

On The Road Again: A Systematic Review And Meta-Analysis Assessing The Impact Of Travelling To Access Surgery On Postoperative Outcomes In High-Income Countries

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Background: “Access to Timely Essential Surgery” is defined by the Lancet Commission on Global Surgery (LCoGS Access Indicator) as the proportion of the national population that resides within 2 hours of travel from a facility capable of surgical and anesthetic care, and implies travel time to surgical care impacts postoperative outcomes unfavourably. This definition does not indicate how travel time influences postoperative outcomes, which outcomes are affected, or how these relationships vary by surgery or urgency. This study aims to quantify and characterize the relationship between time- or distance-travelled and surgical outcomes in high-income countries through meta-analysis to inform the validity of LCoGS Access Indicator.

Methods: All study designs with >100 participants that compared distance- or time-travelled to access surgery to any postoperative outcomes in countries rated as “High” or “Very High” according to the United Nation Human Development Index were eligible for inclusion. Non-English studies or those that assessed hospital transfers or medical tourism were excluded. MEDLINE, Embase, Cochrane Library, Web of Science, and Scopus, and grey literature were searched on July 12, 2022 and June 1, 2023, respectively. Bias assessment was performed using McMaster University CLARITY Group Tool to Assess Risk of Bias in Cohort Studies. DerSimonian and Laird inverse variance meta-analysis was performed using RevMan to estimate aggregate effects using random-effects models. Meta-regression was performed using a mixed-effects model in R.

Results: 138 articles were qualitatively synthesized while 85 were quantitatively synthesized. Aggregate results suggest those who travelled further to access surgery relative to those who travelled less far had lower odds of 30-day mortality (OR 0.67, 95%CI 0.56-0.81 [15 studies]) and 90-day mortality (OR 0.74, 95%CI 0.65-0.84 [16 studies]), greater odds of 30-day major complications (OR 1.14, 95%CI 1.02-1.27 [7 studies]), greater total perioperative costs (SMD 0.12, 95%CI 0.04-0.19 [4 studies]), and potentially reduced 30-day readmissions (OR 0.90, 95%CI 0.81-1.00 [20 studies]). One meta-regression analysis was significant, suggesting that increasing distance-travelled was associated with a decreasing odds of 30-day mortality (B1 = -0.0208 (95% CI -0.0373 to -0.0042; P=0.0196)). Confounders such as differences in patient baseline risk, socioeconomic status, and centre volume were inadequately explored. Insufficient information was provided to ascertain selection biases, information biases, attrition biases, and the role of confounding. For example, it was difficult to ascertain whether sickest participants travelling far

distances may have been excluded upon in-transit death; or, whether younger patients live more rurally than older patients, which may provide a better explanation of outcome differences than distance travelled.

Discussion: In conclusion, current evidence most notably suggests that those who travelled farther to access surgery may have lower odds of postoperative mortality relative to those who did not travel as far. These associations are likely mediated by centre-volume, although it is unclear to what degree. Confounders and biases must be properly addressed before our conclusions can inform LCoGS indicators. In particular, adjusting for acuity and patient baseline prognostic factors, and protecting against selection and survivor biases, will be key to better characterize the relationship between distance- or time-travelled and surgical outcomes.

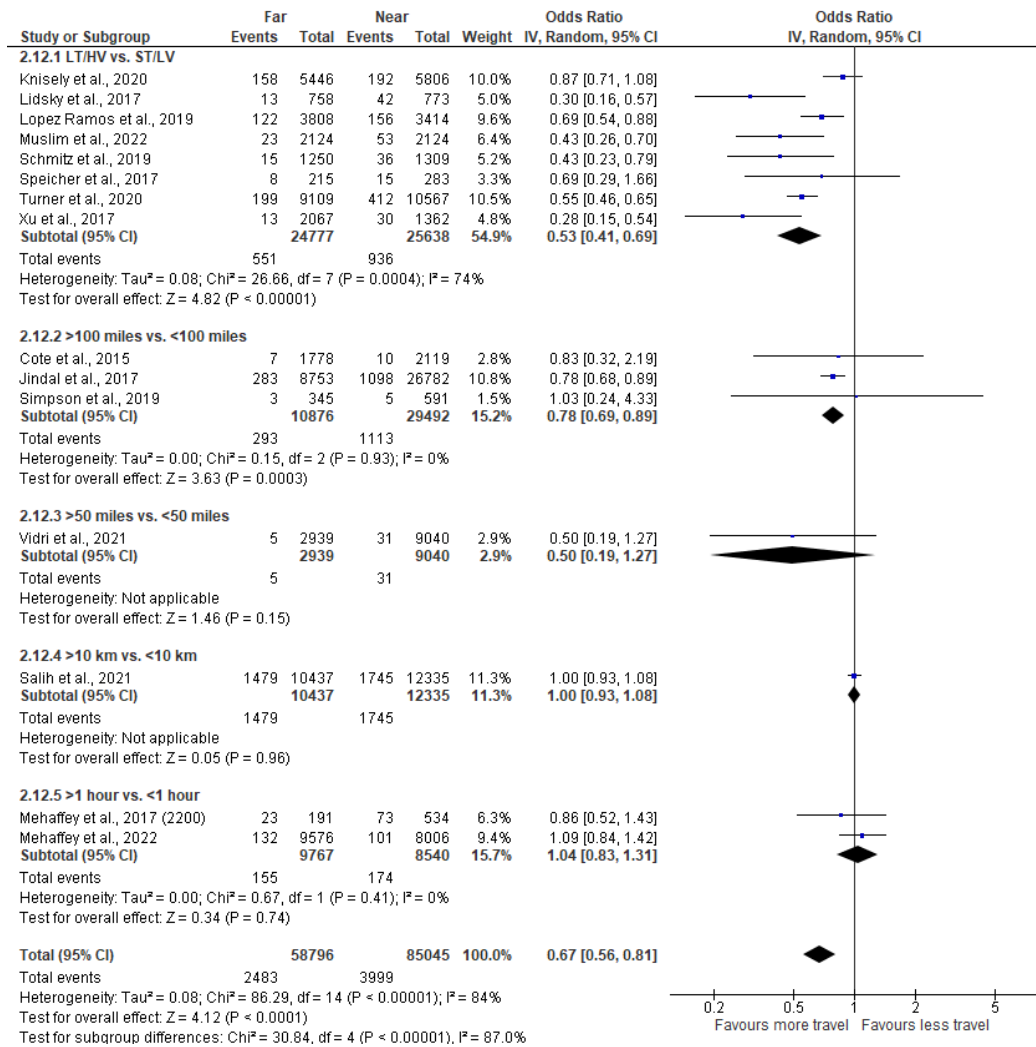
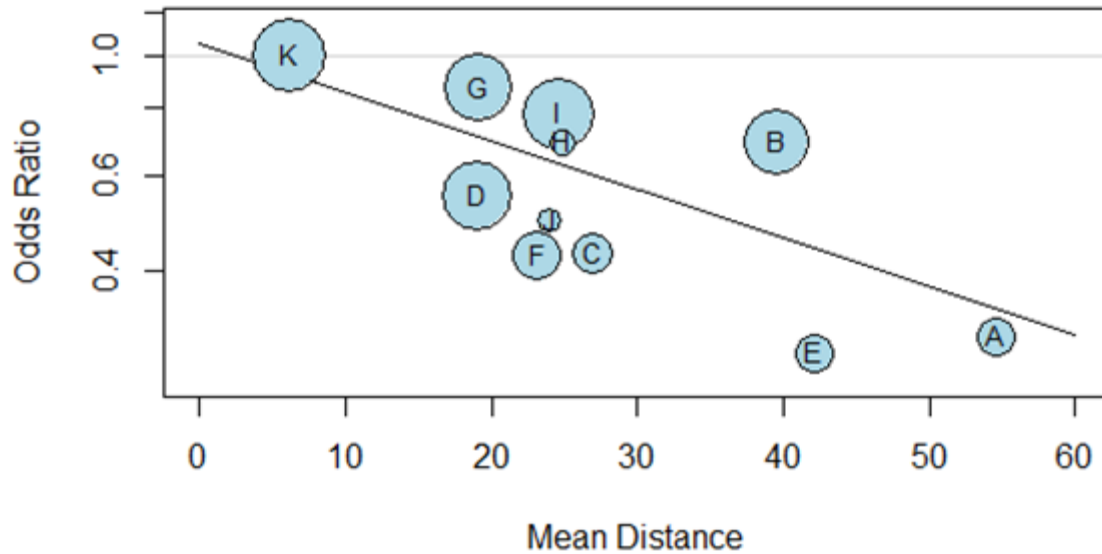


Figure 1 - Forest plot of unadjusted 30-day mortality for patients travelling for surgery, stratified by different time- or distance-travelled comparisons (Review Manager [Computer program]. Version 5.4. The Cochrane Collaboration, 2020).



*Note: A - Lidsky et al., 2017; B – Lopez Ramos et al., 2019; C – Schmitz et al., 2019; D – Turner et al., 2020; E – Xu et al., 2017; F – Muslim et al., 2022; G – Knisely et al., 2020; H – Speicher et al., 2017; I – Jindal et al., 2017; J – Vidri et al., 2021; K – Salih et al., 2021

Figure 2 - Meta-regression for 30-day mortality by mean study distance travelled, comparing patients travelling far and those not travelling far for surgery (R Statistical Software (v4.3.1; R Core Team 2023).