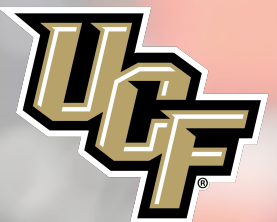**Team McQuarantine Milton**

IDS 6916

Introduction

- COVID is reshaping our lives from daily human interaction to the economy

- COVID transmission mitigation strategies vary by
  - Government
  - Location
  - Profession
  - Organization
  - Individual risk tolerance

- Who makes the mitigation decision?

- Is it based on data?

- Are decisions balancing risk vs reward?

Purpose

The purpose of the research is to determine if UCF football game attendance COVID countermeasures are appropriate in minimizing virus spread potential while maximizing attendance revenue.

Using an agent-based model, the study will determine predicted COVID transmission under current UCF football countermeasures and investigate higher attendance numbers under current mitigation strategies to determine if higher revenue is possible with nominal risk.
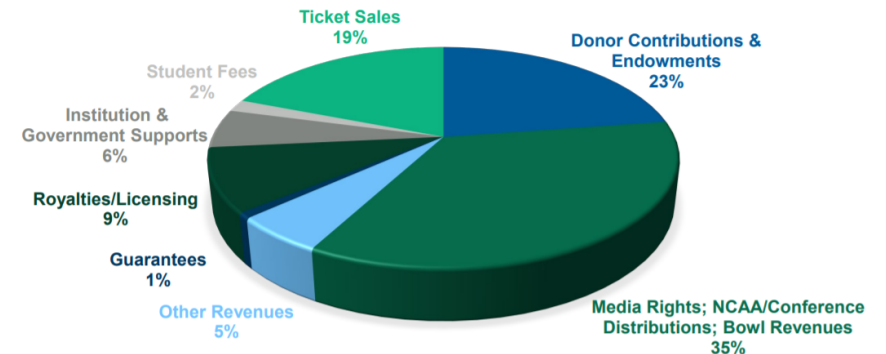
Context

Division I Net Operating Results Excluding Allocated Support (2005-2019)

- At 25% capacity, reduced ticket sales will equate to a $3,719,552 loss in revenue for UCF (out of a 70m budget).

- Our research suggests the 25% capacity limitation is not driven by data or science.
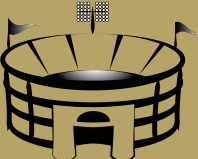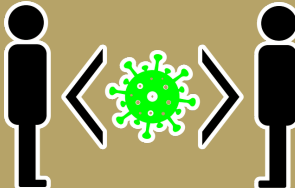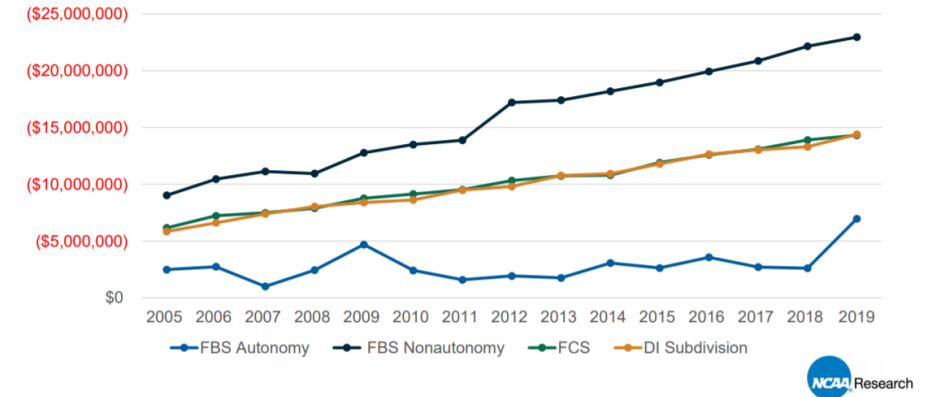

FBS Autonomy Schools: Where the Money Comes From

Research question

Are current COVID football attendance limitation and social distancing strategies appropriate for maximizing attendance and minimizing transmission risk, while controlling for the masked COVID transmission rate?

VARIABLES		
Independent	**Dependent**	**Control**
Stadium capacity and social distancing (group size), group strategy	transmission rate, number of contacts	Masked interpersonal transmission rate

Hypothesis

The number of expected infections proportional to the squared value of the attendance.

The group size does affect the number of infections (or number of contacts).

The number of expected infections is proportional to the group size.

The number of infections is not proportional to attendance capacity

Lit Highlights

- Chu et al. (2020) – large meta-analysis paper identifying 172 observational studies across 16 countries, six continents, with no randomized controlled trials and 44 relevant comparative studies in health-care and non-healthcare settings.
  - 25,697 patients
  - Transmission of viruses was lower with physical distancing of 1 m or more, compared with less than 1 m
  - In the figure – across 29 unadjusted and nine adjusted studies : shows strong association was found between proximity of exposed individual with risk of infection
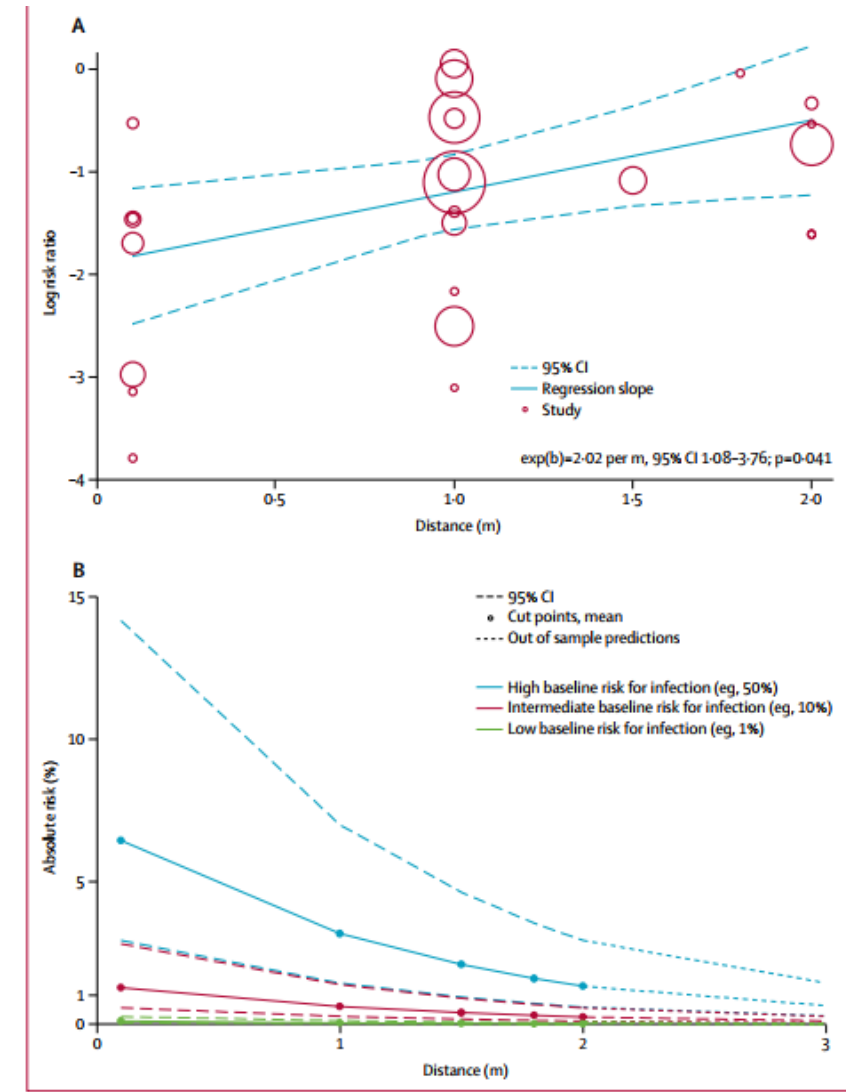
- Estimation of R_0 (Jarvis, et al.) in the United Kingdom (UK)
- R_0 is the potential of transmission of a disease
  - $R_0 < 1$ — each existing infection causes less than one new infection
  - $R_0 = 1$ — each existing infection causes one new infection
  - $R_0 > 1$ — each existing infection causes more than one new infection. May cause an outbreak or epidemic.

- Participation data: survey data
  - 1356 UK participants
  - Recorded 3849 contacts
- R_0 prior to lockdown = 2.6
- Current R_0 estimation (under current social distancing measures) — 0.62
  - 95% Confidence Interval [CI] 0.37 — 0.89)
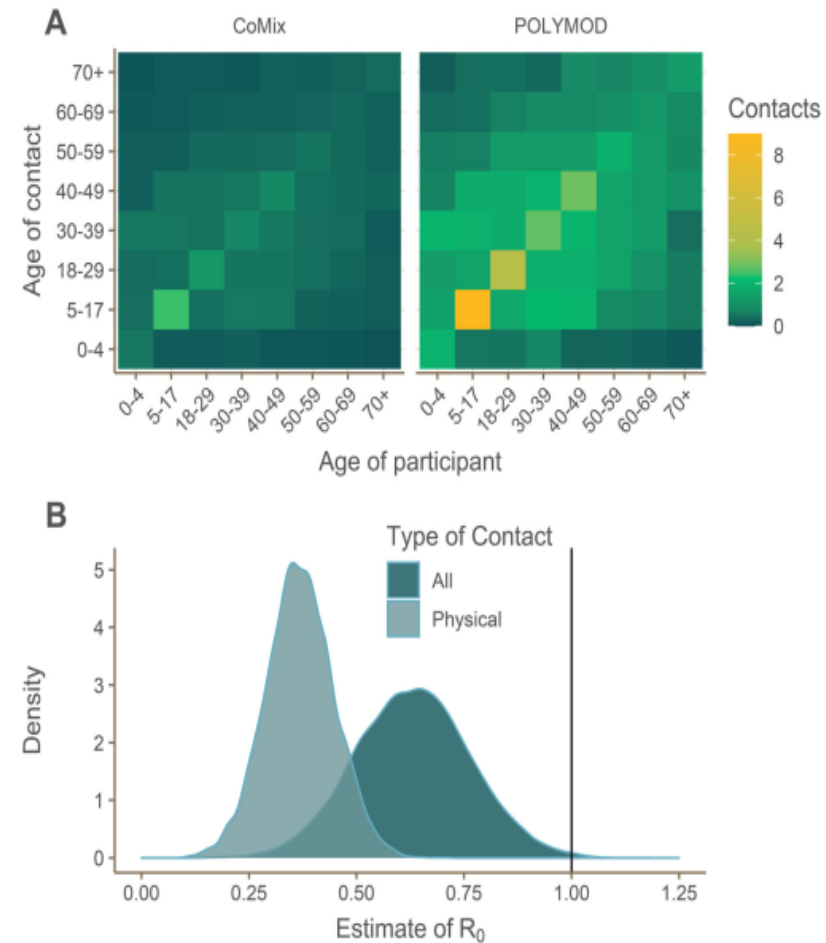 - Based on all types of contact

Fig. 1 Comparison of CoMix and POLYMOD contact matrices and estimated reduction in reproduction number due to physical distancing for all and physical (skin to skin) contacts separately. **a** Social contact matrices showing the average total number of daily reported contacts made by participants in different age groups with individuals in other age groups, with results shown for all contacts reported in the CoMix and POLYMOD data. Participants' contacts in CoMix for age groups 0–4 and 5–17 are imputed using the POLYMOD data. **b** The estimated value of R_0 at the time of the survey, assuming values of $R_0 \sim$ Norm (2.6, SD = 0.54) prior to physical distancing reducing all contacts for all and physical (skin to skin) contacts

Methodology

- Participants
  - 1,600 agent spectators
  - 6' contact zone
  - Grouping behaviors
  - Food/bathroom behaviors
- Materials / Apparatus
  - Anylogic agent model
  - Anylogic SIR model
- Design
  - Dependent Variables
    - Infected agent contacts
    - SIR infection rate
  - Independent Variables
    - Atendence capacity
    - Attendee group size
    - SIR I0
  - Control
    - Mask Wearing

- Procedure
  - See table
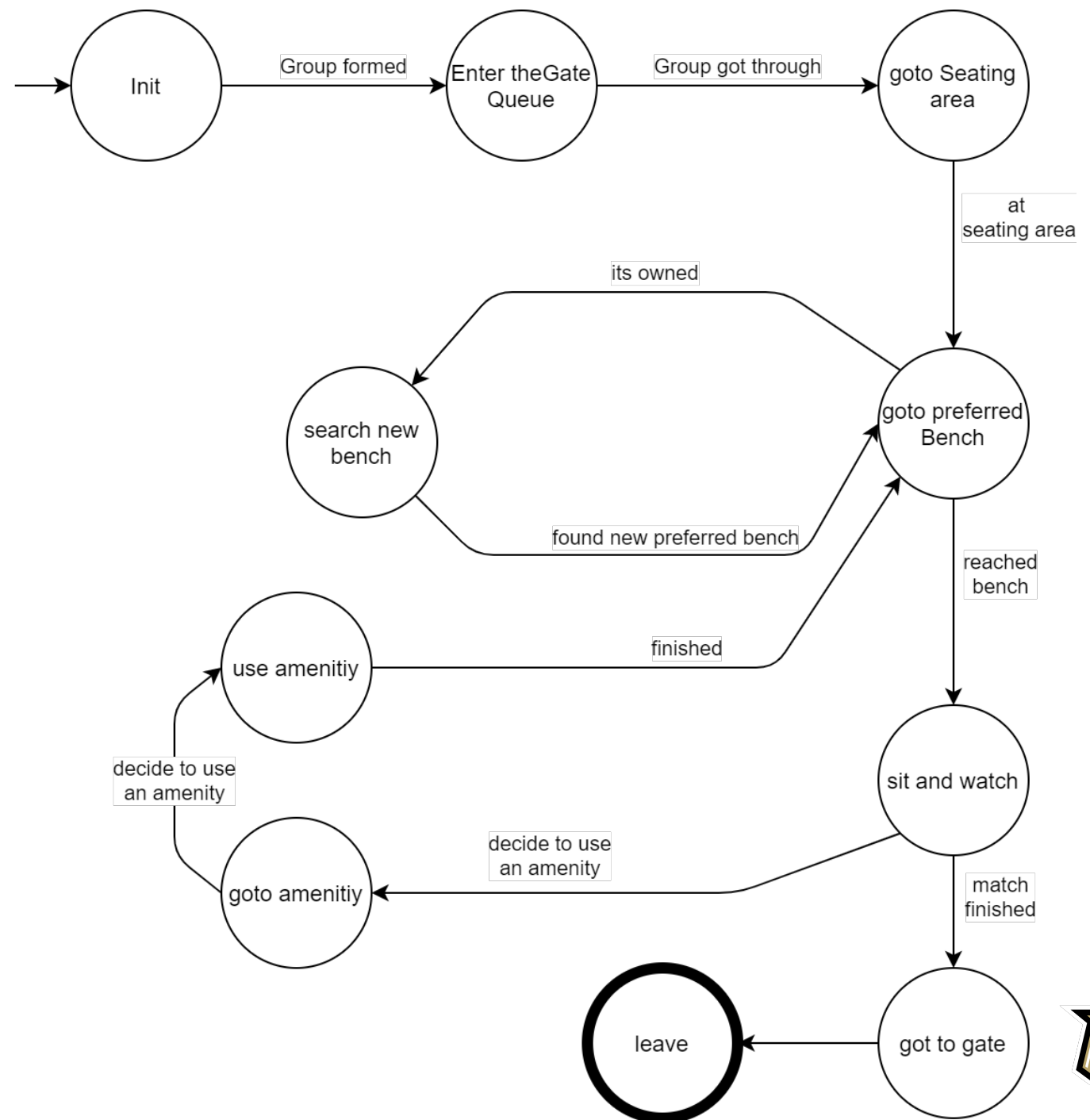- Expected Measure
  - Agent contacts
  - Infection rate
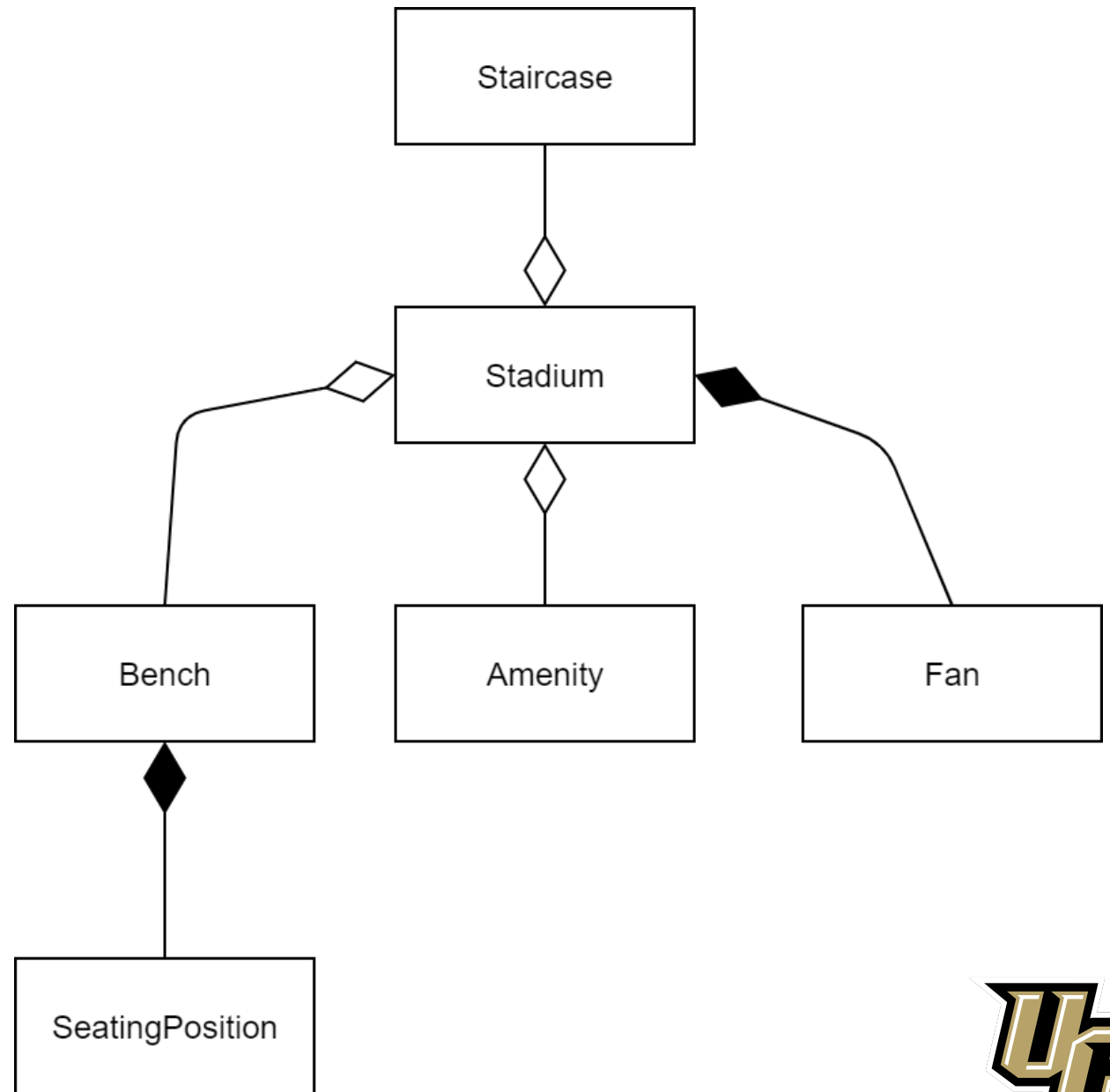
Example: Results table

RunNo.	Prob of Infection: [0.5 (no-mask), 0.25 (mask)]	Social-distancing (T/ F)	Group size (1,2,4)	Attendance	RESULTS (num of contacts)	RESULT (infections)
25						
50						
50<						

Class Diagram

Demo | *Baseline Model*

Transmission Modeling

- Ro value based on number of contacts
- Use SEIR model to find number of contact driven infections
  - Considering E, incubation period, limits secondary transmission.