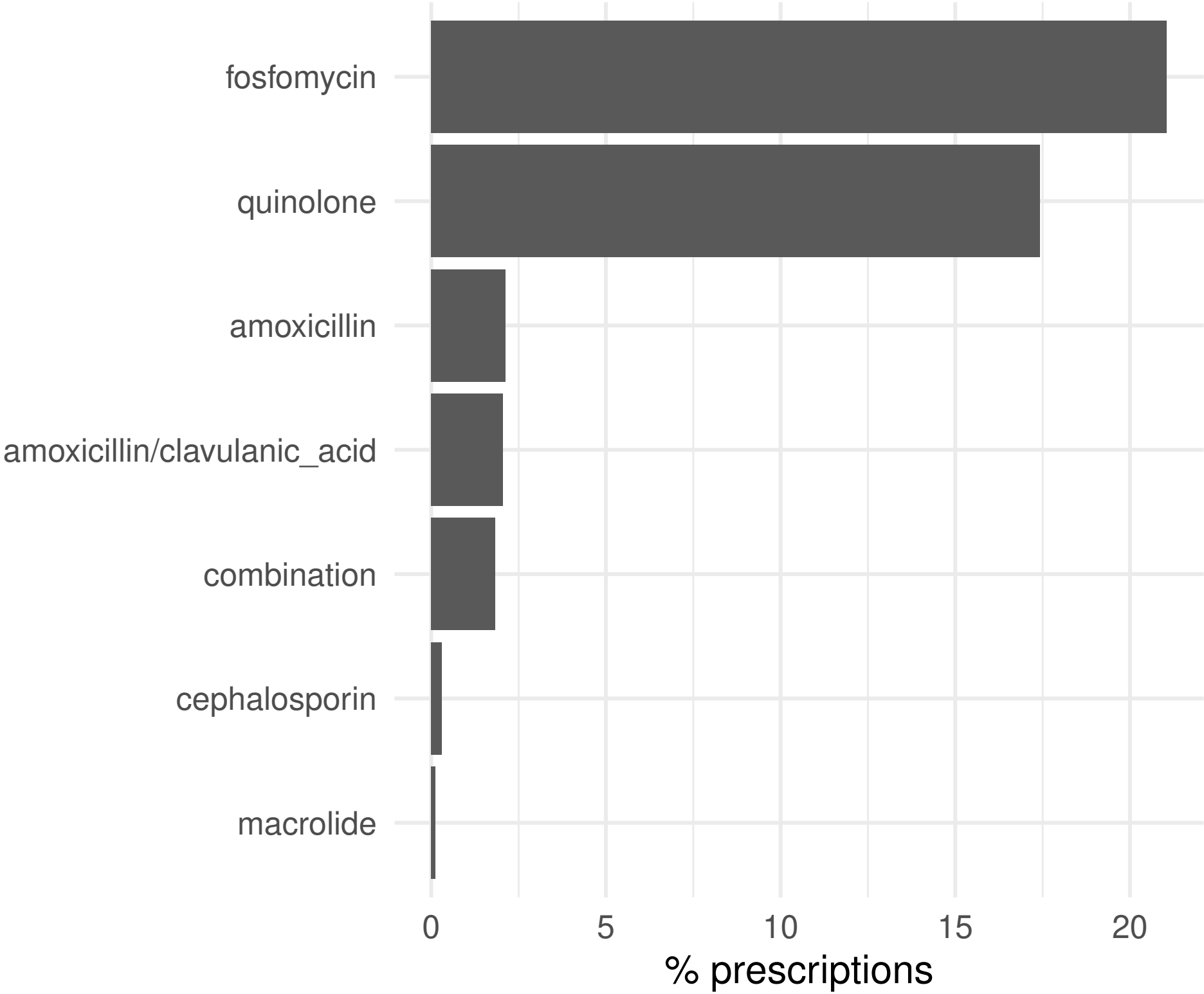
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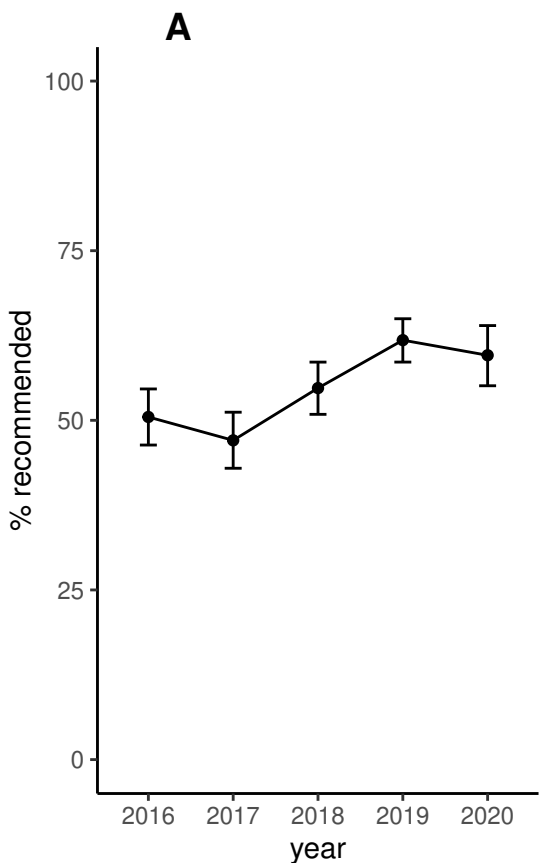
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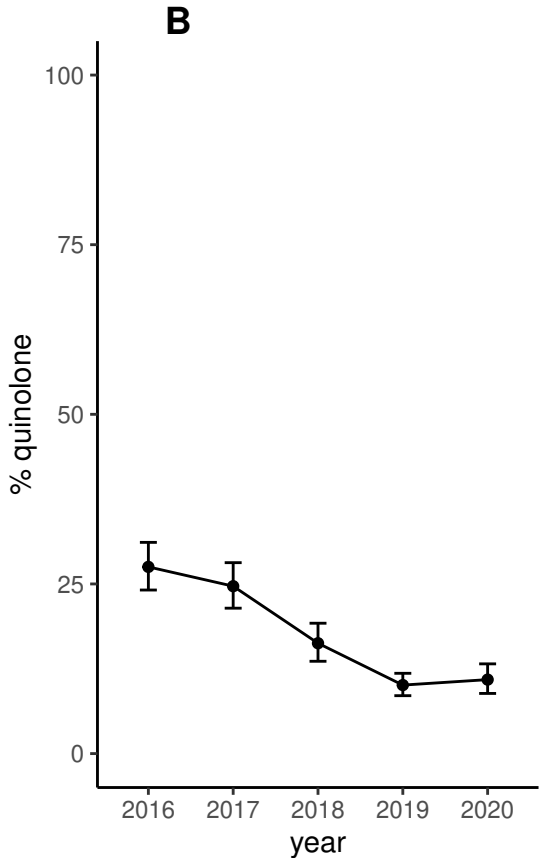
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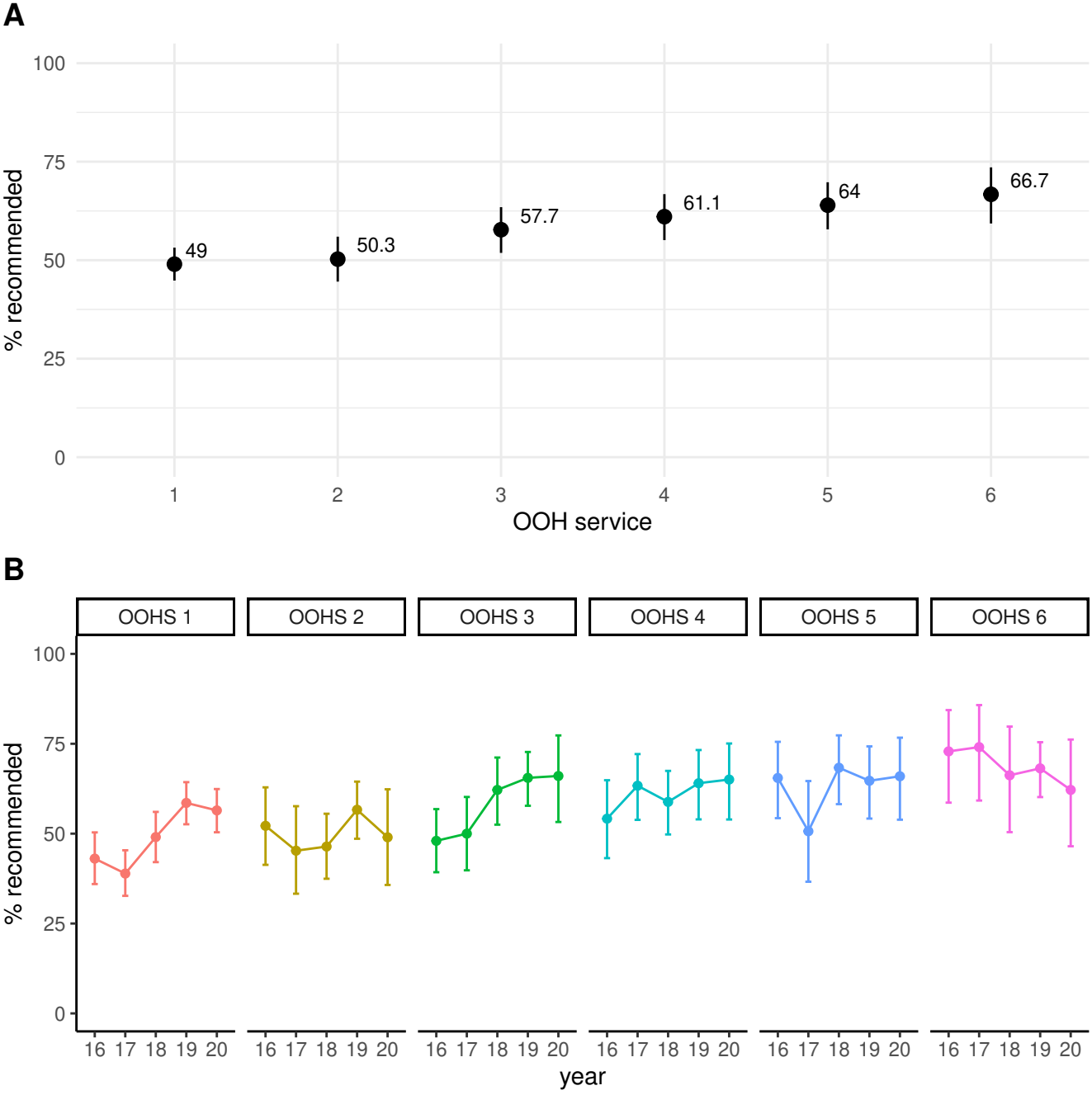
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