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# DESIGNING FOR DISTANCE: COVID-19'S IMPACT ON A LOS ANGELES VOTE CENTER

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## ABSTRACT

Due to the outbreak of COVID-19, concerns regarding public health and safety extend directly to elections; thus, in-person voting imposes new challenges for election administrators. This case study applies discrete-event simulation modeling to a COVID-19 election system and demonstrates that designing for processing changes, such as social distancing and equipment sanitization, differs from traditional elections. The separation of provisional voter check-ins, which reduced average time-in-system (ATS) and maximum time-in-system (MTS) in previous models, increased ATS (i.e., 54-65 minutes) and MTS (i.e., 75-100 minutes) in COVID models. When provisional check-ins were separated and check-in stations were relocated toward the vote center entrance, the ATS and MTS were significantly reduced (i.e., 9-19 minutes and 4-32 minutes, respectively). These findings indicate that election systems operating during COVID-19 require specific considerations rather than generalized recommendations.

## 1 INTRODUCTION

Coronavirus (COVID-19) concerns regarding health and safety extend directly to elections. Despite alternative voting options (NCSL 2020), in-person voting is still available. Election administrators must understand the impact that design decisions have on election planning and resource allocation, especially with COVID-19 safety precautions (i.e., social distancing, sanitization), to ensure healthy and safe elections (CDC 2020; CISA 2020). While these precautions are essential in mitigating the spread of COVID-19, methods for designing polling locations under new regulations are speculation, and the system impact of these decisions is mostly unknown. This case study explores the impact of strategies for COVID-19 through discrete-event simulations (DES) of a Los Angeles County (LAC) vote center.

## 2 LITERATURE REVIEW

Researchers have applied basic queuing theory and simulation models in voting (e.g., Edelstein and Edelstein 2010); however, these approaches often lack the specificity and granularity to represent the complexity of voting process behaviors. DES is a well-established domain and has demonstrated such in many applications, including healthcare and construction. Little research, however, has bridged the gap between election system research and advanced DES. This modeling approach is necessitated by the changes to voting processes per COVID-19 safety regulations (NCSL 2020). This study seeks to assess the impact of design decisions on an election system implementing COVID-19 specific changes.

## 3 CASE STUDY

Through a case study on a LAC vote center design, the impact on election systems implementing social distancing and equipment sanitization was investigated during the 2020 Presidential Primary Election. This study directly expands upon the DES models in Bernardo et al. (2020) to include COVID-19 regulations.

COVID-19 model adaptations reduced equipment quantities (i.e., 75 ballot marking devices [BMD] to 25) and path capacities (i.e., limited capacity on the path to maintain 6' distance) due to social distancing requirements and established an equipment sanitization process after each BMD use (i.e., triangular distribution [10, 15, 25] sec.). All other model aspects (e.g., routing, processing times) were kept from Bernardo et al. (2020). Alternative COVID-19 models were compared to the COVID-19 *Baseline* model, each replicated 100 times, by generating 99.3% confidence intervals (CI) (Bonferroni corrected 95% CI) on the differences in performance (i.e., average time-in-system [ATS], maximum time-in-system [MTS]).

## 4 RESULTS

Results, shown in Table 1, indicate that vote center design can significantly impact ATS and MTS in COVID-19 elections. Strategies that redirected voter flow and relocated check-in stations, both individually and in combination, did not differ substantially from the COVID-19 *Baseline* model. The separation of provisional voter check-in processing (*SPP*), individually and in conjunction with redirected, looping voter paths (*LVP*), demonstrate significant increases in ATS (i.e., 54-65 min. and 54-66 min., respectively) and MTS (i.e., 75-100 min. and 75-101 min., respectively). The combination of all design strategies (i.e., moved check-in stations [*MCS*], *LVP*, and *SPP*) also demonstrated an increase in ATS (57-69 min.) and MTS (81-107 min.). The model that included relocated check-in stations and the separation of provisional check-ins resulted in a significant reduction in ATS (9-19 min.) and MTS (4-32 min.).

Table 1: Significant model results.

| Model | Change in ATS (hrs) | Change in MTS (hrs) |
|---|---|---|
| SPP | -0.991 ± 0.094 | -1.463 ± 0.206 |
| SPP and LVP | -1.003 ± 0.096 | -1.471 ± 0.216 |
| SPP and MCS | 0.231 ± 0.090 | 0.297 ± 0.232 |
| SPP, LVP, and MCS | -1.045 ± 0.097 | -1.562 ± 0.217 |

Note: $p < 0.007$. Calculated as (*Baseline* - *Option*), negative values are an increase in time, positive values are a reduction in time.

## 5 DISCUSSION AND CONCLUSION

In Bernardo et al. (2020), models that separated the provisional voter check-in process demonstrated significant reductions in ATS and MTS. In the COVID-19 models of this study, however, this change does not exclusively result in ATS and MTS reductions. Separating the provisional check-ins in the COVID-19 model only demonstrates an improved system performance when combined with their relocation. These findings suggest that design considerations beneficial in a traditional election may not be as applicable, or may negatively impact system performance, in election systems with COVID-19 mitigation strategies in place. More work is required to fully understand the impacts and interactions between COVID-19 mitigation strategies and polling location design to inform resource allocation decisions and ensure voters are not disenfranchised by in-person voting.

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