COVID-19 Testing Supply Chain and Logistics Systems

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Abstract
Current guidance from scientists and epidemiologists highlights efficient and effective testing as the central pillar for controlling and eventually containing the spread of COVID-19. Since the pandemic began spreading in the United States in late February, the concern over testing has mostly shifted from a lack of tests to the need for more robust supply chains and logistics infrastructure to support wide-scale testing. Conflicts with lab and test site capacity, inadequate transportation strategies, testing material shortages, and widespread delays have created inconsistency in the time it takes for both patients and health services to receive test results. These delays make managing the spread of COVID-19 as well as contact tracing exponentially more difficult. This paper will examine the supply chain and logistics systems surrounding COVID-19 tests to understand current strategies, identifying shortcomings, and optimizing material distribution, sample collection, and laboratory networks for state and local entities.

Keywords
Supply Chain, Logistics, COVID-19, Testing, Laboratories

Biographies

Erik Ramazzini is a graduate student at Cal Poly pursuing a master's degree in Industrial Engineering. He has previously worked as a sales engineering intern for Air Treatment Corporation, an HVAC solutions company, and last summer he worked on a research project for Evidation that examined data analytics and standardization methods for patient-generated health data. He plans to continue his work with a slightly broadened scope for his master's thesis this year. Upon graduation, he would like to continue to work with data, either in consulting or analytics, to solve complex technology and business problems.

Ian Goulding is a fourth year Industrial Engineering student at Cal Poly, San Luis Obispo with a passion for utilizing systems thinking, analytics, and creative technologies to tackle complex problems. Previously, he has interned on a business software R&D team at Arrow Electronics and helped with the market expansion of a hearing protection device with Applied Research Associates, both in his hometown of Denver, Colorado. Upon graduating in June 2021, Mr. Goulding will be joining Deloitte Consulting as a Strategy Analyst in San Francisco, California.

Nolan Brown is an Industrial Engineering student in his fourth year at Cal Poly, San Luis Obispo. This past summer, he interned at Deloitte Consulting, and is planning on returning as an Analyst in their Business Technology Solutions practice in San Francisco, CA upon graduation. Before he starts his career, he's applying to do a one year master's degree in Engineering Management at Cal Poly. He hopes to continue to learn how to best use data analytics and visualization to power smart business decisions through his studies and eventual career.

Joseph Garcia is a fourth year industrial engineering student at Cal Poly San Luis Obispo, with interests in lean business practices and applications. He has previously worked for Webcor Builders on a process improvement project, which analyzed areas of waste and made recommendations for future project planning. He plans to keep expanding his knowledge in this field and to work for a business that allows him to apply lean principles to solve complex problems.

Mohamed Awwad is an Assistant Professor in the Department of Industrial and Manufacturing Engineering at California Polytechnic State University (Cal Poly), San Luis Obispo, CA. He received his Ph.D. and M.S. degrees in Industrial Engineering from the University of Central Florida, Orlando, FL, USA. Additionally, he holds M.S. and

B.S. degrees in Mechanical Engineering from Cairo University, Egypt. Before joining Cal Poly, San Luis Obispo, Dr. Awwad held several teaching and research positions at the State University of New York at Buffalo (SUNY Buffalo), the University of Missouri, Florida Polytechnic University, and the University of Central Florida. His research and teaching interests include applied operations research, logistics & supply chain, blockchain technology, distribution center design, unconventional logistics systems design, and OR applications in healthcare and the military.