

# Notebook #8 (final)

This is the final notebook created for the Simulation ISYE-6644 project.

Key features:

- models incoming clients arrival rate based on seasonality
- incorporates full client families (woman and children)
- incorporates variability of stay based on the condition of the victim (the various cases are detailed [here](#))
- models undisclosed hotel accomodation for life threatening cases
- very flexible. Allows modifying # of simulation runs, duration of simulation, weight of incoming client case-type, arrival rates and much more.

This notebook generates data (csv) and graphs which are then expanded in detail in the project documentation [here](#)

## The shelter model code:

In [15]:

```
#import all them libraries!

import math
import numpy as np
import pandas as pd
import random
from scipy.stats import poisson
from scipy.stats import beta
from scipy.stats import bernoulli
import matplotlib.pyplot as plt
import simpy
from datetime import datetime
import csv
```

In [20]:

```
#GLOBAL VARIABLES
#These make the model highly configurable.

RANDOM_SEED = 42 # not used
NUM_BEDS = 35 # Number of beds in the shelter
MAX_FAMILY_SIZE = 6 # maximum # of people in the client's family (mom and children)
CASE_DISTRIBUTION = [0.25, 0.25, 0.25, 0.25] # ratio of clients showing up [CAPABLE, CULTU
POISSON_ARRIVAL_JAN_AUG = 10 #a family every 10 days
POISSON_ARRIVAL_SEP_DEC = 5 # a family every 5 days
PROB_THAT_CLIENTS_LIFE_IS_THREATENED = 0.10 #these clients need to be sent to undisclosed
SIM_TIME = 365*1 # Simulation time in days
NUMBER_OF_RUNS=3 # the number of simulation iterations we wish to run
```

```
class ShelterData(object):
    # an instance of this class allows for a persisted data structure across multiple sim
    # where all the details of the simulation can be captured.
    def __init__(self):
        self.data_table = pd.DataFrame({
            'run_number' : [],
            'day': [],
            'month' : [],
            'sent_to_hotel' : [],
            'ppl_turned_away': [],
            'shelter_capacity_left': [],
            'client_case1': [],
            'client_case2': [],
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        'client_case3': [],
        'client_case4': []
    })

def append_shelter_data(self, data_array):
    df2 = pd.DataFrame({
        'run_number' : [data_array[0]],
        'day': [data_array[1]],
        'month' : [data_array[2]],
        'sent_to_hotel' : [data_array[3]],
        'ppl_turned_away': [data_array[4]],
        'shelter_capacity_left': [data_array[5]],
        'client_case1': [data_array[6]],
        'client_case2': [data_array[7]],
        'client_case3': [data_array[8]],
        'client_case4': [data_array[9]]
    })

    return pd.concat([self.data_table, df2])

class Shelter(object):
    # the Shelter class is a simpy resource.
    # It keeps track of clients sent to hotel or referred out to families because of no va
    # It is also able to generate the duration of stay for the client and her family based

    referred_clients = 0
    day_of_year = 1

    def __init__(self, env, num_beds):
        self.env = env
        self.shelter = simpy.Resource(env, num_beds)
        print('~SIMULATION STARTUP~ Shelter has {} beds available'.format(NUM_BEDS - sel
        #self.staytime = staytime
        self.referred_clients = 0
        self.sent_to_hotel = 0

    def get_count_of_referred_clients():
        return self.referred_clients

    def increment_count_of_referred_clients():
        self.referred_clients += 1

    def stay2(self, client_name, family_size, case):
        #simulates duration of stay for client (and family, if applicable)
        #based on her case (CAPABLE=1, CULTURAL=2, MENTAL=3, SKILLS=4)

        if case == 1 : # Capable and quickly back on their feet
            stay_duration = random.randint(7, 2*30)
        elif case == 2: #Language and cultural barrier
            stay_duration = random.randint(9*30, 12*30)
        elif case == 3: #Mental barrier
            stay_duration = random.randint(4*30, 9*30) # TODO this is a long tailed distr
            #need to change
        elif case == 4:
            stay_duration = random.randint(2*30, 6*30)

        return stay_duration

    def month(day_num):
        #receives simulation day number and returns the month.
        #example: receives 32 returns 02 (as the 32nd day of run is feb 1st)
        if day_num == 1095:
            day_num = 1094 # otherwise the last day of the run turns into january!
        day_num = day_num % 365

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if day_num == 0:
    day_num = 1
year = "2022"
# converting to date
month = datetime.strptime(year + "-" + str(day_num), "%Y-%j").strftime("%m")
return month

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def number_of_days_next_client_turns_up(current_day):
    #if the day is within first 8 months (Jan - Aug), the rate of clients coming in is slow
    # than if its between 9-12th (Sept-Dec) months.
    # there should be an option in simpy to find the day of the simulation too
    # 242 days === January 1, 2022 - August 31, 2022
    if current_day < 242:
        return poisson.rvs(POISSON_ARRIVAL_JAN_AUG)
    else:
        return poisson.rvs(POISSON_ARRIVAL_SEP_DEC)

def client_family_size():
    return random.randint(1, MAX_FAMILY_SIZE)

def client_case_type():
    caseList = [1,2,3,4]
    return random.choices(caseList, weights=CASE_DISTRIBUTION, k=1)[0]

def client(env, client_name, family_size, case_type, shelter_object, shelter_data_object,
    # This is the workhorse of the model.
    # The client process (each client has a client_name) arrives potentially
    # with family (family_size) with a condition (case_type) at the shelter
    # and requests bed(s). The client code handles three type of cases
    # 1. sends client (and family) to hotel in case of life threatening emergency
    # 2. turns client (and family) away to friends/family if there is no vacancy in shelter
    # 3. if there is vacancy, admits the client (and family) to shelter for a variable duration
    # the duration of stay is Based on clients needs and returned by Shelter.

    if (bernoulli.rvs(PROB_THAT_CLIENTS_LIFE_IS_THREATENED, size=1)[0] == 1):
        #this clients life is under threat, and needs to be sent to a hotel
        shelter_object.sent_to_hotel += family_size
        print("(day {})\t[client] Shelter has sent {} clients (including their family members)
            with life-threatening situations to undisclosed hotels."
            .format(env.now, shelter_object.sent_to_hotel))

        # event! shelter just sent people to hotel, write to the pandas data_table:
        #first , prepare case_array, (all zeros here)
        case_array = [0,0,0,0]
        data_array = [run_number,env.now+1,month(env.now+1),
            shelter_object.sent_to_hotel,
            shelter_object.referred_clients,
            NUM_BEDS - shelter_object.shelter.count]

        #finally, append both data_array and case_array and shove that into the data_table
        shelter_data_object.data_table = shelter_data_object.append_shelter_data(np.append(case_array, data_array))
        #pd.set_option('expand_frame_repr', False)
        #print(shelter_data_object.data_table)

    else:
        # so the client is not under threat.
        # this code block checks if there is room in shelter or not and acts accordingly:
        if (
            (NUM_BEDS - shelter_object.shelter.count == 0) or
            (NUM_BEDS - shelter_object.shelter.count < family_size)):
            # no vacancy!

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print("(day {})\t[client] !!!SHELTER AT CAPACITY. only {} available beds. Ref
        .format(env.now,
                NUM_BEDS - shelter_object.shelter.count,
                client_name,
                family_size))

shelter_object.referred_clients += family_size
print("(day {})\t[client] Shelter has unfortunately turned {} clients (includi
        .format(env.now, shelter_object.referred_clients))

# event! shelter just turned away people, write to the pandas data_table:
#first , prepare case_array, (all zeros here)
case_array = [0,0,0,0]
data_array = [run_number,env.now+1,month(env.now+1),
                shelter_object.sent_to_hotel,
                shelter_object.referred_clients,
                NUM_BEDS - shelter_object.shelter.count]

#finally, append both data_array and case_array and shove that into the data_t
shelter_data_object.data_table = shelter_data_object.append_shelter_data(np.ar
#pd.set_option('expand_frame_repr', False)
#print(shelter_data_object.data_table)

else:
    #we have vacancy! lets admit client and family into shelter, (and consume the
    print('(day {})\t[client] {} (family size = {}, case type = {}) arrives the sh
            .format(env.now, client_name,
                    family_size,
                    case_type,
                    NUM_BEDS - shelter_object.shelter.count))

beds_taken = []

for i in range(family_size):
    #this code consume the shelter resource (aka decrements is by family_size,
    beds_taken.append(shelter_object.shelter.request())
    print("(day {})\t[client] {}, family member {} went into shelter\tavailabl
            .format(env.now, client_name, i, NUM_BEDS - shelter_object.shelter.c

# event! client and family just went into shelter, write to the pandas data_t
#first , prepare case_array
case_array = []

if case_type == 1:
    case_array = [family_size,0,0,0]
elif case_type == 2:
    case_array = [0,family_size,0,0]
elif case_type == 3:
    case_array = [0,0,family_size,0]
elif case_type == 4:
    case_array = [0,0,0,family_size]
#second , prepare data_array
data_array = [run_number,env.now+1,month(env.now+1),
                shelter_object.sent_to_hotel,
                shelter_object.referred_clients,
                NUM_BEDS - shelter_object.shelter.count]

#finally, append both data_array and case_array and shove that into the data_t
shelter_data_object.data_table = shelter_data_object.append_shelter_data(np.ar

# the client and her family's stay starts:
yield env.timeout(shelter_object.stay2(client_name,family_size,case_type))
# the timeout sends this client process to stack. when the timeout completes,
# the client's stay is complete

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        for i in range(family_size):
            shelter_object.shelter.release(beds_taken[i])
            print("(day {})\t[client] {}, family member {} came out of shelter\tavailable
                  .format(env.now, client_name, i, NUM_BEDS - shelter_object.shelter.c

#event! the client and fam just left shelter, update data_table:
#first, invert the case_array (as the peeps are leaving)
case_array = -1*np.array(case_array)
#second, create data_array:

data_array = [run_number,env.now+1,month(env.now+1),
               shelter_object.sent_to_hotel,
               shelter_object.referred_clients,
               NUM_BEDS - shelter_object.shelter.count]
#finally, append both data_array and case_array and shove that into the data_t
shelter_data_object.data_table = shelter_data_object.append_shelter_data(np.ar
#pd.set_option('expand_frame_repr', False)
#print(shelter_data_object.data_table)

print('(day {})\t[client] {} (family size = {}, case type = {}) LEAVES the she
      .format(env.now,
               client_name,
               family_size,
               case_type,
               NUM_BEDS - shelter_object.shelter.count)
    )

def setup(env, num_beds, ds, run_nbr):
    # sets up the shelter model

    # Create the shelter object
    shelter = Shelter(env, num_beds)

    # Create 4 initial clients
    for client_number in range(4):
        env.process(
            client(
                env,
                'Client %d' % client_number,
                client_family_size(),
                client_case_type(),
                shelter,
                ds,
                run_nbr))

    # Create more clients while the simulation is running
    while True:
        # the following code calls a function which returns the number of days after which
        # client(+family) shows up
        yield env.timeout(number_of_days_next_client_turns_up(env.now))
        client_number += 1
        env.process(
            client(env,
                'Client %i' % client_number,
                client_family_size(),
                client_case_type(),
                shelter,
                ds,
                run_nbr))

#~~~~~ MAIN ~~~~~#

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#create a persisted shelter data object
shelter_data = ShelterData()

# Setup and start the simulation
random.seed(RANDOM_SEED)  # This helps reproducing the results

for run_nbr in range(NUMBER_OF_RUNS):
    # Create/Reset environment and start the setup process
    env = simpy.Environment()
    env.process(setup(env, NUM_BEDS, shelter_data, run_nbr+1))
    #execute!
    env.run(until=SIM_TIME)

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~~SIMULATION STARTUP~~ Shelter has 35 beds available
(day 0) [client] Client 0 (family size = 6, case type = 1) arrives the shelter  available
beds 35.
(day 0) [client] Client 0, family member 0 went into shelter      available_beds 34
(day 0) [client] Client 0, family member 1 went into shelter      available_beds 33
(day 0) [client] Client 0, family member 2 went into shelter      available_beds 32
(day 0) [client] Client 0, family member 3 went into shelter      available_beds 31
(day 0) [client] Client 0, family member 4 went into shelter      available_beds 30
(day 0) [client] Client 0, family member 5 went into shelter      available_beds 29
(day 0) [client] Client 1 (family size = 6, case type = 2) arrives the shelter  available
beds 29.
(day 0) [client] Client 1, family member 0 went into shelter      available_beds 28
(day 0) [client] Client 1, family member 1 went into shelter      available_beds 27
(day 0) [client] Client 1, family member 2 went into shelter      available_beds 26
(day 0) [client] Client 1, family member 3 went into shelter      available_beds 25
(day 0) [client] Client 1, family member 4 went into shelter      available_beds 24
(day 0) [client] Client 1, family member 5 went into shelter      available_beds 23
(day 0) [client] Client 2 (family size = 2, case type = 1) arrives the shelter  available
beds 23.
(day 0) [client] Client 2, family member 0 went into shelter      available_beds 22
(day 0) [client] Client 2, family member 1 went into shelter      available_beds 21
(day 0) [client] Shelter has sent 1 clients (including their family members)
with life-threatening situations to undisclosed hotels.
(day 13)          [client] Client 4 (family size = 4, case type = 1) arrives the shelter  av
ailable beds 21.
(day 13)          [client] Client 4, family member 0 went into shelter      available_beds 20
(day 13)          [client] Client 4, family member 1 went into shelter      available_beds 19
(day 13)          [client] Client 4, family member 2 went into shelter      available_beds 18
(day 13)          [client] Client 4, family member 3 went into shelter      available_beds 17
(day 23)          [client] Client 5 (family size = 2, case type = 1) arrives the shelter  av
ailable beds 17.
(day 23)          [client] Client 5, family member 0 went into shelter      available_beds 16
(day 23)          [client] Client 5, family member 1 went into shelter      available_beds 15
(day 25)          [client] Client 4, family member 0 came out of shelter  available_beds 16
(day 25)          [client] Client 4, family member 1 came out of shelter  available_beds 17
(day 25)          [client] Client 4, family member 2 came out of shelter  available_beds 18
(day 25)          [client] Client 4, family member 3 came out of shelter  available_beds 19
(day 25)          [client] Client 4 (family size = 4, case type = 1) LEAVES the shelter  av
ailable beds 19
(day 34)          [client] Client 6 (family size = 1, case type = 3) arrives the shelter  av
ailable beds 19.
(day 34)          [client] Client 6, family member 0 went into shelter      available_beds 18
(day 41)          [client] Client 0, family member 0 came out of shelter  available_beds 19
(day 41)          [client] Client 0, family member 1 came out of shelter  available_beds 20
(day 41)          [client] Client 0, family member 2 came out of shelter  available_beds 21
(day 41)          [client] Client 0, family member 3 came out of shelter  available_beds 22
(day 41)          [client] Client 0, family member 4 came out of shelter  available_beds 23
(day 41)          [client] Client 0, family member 5 came out of shelter  available_beds 24
(day 41)          [client] Client 0 (family size = 6, case type = 1) LEAVES the shelter  av
ailable beds 24

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(day 42) [client] Client 7 (family size = 4, case type = 1) arrives the shelter available beds 24.

(day 42) [client] Client 7, family member 0 went into shelter available\_beds 23

(day 42) [client] Client 7, family member 1 went into shelter available\_beds 22

(day 42) [client] Client 7, family member 2 went into shelter available\_beds 21

(day 42) [client] Client 7, family member 3 went into shelter available\_beds 20

(day 44) [client] Client 2, family member 0 came out of shelter available\_beds 21

(day 44) [client] Client 2, family member 1 came out of shelter available\_beds 22

(day 44) [client] Client 2 (family size = 2, case type = 1) LEAVES the shelter available beds 22

(day 50) [client] Client 8 (family size = 3, case type = 4) arrives the shelter available beds 22.

(day 50) [client] Client 8, family member 0 went into shelter available\_beds 21

(day 50) [client] Client 8, family member 1 went into shelter available\_beds 20

(day 50) [client] Client 8, family member 2 went into shelter available\_beds 19

(day 63) [client] Client 9 (family size = 2, case type = 3) arrives the shelter available beds 19.

(day 63) [client] Client 9, family member 0 went into shelter available\_beds 18

(day 63) [client] Client 9, family member 1 went into shelter available\_beds 17

(day 68) [client] Client 5, family member 0 came out of shelter available\_beds 18

(day 68) [client] Client 5, family member 1 came out of shelter available\_beds 19

(day 68) [client] Client 5 (family size = 2, case type = 1) LEAVES the shelter available beds 19

(day 72) [client] Client 10 (family size = 3, case type = 1) arrives the shelter available beds 19.

(day 72) [client] Client 10, family member 0 went into shelter available\_beds 18

(day 72) [client] Client 10, family member 1 went into shelter available\_beds 17

(day 72) [client] Client 10, family member 2 went into shelter available\_beds 16

(day 86) [client] Client 7, family member 0 came out of shelter available\_beds 17

(day 86) [client] Client 7, family member 1 came out of shelter available\_beds 18

(day 86) [client] Client 7, family member 2 came out of shelter available\_beds 19

(day 86) [client] Client 7, family member 3 came out of shelter available\_beds 20

(day 86) [client] Client 7 (family size = 4, case type = 1) LEAVES the shelter available beds 20

(day 86) [client] Client 11 (family size = 3, case type = 1) arrives the shelter available beds 20.

(day 86) [client] Client 11, family member 0 went into shelter available\_beds 19

(day 86) [client] Client 11, family member 1 went into shelter available\_beds 18

(day 86) [client] Client 11, family member 2 went into shelter available\_beds 17

(day 94) [client] Shelter has sent 2 clients (including their family members) with life-threatening situations to undisclosed hotels.

(day 98) [client] Client 13 (family size = 3, case type = 3) arrives the shelter available beds 17.

(day 98) [client] Client 13, family member 0 went into shelter available\_beds 16

(day 98) [client] Client 13, family member 1 went into shelter available\_beds 15

(day 98) [client] Client 13, family member 2 went into shelter available\_beds 14

(day 110) [client] Client 8, family member 0 came out of shelter available\_beds 15

(day 110) [client] Client 8, family member 1 came out of shelter available\_beds 16

(day 110) [client] Client 8, family member 2 came out of shelter available\_beds 17

(day 110) [client] Client 8 (family size = 3, case type = 4) LEAVES the shelter available beds 17

(day 111) [client] Client 14 (family size = 6, case type = 2) arrives the shelter available beds 17.

(day 111) [client] Client 14, family member 0 went into shelter available\_beds 16

(day 111) [client] Client 14, family member 1 went into shelter available\_beds 15

(day 111) [client] Client 14, family member 2 went into shelter available\_beds 14

(day 111) [client] Client 14, family member 3 went into shelter available\_beds 13

(day 111) [client] Client 14, family member 4 went into shelter available\_beds 12

(day 111) [client] Client 14, family member 5 went into shelter available\_beds 11

(day 117) [client] Client 11, family member 0 came out of shelter available\_beds 12

(day 117) [client] Client 11, family member 1 came out of shelter available\_beds 13

(day 117) [client] Client 11, family member 2 came out of shelter available\_beds 14

(day 117) [client] Client 11 (family size = 3, case type = 1) LEAVES the shelter available beds 14

(day 124) [client] Client 15 (family size = 4, case type = 1) arrives the shelter available beds 14.

(day 124) [client] Client 15, family member 0 went into shelter available\_beds 13  
 (day 124) [client] Client 15, family member 1 went into shelter available\_beds 12  
 (day 124) [client] Client 15, family member 2 went into shelter available\_beds 11  
 (day 124) [client] Client 15, family member 3 went into shelter available\_beds 10  
 (day 127) [client] Client 10, family member 0 came out of shelter available\_beds 11  
 (day 127) [client] Client 10, family member 1 came out of shelter available\_beds 12  
 (day 127) [client] Client 10, family member 2 came out of shelter available\_beds 13  
 (day 127) [client] Client 10 (family size = 3, case type = 1) LEAVES the shelter av  
 available beds 13  
 (day 142) [client] Client 16 (family size = 6, case type = 3) arrives the shelter av  
 available beds 13.  
 (day 142) [client] Client 16, family member 0 went into shelter available\_beds 12  
 (day 142) [client] Client 16, family member 1 went into shelter available\_beds 11  
 (day 142) [client] Client 16, family member 2 went into shelter available\_beds 10  
 (day 142) [client] Client 16, family member 3 went into shelter available\_beds 9  
 (day 142) [client] Client 16, family member 4 went into shelter available\_beds 8  
 (day 142) [client] Client 16, family member 5 went into shelter available\_beds 7  
 (day 149) [client] Client 15, family member 0 came out of shelter available\_beds 8  
 (day 149) [client] Client 15, family member 1 came out of shelter available\_beds 9  
 (day 149) [client] Client 15, family member 2 came out of shelter available\_beds 10  
 (day 149) [client] Client 15, family member 3 came out of shelter available\_beds 11  
 (day 149) [client] Client 15 (family size = 4, case type = 1) LEAVES the shelter av  
 available beds 11  
 (day 153) [client] Client 17 (family size = 5, case type = 1) arrives the shelter av  
 available beds 11.  
 (day 153) [client] Client 17, family member 0 went into shelter available\_beds 10  
 (day 153) [client] Client 17, family member 1 went into shelter available\_beds 9  
 (day 153) [client] Client 17, family member 2 went into shelter available\_beds 8  
 (day 153) [client] Client 17, family member 3 went into shelter available\_beds 7  
 (day 153) [client] Client 17, family member 4 went into shelter available\_beds 6  
 (day 162) [client] Client 18 (family size = 1, case type = 3) arrives the shelter av  
 available beds 6.  
 (day 162) [client] Client 18, family member 0 went into shelter available\_beds 5  
 (day 164) [client] Client 17, family member 0 came out of shelter available\_beds 6  
 (day 164) [client] Client 17, family member 1 came out of shelter available\_beds 7  
 (day 164) [client] Client 17, family member 2 came out of shelter available\_beds 8  
 (day 164) [client] Client 17, family member 3 came out of shelter available\_beds 9  
 (day 164) [client] Client 17, family member 4 came out of shelter available\_beds 10  
 (day 164) [client] Client 17 (family size = 5, case type = 1) LEAVES the shelter av  
 available beds 10  
 (day 174) [client] Client 19 (family size = 1, case type = 4) arrives the shelter av  
 available beds 10.  
 (day 174) [client] Client 19, family member 0 went into shelter available\_beds 9  
 (day 184) [client] Shelter has sent 3 clients (including their family members)  
 with life-threatening situations to undisclosed hotels.  
 (day 191) [client] Client 21 (family size = 4, case type = 3) arrives the shelter av  
 available beds 9.  
 (day 191) [client] Client 21, family member 0 went into shelter available\_beds 8  
 (day 191) [client] Client 21, family member 1 went into shelter available\_beds 7  
 (day 191) [client] Client 21, family member 2 went into shelter available\_beds 6  
 (day 191) [client] Client 21, family member 3 went into shelter available\_beds 5  
 (day 209) [client] Shelter has sent 5 clients (including their family members)  
 with life-threatening situations to undisclosed hotels.  
 (day 221) [client] Client 23 (family size = 2, case type = 3) arrives the shelter av  
 available beds 5.  
 (day 221) [client] Client 23, family member 0 went into shelter available\_beds 4  
 (day 221) [client] Client 23, family member 1 went into shelter available\_beds 3  
 (day 229) [client] Client 13, family member 0 came out of shelter available\_beds 4  
 (day 229) [client] Client 13, family member 1 came out of shelter available\_beds 5  
 (day 229) [client] Client 13, family member 2 came out of shelter available\_beds 6  
 (day 229) [client] Client 13 (family size = 3, case type = 3) LEAVES the shelter av  
 available beds 6  
 (day 231) [client] Client 24 (family size = 5, case type = 3) arrives the shelter av  
 available beds 6.  
 (day 231) [client] Client 24, family member 0 went into shelter available\_beds 5  
 (day 231) [client] Client 24, family member 1 went into shelter available\_beds 4



(day 231) [client] Client 24, family member 2 went into shelter available\_beds 3  
(day 231) [client] Client 24, family member 3 went into shelter available\_beds 2  
(day 231) [client] Client 24, family member 4 went into shelter available\_beds 1  
(day 240) [client] Shelter has sent 11 clients (including their family members)  
with life-threatening situations to undisclosed hotels.  
(day 246) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 26 family of 4  
(day 246) [client] Shelter has unfortunately turned 4 clients (including their family members) away thus far.  
(day 253) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 27 family of 6  
(day 253) [client] Shelter has unfortunately turned 10 clients (including their family members) away thus far.  
(day 257) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 28 family of 2  
(day 257) [client] Shelter has unfortunately turned 12 clients (including their family members) away thus far.  
(day 266) [client] Client 29 (family size = 1, case type = 1) arrives the shelter available\_beds 1.  
(day 266) [client] Client 29, family member 0 went into shelter available\_beds 0  
(day 270) [client] Client 9, family member 0 came out of shelter available\_beds 1  
(day 270) [client] Client 9, family member 1 came out of shelter available\_beds 2  
(day 270) [client] Client 9 (family size = 2, case type = 3) LEAVES the shelter available\_beds 2  
(day 271) [client] !!!!SHELTER AT CAPACITY. only 2 available beds. Referring out Client 30 family of 3  
(day 271) [client] Shelter has unfortunately turned 15 clients (including their family members) away thus far.  
(day 275) [client] Client 29, family member 0 came out of shelter available\_beds 3  
(day 275) [client] Client 29 (family size = 1, case type = 1) LEAVES the shelter available\_beds 3  
(day 277) [client] Client 31 (family size = 1, case type = 1) arrives the shelter available\_beds 3.  
(day 277) [client] Client 31, family member 0 went into shelter available\_beds 2  
(day 281) [client] Client 1, family member 0 came out of shelter available\_beds 3  
(day 281) [client] Client 1, family member 1 came out of shelter available\_beds 4  
(day 281) [client] Client 1, family member 2 came out of shelter available\_beds 5  
(day 281) [client] Client 1, family member 3 came out of shelter available\_beds 6  
(day 281) [client] Client 1, family member 4 came out of shelter available\_beds 7  
(day 281) [client] Client 1, family member 5 came out of shelter available\_beds 8  
(day 281) [client] Client 1 (family size = 6, case type = 2) LEAVES the shelter available\_beds 8  
(day 281) [client] Client 32 (family size = 6, case type = 2) arrives the shelter available\_beds 8.  
(day 281) [client] Client 32, family member 0 went into shelter available\_beds 7  
(day 281) [client] Client 32, family member 1 went into shelter available\_beds 6  
(day 281) [client] Client 32, family member 2 went into shelter available\_beds 5  
(day 281) [client] Client 32, family member 3 went into shelter available\_beds 4  
(day 281) [client] Client 32, family member 4 went into shelter available\_beds 3  
(day 281) [client] Client 32, family member 5 went into shelter available\_beds 2  
(day 285) [client] !!!!SHELTER AT CAPACITY. only 2 available beds. Referring out Client 33 family of 4  
(day 285) [client] Shelter has unfortunately turned 19 clients (including their family members) away thus far.  
(day 293) [client] Client 6, family member 0 came out of shelter available\_beds 3  
(day 293) [client] Client 6 (family size = 1, case type = 3) LEAVES the shelter available\_beds 3  
(day 294) [client] !!!!SHELTER AT CAPACITY. only 3 available beds. Referring out Client 34 family of 6  
(day 294) [client] Shelter has unfortunately turned 25 clients (including their family members) away thus far.  
(day 298) [client] Client 35 (family size = 3, case type = 1) arrives the shelter available\_beds 3.  
(day 298) [client] Client 35, family member 0 went into shelter available\_beds 2  
(day 298) [client] Client 35, family member 1 went into shelter available\_beds 1  
(day 298) [client] Client 35, family member 2 went into shelter available\_beds 0

(day 299) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 36 family of 5  
(day 299) [client] Shelter has unfortunately turned 30 clients (including their family members) away thus far.  
(day 305) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 37 family of 6  
(day 305) [client] Shelter has unfortunately turned 36 clients (including their family members) away thus far.  
(day 309) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 38 family of 5  
(day 309) [client] Shelter has unfortunately turned 41 clients (including their family members) away thus far.  
(day 314) [client] Shelter has sent 13 clients (including their family members) with life-threatening situations to undisclosed hotels.  
(day 319) [client] Shelter has sent 15 clients (including their family members) with life-threatening situations to undisclosed hotels.  
(day 320) [client] Client 31, family member 0 came out of shelter available\_beds 1  
(day 320) [client] Client 31 (family size = 1, case type = 1) LEAVES the shelter available beds 1  
(day 326) [client] Client 41 (family size = 1, case type = 4) arrives the shelter available beds 1.  
(day 326) [client] Client 41, family member 0 went into shelter available\_beds 0  
(day 330) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 42 family of 1  
(day 330) [client] Shelter has unfortunately turned 42 clients (including their family members) away thus far.  
(day 333) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 43 family of 2  
(day 333) [client] Shelter has unfortunately turned 44 clients (including their family members) away thus far.  
(day 338) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 44 family of 4  
(day 338) [client] Shelter has unfortunately turned 48 clients (including their family members) away thus far.  
(day 339) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 45 family of 4  
(day 339) [client] Shelter has unfortunately turned 52 clients (including their family members) away thus far.  
(day 344) [client] Client 19, family member 0 came out of shelter available\_beds 1  
(day 344) [client] Client 19 (family size = 1, case type = 4) LEAVES the shelter available beds 1  
(day 344) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 46 family of 4  
(day 344) [client] Shelter has unfortunately turned 56 clients (including their family members) away thus far.  
(day 349) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 47 family of 5  
(day 349) [client] Shelter has unfortunately turned 61 clients (including their family members) away thus far.  
(day 350) [client] Shelter has sent 16 clients (including their family members) with life-threatening situations to undisclosed hotels.  
(day 352) [client] Client 35, family member 0 came out of shelter available\_beds 2  
(day 352) [client] Client 35, family member 1 came out of shelter available\_beds 3  
(day 352) [client] Client 35, family member 2 came out of shelter available\_beds 4  
(day 352) [client] Client 35 (family size = 3, case type = 1) LEAVES the shelter available beds 4  
(day 354) [client] Client 16, family member 0 came out of shelter available\_beds 5  
(day 354) [client] Client 16, family member 1 came out of shelter available\_beds 6  
(day 354) [client] Client 16, family member 2 came out of shelter available\_beds 7  
(day 354) [client] Client 16, family member 3 came out of shelter available\_beds 8  
(day 354) [client] Client 16, family member 4 came out of shelter available\_beds 9  
(day 354) [client] Client 16, family member 5 came out of shelter available\_beds 10  
(day 354) [client] Client 16 (family size = 6, case type = 3) LEAVES the shelter available beds 10  
(day 354) [client] Client 49 (family size = 1, case type = 3) arrives the shelter available beds 10.

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(day 354)      [client] Client 49, family member 0 went into shelter      available_beds 9
(day 356)      [client] Client 18, family member 0 came out of shelter available_beds 10
(day 356)      [client] Client 18 (family size = 1, case type = 3) LEAVES the shelter av
available beds 10
(day 357)      [client] Client 50 (family size = 3, case type = 4) arrives the shelter av
available beds 10.
(day 357)      [client] Client 50, family member 0 went into shelter      available_beds 9
(day 357)      [client] Client 50, family member 1 went into shelter      available_beds 8
(day 357)      [client] Client 50, family member 2 went into shelter      available_beds 7
(day 359)      [client] Client 23, family member 0 came out of shelter available_beds 8
(day 359)      [client] Client 23, family member 1 came out of shelter available_beds 9
(day 359)      [client] Client 23 (family size = 2, case type = 3) LEAVES the shelter av
available beds 9
(day 363)      [client] Client 51 (family size = 1, case type = 2) arrives the shelter av
available beds 9.
(day 363)      [client] Client 51, family member 0 went into shelter      available_beds 8
~~SIMULATION STARTUP~~ Shelter has 35 beds available
(day 0) [client] Shelter has sent 4 clients (including their family members)
with life-threatening situations to undisclosed hotels.
(day 0) [client] Client 1 (family size = 6, case type = 4) arrives the shelter      available
beds 35.
(day 0) [client] Client 1, family member 0 went into shelter      available_beds 34
(day 0) [client] Client 1, family member 1 went into shelter      available_beds 33
(day 0) [client] Client 1, family member 2 went into shelter      available_beds 32
(day 0) [client] Client 1, family member 3 went into shelter      available_beds 31
(day 0) [client] Client 1, family member 4 went into shelter      available_beds 30
(day 0) [client] Client 1, family member 5 went into shelter      available_beds 29
(day 0) [client] Client 2 (family size = 3, case type = 4) arrives the shelter      available
beds 29.
(day 0) [client] Client 2, family member 0 went into shelter      available_beds 28
(day 0) [client] Client 2, family member 1 went into shelter      available_beds 27
(day 0) [client] Client 2, family member 2 went into shelter      available_beds 26
(day 0) [client] Client 3 (family size = 2, case type = 3) arrives the shelter      available
beds 26.
(day 0) [client] Client 3, family member 0 went into shelter      available_beds 25
(day 0) [client] Client 3, family member 1 went into shelter      available_beds 24
(day 9) [client] Client 4 (family size = 6, case type = 3) arrives the shelter      available
beds 24.
(day 9) [client] Client 4, family member 0 went into shelter      available_beds 23
(day 9) [client] Client 4, family member 1 went into shelter      available_beds 22
(day 9) [client] Client 4, family member 2 went into shelter      available_beds 21
(day 9) [client] Client 4, family member 3 went into shelter      available_beds 20
(day 9) [client] Client 4, family member 4 went into shelter      available_beds 19
(day 9) [client] Client 4, family member 5 went into shelter      available_beds 18
(day 16)      [client] Shelter has sent 6 clients (including their family members)
with life-threatening situations to undisclosed hotels.
(day 26)      [client] Client 6 (family size = 2, case type = 3) arrives the shelter av
available beds 18.
(day 26)      [client] Client 6, family member 0 went into shelter      available_beds 17
(day 26)      [client] Client 6, family member 1 went into shelter      available_beds 16
(day 39)      [client] Client 7 (family size = 1, case type = 3) arrives the shelter av
available beds 16.
(day 39)      [client] Client 7, family member 0 went into shelter      available_beds 15
(day 47)      [client] Client 8 (family size = 1, case type = 1) arrives the shelter av
available beds 15.
(day 47)      [client] Client 8, family member 0 went into shelter      available_beds 14
(day 63)      [client] Client 9 (family size = 3, case type = 1) arrives the shelter av
available beds 14.
(day 63)      [client] Client 9, family member 0 went into shelter      available_beds 13
(day 63)      [client] Client 9, family member 1 went into shelter      available_beds 12
(day 63)      [client] Client 9, family member 2 went into shelter      available_beds 11
(day 73)      [client] Client 1, family member 0 came out of shelter available_beds 12
(day 73)      [client] Client 1, family member 1 came out of shelter available_beds 13
(day 73)      [client] Client 1, family member 2 came out of shelter available_beds 14
(day 73)      [client] Client 1, family member 3 came out of shelter available_beds 15
(day 73)      [client] Client 1, family member 4 came out of shelter available_beds 16

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(day 73) [client] Client 1, family member 5 came out of shelter available\_beds 17  
(day 73) [client] Client 1 (family size = 6, case type = 4) LEAVES the shelter av  
ailable beds 17  
(day 77) [client] Client 8, family member 0 came out of shelter available\_beds 18  
(day 77) [client] Client 8 (family size = 1, case type = 1) LEAVES the shelter av  
ailable beds 18  
(day 78) [client] Client 10 (family size = 5, case type = 4) arrives the shelter av  
ailable beds 18.  
(day 78) [client] Client 10, family member 0 went into shelter available\_beds 17  
(day 78) [client] Client 10, family member 1 went into shelter available\_beds 16  
(day 78) [client] Client 10, family member 2 went into shelter available\_beds 15  
(day 78) [client] Client 10, family member 3 went into shelter available\_beds 14  
(day 78) [client] Client 10, family member 4 went into shelter available\_beds 13  
(day 85) [client] Client 9, family member 0 came out of shelter available\_beds 14  
(day 85) [client] Client 9, family member 1 came out of shelter available\_beds 15  
(day 85) [client] Client 9, family member 2 came out of shelter available\_beds 16  
(day 85) [client] Client 9 (family size = 3, case type = 1) LEAVES the shelter av  
ailable beds 16  
(day 89) [client] Client 11 (family size = 6, case type = 2) arrives the shelter av  
ailable beds 16.  
(day 89) [client] Client 11, family member 0 went into shelter available\_beds 15  
(day 89) [client] Client 11, family member 1 went into shelter available\_beds 14  
(day 89) [client] Client 11, family member 2 went into shelter available\_beds 13  
(day 89) [client] Client 11, family member 3 went into shelter available\_beds 12  
(day 89) [client] Client 11, family member 4 went into shelter available\_beds 11  
(day 89) [client] Client 11, family member 5 went into shelter available\_beds 10  
(day 100) [client] Client 12 (family size = 5, case type = 4) arrives the shelter av  
ailable beds 10.  
(day 100) [client] Client 12, family member 0 went into shelter available\_beds 9  
(day 100) [client] Client 12, family member 1 went into shelter available\_beds 8  
(day 100) [client] Client 12, family member 2 went into shelter available\_beds 7  
(day 100) [client] Client 12, family member 3 went into shelter available\_beds 6  
(day 100) [client] Client 12, family member 4 went into shelter available\_beds 5  
(day 110) [client] !!!!SHELTER AT CAPACITY. only 5 available beds. Referring out Cli  
ent 13 family of 6  
(day 110) [client] Shelter has unfortunately turned 6 clients (including their famil  
y members) away thus far.  
(day 120) [client] Client 14 (family size = 5, case type = 1) arrives the shelter av  
ailable beds 5.  
(day 120) [client] Client 14, family member 0 went into shelter available\_beds 4  
(day 120) [client] Client 14, family member 1 went into shelter available\_beds 3  
(day 120) [client] Client 14, family member 2 went into shelter available\_beds 2  
(day 120) [client] Client 14, family member 3 went into shelter available\_beds 1  
(day 120) [client] Client 14, family member 4 went into shelter available\_beds 0  
(day 133) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Cli  
ent 15 family of 5  
(day 133) [client] Shelter has unfortunately turned 11 clients (including their fami  
ly members) away thus far.  
(day 142) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Cli  
ent 16 family of 2  
(day 142) [client] Shelter has unfortunately turned 13 clients (including their fami  
ly members) away thus far.  
(day 148) [client] Client 10, family member 0 came out of shelter available\_beds 1  
(day 148) [client] Client 10, family member 1 came out of shelter available\_beds 2  
(day 148) [client] Client 10, family member 2 came out of shelter available\_beds 3  
(day 148) [client] Client 10, family member 3 came out of shelter available\_beds 4  
(day 148) [client] Client 10, family member 4 came out of shelter available\_beds 5  
(day 148) [client] Client 10 (family size = 5, case type = 4) LEAVES the shelter av  
ailable beds 5  
(day 151) [client] Shelter has sent 12 clients (including their family members)  
with life-threatening situations to undisclosed hotels.  
(day 160) [client] Client 14, family member 0 came out of shelter available\_beds 6  
(day 160) [client] Client 14, family member 1 came out of shelter available\_beds 7  
(day 160) [client] Client 14, family member 2 came out of shelter available\_beds 8  
(day 160) [client] Client 14, family member 3 came out of shelter available\_beds 9  
(day 160) [client] Client 14, family member 4 came out of shelter available\_beds 10

(day 160) [client] Client 14 (family size = 5, case type = 1) LEAVES the shelter av  
 available beds 10  
 (day 162) [client] Client 18 (family size = 6, case type = 2) arrives the shelter av  
 available beds 10.  
 (day 162) [client] Client 18, family member 0 went into shelter available\_beds 9  
 (day 162) [client] Client 18, family member 1 went into shelter available\_beds 8  
 (day 162) [client] Client 18, family member 2 went into shelter available\_beds 7  
 (day 162) [client] Client 18, family member 3 went into shelter available\_beds 6  
 (day 162) [client] Client 18, family member 4 went into shelter available\_beds 5  
 (day 162) [client] Client 18, family member 5 went into shelter available\_beds 4  
 (day 171) [client] Client 2, family member 0 came out of shelter available\_beds 5  
 (day 171) [client] Client 2, family member 1 came out of shelter available\_beds 6  
 (day 171) [client] Client 2, family member 2 came out of shelter available\_beds 7  
 (day 171) [client] Client 2 (family size = 3, case type = 4) LEAVES the shelter av  
 available beds 7  
 (day 176) [client] Client 12, family member 0 came out of shelter available\_beds 8  
 (day 176) [client] Client 12, family member 1 came out of shelter available\_beds 9  
 (day 176) [client] Client 12, family member 2 came out of shelter available\_beds 10  
 (day 176) [client] Client 12, family member 3 came out of shelter available\_beds 11  
 (day 176) [client] Client 12, family member 4 came out of shelter available\_beds 12  
 (day 176) [client] Client 12 (family size = 5, case type = 4) LEAVES the shelter av  
 available beds 12  
 (day 178) [client] Client 19 (family size = 6, case type = 2) arrives the shelter av  
 available beds 12.  
 (day 178) [client] Client 19, family member 0 went into shelter available\_beds 11  
 (day 178) [client] Client 19, family member 1 went into shelter available\_beds 10  
 (day 178) [client] Client 19, family member 2 went into shelter available\_beds 9  
 (day 178) [client] Client 19, family member 3 went into shelter available\_beds 8  
 (day 178) [client] Client 19, family member 4 went into shelter available\_beds 7  
 (day 178) [client] Client 19, family member 5 went into shelter available\_beds 6  
 (day 179) [client] Client 4, family member 0 came out of shelter available\_beds 7  
 (day 179) [client] Client 4, family member 1 came out of shelter available\_beds 8  
 (day 179) [client] Client 4, family member 2 came out of shelter available\_beds 9  
 (day 179) [client] Client 4, family member 3 came out of shelter available\_beds 10  
 (day 179) [client] Client 4, family member 4 came out of shelter available\_beds 11  
 (day 179) [client] Client 4, family member 5 came out of shelter available\_beds 12  
 (day 179) [client] Client 4 (family size = 6, case type = 3) LEAVES the shelter av  
 available beds 12  
 (day 196) [client] Client 3, family member 0 came out of shelter available\_beds 13  
 (day 196) [client] Client 3, family member 1 came out of shelter available\_beds 14  
 (day 196) [client] Client 3 (family size = 2, case type = 3) LEAVES the shelter av  
 available beds 14  
 (day 197) [client] Client 20 (family size = 4, case type = 1) arrives the shelter av  
 available beds 14.  
 (day 197) [client] Client 20, family member 0 went into shelter available\_beds 13  
 (day 197) [client] Client 20, family member 1 went into shelter available\_beds 12  
 (day 197) [client] Client 20, family member 2 went into shelter available\_beds 11  
 (day 197) [client] Client 20, family member 3 went into shelter available\_beds 10  
 (day 209) [client] Client 21 (family size = 1, case type = 2) arrives the shelter av  
 available beds 10.  
 (day 209) [client] Client 21, family member 0 went into shelter available\_beds 9  
 (day 216) [client] Client 22 (family size = 5, case type = 1) arrives the shelter av  
 available beds 9.  
 (day 216) [client] Client 22, family member 0 went into shelter available\_beds 8  
 (day 216) [client] Client 22, family member 1 went into shelter available\_beds 7  
 (day 216) [client] Client 22, family member 2 went into shelter available\_beds 6  
 (day 216) [client] Client 22, family member 3 went into shelter available\_beds 5  
 (day 216) [client] Client 22, family member 4 went into shelter available\_beds 4  
 (day 218) [client] Client 20, family member 0 came out of shelter available\_beds 5  
 (day 218) [client] Client 20, family member 1 came out of shelter available\_beds 6  
 (day 218) [client] Client 20, family member 2 came out of shelter available\_beds 7  
 (day 218) [client] Client 20, family member 3 came out of shelter available\_beds 8  
 (day 218) [client] Client 20 (family size = 4, case type = 1) LEAVES the shelter av  
 available beds 8  
 (day 224) [client] Client 23 (family size = 1, case type = 1) arrives the shelter av  
 available beds 8.

(day 224) [client] Client 23, family member 0 went into shelter available\_beds 7  
(day 231) [client] Client 24 (family size = 1, case type = 1) arrives the shelter av  
ailable beds 7.  
(day 231) [client] Client 24, family member 0 went into shelter available\_beds 6  
(day 237) [client] Client 22, family member 0 came out of shelter available\_beds 7  
(day 237) [client] Client 22, family member 1 came out of shelter available\_beds 8  
(day 237) [client] Client 22, family member 2 came out of shelter available\_beds 9  
(day 237) [client] Client 22, family member 3 came out of shelter available\_beds 10  
(day 237) [client] Client 22, family member 4 came out of shelter available\_beds 11  
(day 237) [client] Client 22 (family size = 5, case type = 1) LEAVES the shelter av  
ailable beds 11  
(day 240) [client] Client 24, family member 0 came out of shelter available\_beds 12  
(day 240) [client] Client 24 (family size = 1, case type = 1) LEAVES the shelter av  
ailable beds 12  
(day 242) [client] Client 25 (family size = 3, case type = 1) arrives the shelter av  
ailable beds 12.  
(day 242) [client] Client 25, family member 0 went into shelter available\_beds 11  
(day 242) [client] Client 25, family member 1 went into shelter available\_beds 10  
(day 242) [client] Client 25, family member 2 went into shelter available\_beds 9  
(day 245) [client] Client 26 (family size = 3, case type = 3) arrives the shelter av  
ailable beds 9.  
(day 245) [client] Client 26, family member 0 went into shelter available\_beds 8  
(day 245) [client] Client 26, family member 1 went into shelter available\_beds 7  
(day 245) [client] Client 26, family member 2 went into shelter available\_beds 6  
(day 251) [client] Client 27 (family size = 5, case type = 1) arrives the shelter av  
ailable beds 6.  
(day 251) [client] Client 27, family member 0 went into shelter available\_beds 5  
(day 251) [client] Client 27, family member 1 went into shelter available\_beds 4  
(day 251) [client] Client 27, family member 2 went into shelter available\_beds 3  
(day 251) [client] Client 27, family member 3 went into shelter available\_beds 2  
(day 251) [client] Client 27, family member 4 went into shelter available\_beds 1  
(day 254) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Cli  
ent 28 family of 5  
(day 254) [client] Shelter has unfortunately turned 18 clients (including their fami  
ly members) away thus far.  
(day 259) [client] Shelter has sent 16 clients (including their family members)  
with life-threatening situations to undisclosed hotels.  
(day 264) [client] Client 25, family member 0 came out of shelter available\_beds 2  
(day 264) [client] Client 25, family member 1 came out of shelter available\_beds 3  
(day 264) [client] Client 25, family member 2 came out of shelter available\_beds 4  
(day 264) [client] Client 25 (family size = 3, case type = 1) LEAVES the shelter av  
ailable beds 4  
(day 265) [client] Client 30 (family size = 2, case type = 1) arrives the shelter av  
ailable beds 4.  
(day 265) [client] Client 30, family member 0 went into shelter available\_beds 3  
(day 265) [client] Client 30, family member 1 went into shelter available\_beds 2  
(day 271) [client] Client 23, family member 0 came out of shelter available\_beds 3  
(day 271) [client] Client 23 (family size = 1, case type = 1) LEAVES the shelter av  
ailable beds 3  
(day 272) [client] !!!!SHELTER AT CAPACITY. only 3 available beds. Referring out Cli  
ent 31 family of 4  
(day 272) [client] Shelter has unfortunately turned 22 clients (including their fami  
ly members) away thus far.  
(day 276) [client] !!!!SHELTER AT CAPACITY. only 3 available beds. Referring out Cli  
ent 32 family of 4  
(day 276) [client] Shelter has unfortunately turned 26 clients (including their fami  
ly members) away thus far.  
(day 281) [client] Client 6, family member 0 came out of shelter available\_beds 4  
(day 281) [client] Client 6, family member 1 came out of shelter available\_beds 5  
(day 281) [client] Client 6 (family size = 2, case type = 3) LEAVES the shelter av  
ailable beds 5  
(day 283) [client] Shelter has sent 22 clients (including their family members)  
with life-threatening situations to undisclosed hotels.  
(day 284) [client] Client 7, family member 0 came out of shelter available\_beds 6  
(day 284) [client] Client 7 (family size = 1, case type = 3) LEAVES the shelter av  
ailable beds 6

(day 288) [client] Shelter has sent 28 clients (including their family members) with life-threatening situations to undisclosed hotels.

(day 291) [client] Client 35 (family size = 1, case type = 1) arrives the shelter available beds 6.

(day 291) [client] Client 35, family member 0 went into shelter available\_beds 5

(day 294) [client] Client 27, family member 0 came out of shelter available\_beds 6

(day 294) [client] Client 27, family member 1 came out of shelter available\_beds 7

(day 294) [client] Client 27, family member 2 came out of shelter available\_beds 8

(day 294) [client] Client 27, family member 3 came out of shelter available\_beds 9

(day 294) [client] Client 27, family member 4 came out of shelter available\_beds 10

(day 294) [client] Client 27 (family size = 5, case type = 1) LEAVES the shelter available beds 10

(day 296) [client] Client 36 (family size = 3, case type = 4) arrives the shelter available beds 10.

(day 296) [client] Client 36, family member 0 went into shelter available\_beds 9

(day 296) [client] Client 36, family member 1 went into shelter available\_beds 8

(day 296) [client] Client 36, family member 2 went into shelter available\_beds 7

(day 300) [client] Client 37 (family size = 2, case type = 1) arrives the shelter available beds 7.

(day 300) [client] Client 37, family member 0 went into shelter available\_beds 6

(day 300) [client] Client 37, family member 1 went into shelter available\_beds 5

(day 302) [client] Client 38 (family size = 4, case type = 1) arrives the shelter available beds 5.

(day 302) [client] Client 38, family member 0 went into shelter available\_beds 4

(day 302) [client] Client 38, family member 1 went into shelter available\_beds 3

(day 302) [client] Client 38, family member 2 went into shelter available\_beds 2

(day 302) [client] Client 38, family member 3 went into shelter available\_beds 1

(day 308) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 39 family of 3

(day 308) [client] Shelter has unfortunately turned 29 clients (including their family members) away thus far.

(day 311) [client] Client 40 (family size = 1, case type = 2) arrives the shelter available beds 1.

(day 311) [client] Client 40, family member 0 went into shelter available\_beds 0

(day 314) [client] Client 30, family member 0 came out of shelter available\_beds 1

(day 314) [client] Client 30, family member 1 came out of shelter available\_beds 2

(day 314) [client] Client 30 (family size = 2, case type = 1) LEAVES the shelter available beds 2

(day 316) [client] Client 41 (family size = 1, case type = 1) arrives the shelter available beds 2.

(day 316) [client] Client 41, family member 0 went into shelter available\_beds 1

(day 320) [client] Client 38, family member 0 came out of shelter available\_beds 2

(day 320) [client] Client 38, family member 1 came out of shelter available\_beds 3

(day 320) [client] Client 38, family member 2 came out of shelter available\_beds 4

(day 320) [client] Client 38, family member 3 came out of shelter available\_beds 5

(day 320) [client] Client 38 (family size = 4, case type = 1) LEAVES the shelter available beds 5

(day 321) [client] Client 42 (family size = 1, case type = 4) arrives the shelter available beds 5.

(day 321) [client] Client 42, family member 0 went into shelter available\_beds 4

(day 324) [client] Client 43 (family size = 2, case type = 1) arrives the shelter available beds 4.

(day 324) [client] Client 43, family member 0 went into shelter available\_beds 3

(day 324) [client] Client 43, family member 1 went into shelter available\_beds 2

(day 327) [client] !!!!SHELTER AT CAPACITY. only 2 available beds. Referring out Client 44 family of 4

(day 327) [client] Shelter has unfortunately turned 33 clients (including their family members) away thus far.

(day 329) [client] Shelter has sent 32 clients (including their family members) with life-threatening situations to undisclosed hotels.

(day 339) [client] Client 46 (family size = 2, case type = 2) arrives the shelter available beds 2.

(day 339) [client] Client 46, family member 0 went into shelter available\_beds 1

(day 339) [client] Client 46, family member 1 went into shelter available\_beds 0

(day 341) [client] Client 37, family member 0 came out of shelter available\_beds 1

(day 341) [client] Client 37, family member 1 came out of shelter available\_beds 2

(day 341) [client] Client 37 (family size = 2, case type = 1) LEAVES the shelter available beds 2

(day 344) [client] Client 35, family member 0 came out of shelter available\_beds 3

(day 344) [client] Client 35 (family size = 1, case type = 1) LEAVES the shelter available beds 3

(day 345) [client] Client 47 (family size = 3, case type = 4) arrives the shelter available beds 3.

(day 345) [client] Client 47, family member 0 went into shelter available\_beds 2

(day 345) [client] Client 47, family member 1 went into shelter available\_beds 1

(day 345) [client] Client 47, family member 2 went into shelter available\_beds 0

(day 356) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 48 family of 4

(day 356) [client] Shelter has unfortunately turned 37 clients (including their family members) away thus far.

(day 357) [client] Client 41, family member 0 came out of shelter available\_beds 1

(day 357) [client] Client 41 (family size = 1, case type = 1) LEAVES the shelter available beds 1

(day 361) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 49 family of 6

(day 361) [client] Shelter has unfortunately turned 43 clients (including their family members) away thus far.

(day 362) [client] Client 43, family member 0 came out of shelter available\_beds 2

(day 362) [client] Client 43, family member 1 came out of shelter available\_beds 3

(day 362) [client] Client 43 (family size = 2, case type = 1) LEAVES the shelter available beds 3

~~SIMULATION STARTUP~~ Shelter has 35 beds available

(day 0) [client] Client 0 (family size = 5, case type = 3) arrives the shelter available beds 35.

(day 0) [client] Client 0, family member 0 went into shelter available\_beds 34

(day 0) [client] Client 0, family member 1 went into shelter available\_beds 33

(day 0) [client] Client 0, family member 2 went into shelter available\_beds 32

(day 0) [client] Client 0, family member 3 went into shelter available\_beds 31

(day 0) [client] Client 0, family member 4 went into shelter available\_beds 30

(day 0) [client] Shelter has sent 4 clients (including their family members) with life-threatening situations to undisclosed hotels.

(day 0) [client] Client 2 (family size = 3, case type = 1) arrives the shelter available beds 30.

(day 0) [client] Client 2, family member 0 went into shelter available\_beds 29

(day 0) [client] Client 2, family member 1 went into shelter available\_beds 28

(day 0) [client] Client 2, family member 2 went into shelter available\_beds 27

(day 0) [client] Client 3 (family size = 1, case type = 3) arrives the shelter available beds 27.

(day 0) [client] Client 3, family member 0 went into shelter available\_beds 26

(day 7) [client] Client 4 (family size = 1, case type = 1) arrives the shelter available beds 26.

(day 7) [client] Client 4, family member 0 went into shelter available\_beds 25

(day 10) [client] Client 2, family member 0 came out of shelter available\_beds 26

(day 10) [client] Client 2, family member 1 came out of shelter available\_beds 27

(day 10) [client] Client 2, family member 2 came out of shelter available\_beds 28

(day 10) [client] Client 2 (family size = 3, case type = 1) LEAVES the shelter available beds 28

(day 16) [client] Client 5 (family size = 5, case type = 4) arrives the shelter available beds 28.

(day 16) [client] Client 5, family member 0 went into shelter available\_beds 27

(day 16) [client] Client 5, family member 1 went into shelter available\_beds 26

(day 16) [client] Client 5, family member 2 went into shelter available\_beds 25

(day 16) [client] Client 5, family member 3 went into shelter available\_beds 24

(day 16) [client] Client 5, family member 4 went into shelter available\_beds 23

(day 26) [client] Client 6 (family size = 2, case type = 1) arrives the shelter available beds 23.

(day 26) [client] Client 6, family member 0 went into shelter available\_beds 22

(day 26) [client] Client 6, family member 1 went into shelter available\_beds 21

(day 36) [client] Client 7 (family size = 1, case type = 4) arrives the shelter available beds 21.

(day 36) [client] Client 7, family member 0 went into shelter available\_beds 20

(day 44) [client] Client 4, family member 0 came out of shelter available\_beds 21



(day 44) [client] Client 4 (family size = 1, case type = 1) LEAVES the shelter av  
available beds 21  
(day 45) [client] Client 8 (family size = 5, case type = 1) arrives the shelter av  
available beds 21.  
(day 45) [client] Client 8, family member 0 went into shelter available\_beds 20  
(day 45) [client] Client 8, family member 1 went into shelter available\_beds 19  
(day 45) [client] Client 8, family member 2 went into shelter available\_beds 18  
(day 45) [client] Client 8, family member 3 went into shelter available\_beds 17  
(day 45) [client] Client 8, family member 4 went into shelter available\_beds 16  
(day 53) [client] Client 9 (family size = 4, case type = 1) arrives the shelter av  
available beds 16.  
(day 53) [client] Client 9, family member 0 went into shelter available\_beds 15  
(day 53) [client] Client 9, family member 1 went into shelter available\_beds 14  
(day 53) [client] Client 9, family member 2 went into shelter available\_beds 13  
(day 53) [client] Client 9, family member 3 went into shelter available\_beds 12  
(day 64) [client] Client 10 (family size = 2, case type = 3) arrives the shelter av  
available beds 12.  
(day 64) [client] Client 10, family member 0 went into shelter available\_beds 11  
(day 64) [client] Client 10, family member 1 went into shelter available\_beds 10  
(day 65) [client] Client 6, family member 0 came out of shelter available\_beds 11  
(day 65) [client] Client 6, family member 1 came out of shelter available\_beds 12  
(day 65) [client] Client 6 (family size = 2, case type = 1) LEAVES the shelter av  
available beds 12  
(day 67) [client] Client 8, family member 0 came out of shelter available\_beds 13  
(day 67) [client] Client 8, family member 1 came out of shelter available\_beds 14  
(day 67) [client] Client 8, family member 2 came out of shelter available\_beds 15  
(day 67) [client] Client 8, family member 3 came out of shelter available\_beds 16  
(day 67) [client] Client 8, family member 4 came out of shelter available\_beds 17  
(day 67) [client] Client 8 (family size = 5, case type = 1) LEAVES the shelter av  
available beds 17  
(day 73) [client] Client 11 (family size = 5, case type = 1) arrives the shelter av  
available beds 17.  
(day 73) [client] Client 11, family member 0 went into shelter available\_beds 16  
(day 73) [client] Client 11, family member 1 went into shelter available\_beds 15  
(day 73) [client] Client 11, family member 2 went into shelter available\_beds 14  
(day 73) [client] Client 11, family member 3 went into shelter available\_beds 13  
(day 73) [client] Client 11, family member 4 went into shelter available\_beds 12  
(day 87) [client] Client 12 (family size = 5, case type = 3) arrives the shelter av  
available beds 12.  
(day 87) [client] Client 12, family member 0 went into shelter available\_beds 11  
(day 87) [client] Client 12, family member 1 went into shelter available\_beds 10  
(day 87) [client] Client 12, family member 2 went into shelter available\_beds 9  
(day 87) [client] Client 12, family member 3 went into shelter available\_beds 8  
(day 87) [client] Client 12, family member 4 went into shelter available\_beds 7  
(day 96) [client] Client 9, family member 0 came out of shelter available\_beds 8  
(day 96) [client] Client 9, family member 1 came out of shelter available\_beds 9  
(day 96) [client] Client 9, family member 2 came out of shelter available\_beds 10  
(day 96) [client] Client 9, family member 3 came out of shelter available\_beds 11  
(day 96) [client] Client 9 (family size = 4, case type = 1) LEAVES the shelter av  
available beds 11  
(day 97) [client] Shelter has sent 7 clients (including their family members)  
with life-threatening situations to undisclosed hotels.  
(day 104) [client] Client 7, family member 0 came out of shelter available\_beds 12  
(day 104) [client] Client 7 (family size = 1, case type = 4) LEAVES the shelter av  
available beds 12  
(day 104) [client] Client 14 (family size = 6, case type = 2) arrives the shelter av  
available beds 12.  
(day 104) [client] Client 14, family member 0 went into shelter available\_beds 11  
(day 104) [client] Client 14, family member 1 went into shelter available\_beds 10  
(day 104) [client] Client 14, family member 2 went into shelter available\_beds 9  
(day 104) [client] Client 14, family member 3 went into shelter available\_beds 8  
(day 104) [client] Client 14, family member 4 went into shelter available\_beds 7  
(day 104) [client] Client 14, family member 5 went into shelter available\_beds 6  
(day 119) [client] Client 15 (family size = 4, case type = 1) arrives the shelter av  
available beds 6.  
(day 119) [client] Client 15, family member 0 went into shelter available\_beds 5

(day 119) [client] Client 15, family member 1 went into shelter available\_beds 4  
 (day 119) [client] Client 15, family member 2 went into shelter available\_beds 3  
 (day 119) [client] Client 15, family member 3 went into shelter available\_beds 2  
 (day 122) [client] Client 11, family member 0 came out of shelter available\_beds 3  
 (day 122) [client] Client 11, family member 1 came out of shelter available\_beds 4  
 (day 122) [client] Client 11, family member 2 came out of shelter available\_beds 5  
 (day 122) [client] Client 11, family member 3 came out of shelter available\_beds 6  
 (day 122) [client] Client 11, family member 4 came out of shelter available\_beds 7  
 (day 122) [client] Client 11 (family size = 5, case type = 1) LEAVES the shelter av  
 available beds 7  
 (day 136) [client] Client 16 (family size = 3, case type = 2) arrives the shelter av  
 available beds 7.  
 (day 136) [client] Client 16, family member 0 went into shelter available\_beds 6  
 (day 136) [client] Client 16, family member 1 went into shelter available\_beds 5  
 (day 136) [client] Client 16, family member 2 went into shelter available\_beds 4  
 (day 143) [client] Client 5, family member 0 came out of shelter available\_beds 5  
 (day 143) [client] Client 5, family member 1 came out of shelter available\_beds 6  
 (day 143) [client] Client 5, family member 2 came out of shelter available\_beds 7  
 (day 143) [client] Client 5, family member 3 came out of shelter available\_beds 8  
 (day 143) [client] Client 5, family member 4 came out of shelter available\_beds 9  
 (day 143) [client] Client 5 (family size = 5, case type = 4) LEAVES the shelter av  
 available beds 9  
 (day 146) [client] Client 17 (family size = 1, case type = 2) arrives the shelter av  
 available beds 9.  
 (day 146) [client] Client 17, family member 0 went into shelter available\_beds 8  
 (day 155) [client] Client 18 (family size = 1, case type = 1) arrives the shelter av  
 available beds 8.  
 (day 155) [client] Client 18, family member 0 went into shelter available\_beds 7  
 (day 159) [client] Client 19 (family size = 5, case type = 2) arrives the shelter av  
 available beds 7.  
 (day 159) [client] Client 19, family member 0 went into shelter available\_beds 6  
 (day 159) [client] Client 19, family member 1 went into shelter available\_beds 5  
 (day 159) [client] Client 19, family member 2 went into shelter available\_beds 4  
 (day 159) [client] Client 19, family member 3 went into shelter available\_beds 3  
 (day 159) [client] Client 19, family member 4 went into shelter available\_beds 2  
 (day 167) [client] Client 15, family member 0 came out of shelter available\_beds 3  
 (day 167) [client] Client 15, family member 1 came out of shelter available\_beds 4  
 (day 167) [client] Client 15, family member 2 came out of shelter available\_beds 5  
 (day 167) [client] Client 15, family member 3 came out of shelter available\_beds 6  
 (day 167) [client] Client 15 (family size = 4, case type = 1) LEAVES the shelter av  
 available beds 6  
 (day 169) [client] Client 20 (family size = 1, case type = 4) arrives the shelter av  
 available beds 6.  
 (day 169) [client] Client 20, family member 0 went into shelter available\_beds 5  
 (day 175) [client] Client 18, family member 0 came out of shelter available\_beds 6  
 (day 175) [client] Client 18 (family size = 1, case type = 1) LEAVES the shelter av  
 available beds 6  
 (day 177) [client] Client 21 (family size = 3, case type = 1) arrives the shelter av  
 available beds 6.  
 (day 177) [client] Client 21, family member 0 went into shelter available\_beds 5  
 (day 177) [client] Client 21, family member 1 went into shelter available\_beds 4  
 (day 177) [client] Client 21, family member 2 went into shelter available\_beds 3  
 (day 188) [client] !!!!SHELTER AT CAPACITY. only 3 available beds. Referring out Cli  
 ent 22 family of 5  
 (day 188) [client] Shelter has unfortunately turned 5 clients (including their famil  
 y members) away thus far.  
 (day 194) [client] Client 10, family member 0 came out of shelter available\_beds 4  
 (day 194) [client] Client 10, family member 1 came out of shelter available\_beds 5  
 (day 194) [client] Client 10 (family size = 2, case type = 3) LEAVES the shelter av  
 available beds 5  
 (day 200) [client] Client 3, family member 0 came out of shelter available\_beds 6  
 (day 200) [client] Client 3 (family size = 1, case type = 3) LEAVES the shelter av  
 available beds 6  
 (day 201) [client] Client 23 (family size = 5, case type = 4) arrives the shelter av  
 available beds 6.  
 (day 201) [client] Client 23, family member 0 went into shelter available\_beds 5

(day 201) [client] Client 23, family member 1 went into shelter available\_beds 4  
 (day 201) [client] Client 23, family member 2 went into shelter available\_beds 3  
 (day 201) [client] Client 23, family member 3 went into shelter available\_beds 2  
 (day 201) [client] Client 23, family member 4 went into shelter available\_beds 1  
 (day 211) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 24 family of 6  
 (day 211) [client] Shelter has unfortunately turned 11 clients (including their family members) away thus far.  
 (day 226) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 25 family of 6  
 (day 226) [client] Shelter has unfortunately turned 17 clients (including their family members) away thus far.  
 (day 229) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 26 family of 3  
 (day 229) [client] Shelter has unfortunately turned 20 clients (including their family members) away thus far.  
 (day 236) [client] Client 27 (family size = 1, case type = 4) arrives the shelter available\_beds 1.  
 (day 236) [client] Client 27, family member 0 went into shelter available\_beds 0  
 (day 237) [client] Client 21, family member 0 came out of shelter available\_beds 1  
 (day 237) [client] Client 21, family member 1 came out of shelter available\_beds 2  
 (day 237) [client] Client 21, family member 2 came out of shelter available\_beds 3  
 (day 237) [client] Client 21 (family size = 3, case type = 1) LEAVES the shelter available\_beds 3  
 (day 243) [client] Client 28 (family size = 3, case type = 1) arrives the shelter available\_beds 3.  
 (day 243) [client] Client 28, family member 0 went into shelter available\_beds 2  
 (day 243) [client] Client 28, family member 1 went into shelter available\_beds 1  
 (day 243) [client] Client 28, family member 2 went into shelter available\_beds 0  
 (day 246) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 29 family of 6  
 (day 246) [client] Shelter has unfortunately turned 26 clients (including their family members) away thus far.  
 (day 250) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 30 family of 3  
 (day 250) [client] Shelter has unfortunately turned 29 clients (including their family members) away thus far.  
 (day 253) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 31 family of 2  
 (day 253) [client] Shelter has unfortunately turned 31 clients (including their family members) away thus far.  
 (day 256) [client] Client 28, family member 0 came out of shelter available\_beds 1  
 (day 256) [client] Client 28, family member 1 came out of shelter available\_beds 2  
 (day 256) [client] Client 28, family member 2 came out of shelter available\_beds 3  
 (day 256) [client] Client 28 (family size = 3, case type = 1) LEAVES the shelter available\_beds 3  
 (day 257) [client] Client 32 (family size = 2, case type = 3) arrives the shelter available\_beds 3.  
 (day 257) [client] Client 32, family member 0 went into shelter available\_beds 2  
 (day 257) [client] Client 32, family member 1 went into shelter available\_beds 1  
 (day 258) [client] Client 0, family member 0 came out of shelter available\_beds 2  
 (day 258) [client] Client 0, family member 1 came out of shelter available\_beds 3  
 (day 258) [client] Client 0, family member 2 came out of shelter available\_beds 4  
 (day 258) [client] Client 0, family member 3 came out of shelter available\_beds 5  
 (day 258) [client] Client 0, family member 4 came out of shelter available\_beds 6  
 (day 258) [client] Client 0 (family size = 5, case type = 3) LEAVES the shelter available\_beds 6  
 (day 260) [client] Client 33 (family size = 5, case type = 2) arrives the shelter available\_beds 6.  
 (day 260) [client] Client 33, family member 0 went into shelter available\_beds 5  
 (day 260) [client] Client 33, family member 1 went into shelter available\_beds 4  
 (day 260) [client] Client 33, family member 2 went into shelter available\_beds 3  
 (day 260) [client] Client 33, family member 3 went into shelter available\_beds 2  
 (day 260) [client] Client 33, family member 4 went into shelter available\_beds 1  
 (day 264) [client] Client 34 (family size = 1, case type = 3) arrives the shelter available\_beds 1.

(day 264) [client] Client 34, family member 0 went into shelter available\_beds 0  
(day 265) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 35 family of 1  
(day 265) [client] Shelter has unfortunately turned 32 clients (including their family members) away thus far.  
(day 272) [client] !!!!SHELTER AT CAPACITY. only 0 available beds. Referring out Client 36 family of 2  
(day 272) [client] Shelter has unfortunately turned 34 clients (including their family members) away thus far.  
(day 276) [client] Client 20, family member 0 came out of shelter available\_beds 1  
(day 276) [client] Client 20 (family size = 1, case type = 4) LEAVES the shelter available\_beds 1  
(day 281) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 37 family of 3  
(day 281) [client] Shelter has unfortunately turned 37 clients (including their family members) away thus far.  
(day 284) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 38 family of 4  
(day 284) [client] Shelter has unfortunately turned 41 clients (including their family members) away thus far.  
(day 287) [client] Client 12, family member 0 came out of shelter available\_beds 2  
(day 287) [client] Client 12, family member 1 came out of shelter available\_beds 3  
(day 287) [client] Client 12, family member 2 came out of shelter available\_beds 4  
(day 287) [client] Client 12, family member 3 came out of shelter available\_beds 5  
(day 287) [client] Client 12, family member 4 came out of shelter available\_beds 6  
(day 287) [client] Client 12 (family size = 5, case type = 3) LEAVES the shelter available\_beds 6  
(day 288) [client] Client 39 (family size = 4, case type = 3) arrives the shelter available\_beds 6.  
(day 288) [client] Client 39, family member 0 went into shelter available\_beds 5  
(day 288) [client] Client 39, family member 1 went into shelter available\_beds 4  
(day 288) [client] Client 39, family member 2 went into shelter available\_beds 3  
(day 288) [client] Client 39, family member 3 went into shelter available\_beds 2  
(day 293) [client] Client 40 (family size = 1, case type = 4) arrives the shelter available\_beds 2.  
(day 293) [client] Client 40, family member 0 went into shelter available\_beds 1  
(day 299) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 41 family of 2  
(day 299) [client] Shelter has unfortunately turned 43 clients (including their family members) away thus far.  
(day 307) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 42 family of 3  
(day 307) [client] Shelter has unfortunately turned 46 clients (including their family members) away thus far.  
(day 311) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 43 family of 2  
(day 311) [client] Shelter has unfortunately turned 48 clients (including their family members) away thus far.  
(day 313) [client] Client 27, family member 0 came out of shelter available\_beds 2  
(day 313) [client] Client 27 (family size = 1, case type = 4) LEAVES the shelter available\_beds 2  
(day 315) [client] Client 44 (family size = 1, case type = 2) arrives the shelter available\_beds 2.  
(day 315) [client] Client 44, family member 0 went into shelter available\_beds 1  
(day 322) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 45 family of 3  
(day 322) [client] Shelter has unfortunately turned 51 clients (including their family members) away thus far.  
(day 324) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 46 family of 2  
(day 324) [client] Shelter has unfortunately turned 53 clients (including their family members) away thus far.  
(day 333) [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 47 family of 3  
(day 333) [client] Shelter has unfortunately turned 56 clients (including their family members) away thus far.

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(day 337)      [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 48 family of 4
(day 337)      [client] Shelter has unfortunately turned 60 clients (including their family members) away thus far.
(day 340)      [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 49 family of 6
(day 340)      [client] Shelter has unfortunately turned 66 clients (including their family members) away thus far.
(day 346)      [client] !!!!SHELTER AT CAPACITY. only 1 available beds. Referring out Client 50 family of 2
(day 346)      [client] Shelter has unfortunately turned 68 clients (including their family members) away thus far.
(day 352)      [client] Shelter has sent 9 clients (including their family members) with life-threatening situations to undisclosed hotels.
(day 355)      [client] Client 52 (family size = 1, case type = 1) arrives the shelter available beds 1.
(day 355)      [client] Client 52, family member 0 went into shelter available_beds 0
(day 364)      [client] Client 23, family member 0 came out of shelter available_beds 1
(day 364)      [client] Client 23, family member 1 came out of shelter available_beds 2
(day 364)      [client] Client 23, family member 2 came out of shelter available_beds 3
(day 364)      [client] Client 23, family member 3 came out of shelter available_beds 4
(day 364)      [client] Client 23, family member 4 came out of shelter available_beds 5
(day 364)      [client] Client 23 (family size = 5, case type = 4) LEAVES the shelter available beds 5

```

```

In [21]: #Create a persistent CSV file of the simulation runs.
shelter_data.data_table.to_csv("test_run_new.csv", index=False)

```

## Visualization section

We now take the data generated from the simulation and visualize the output in the code below

```

In [22]: import pandas as pd
import numpy as np
from datetime import datetime
from matplotlib import pyplot as plt
plt.rcParams.update({'font.size': 15})

# path1 = "/Users/sjayab596/Documents/GIT_Personal_Repos/ISYE_6644_Sim/Project/Run1_DataSh
# path2 = "/Users/sjayab596/Documents/GIT_Personal_Repos/ISYE_6644_Sim/Project/Run2_DataSh
# path3 = "/Users/sjayab596/Documents/GIT_Personal_Repos/ISYE_6644_Sim/Project/Run3_DataSh

all_runs=pd.read_csv("test_run_new.csv")
run1 = all_runs[all_runs['run_number'] == 1]
run2 = all_runs[all_runs['run_number'] == 2]
run3 = all_runs[all_runs['run_number'] == 3]

# run1=pd.read_csv(path1)
# run2=pd.read_csv(path2)
# run3=pd.read_csv(path3)

```

```

In [23]: %%capture # to hide the warnings

# run1['month'] = run1['month'].apply(lambda x: datetime.strptime(x, "%m").strftime("%B"))
# run2['month'] = run2['month'].apply(lambda x: datetime.strptime(x, "%m").strftime("%B"))
# run3['month'] = run3['month'].apply(lambda x: datetime.strptime(x, "%m").strftime("%B"))
# isinstance(i,int)
run1['month'] = run1['month'].apply(lambda x: datetime.strptime(str(x), "%m").strftime("%B"))
run2['month'] = run2['month'].apply(lambda x: datetime.strptime(str(x), "%m").strftime("%B"))
run3['month'] = run3['month'].apply(lambda x: datetime.strptime(str(x), "%m").strftime("%B"))

```

```
occ_monthly1=run1
occ_monthly2=run2
occ_monthly3=run3
```

```
occ_monthly1=occ_monthly1.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))
occ_monthly2=occ_monthly2.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))
occ_monthly3=occ_monthly3.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))
```

/Users/oansari/Documents/marketing/src/knaill/sim-team-z/learning-simpy/venv/lib/python3.7/site-packages/ipykernel\_launcher.py:7: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

```
import sys
/Users/oansari/Documents/marketing/src/knaill/sim-team-z/learning-simpy/venv/lib/python3.7/site-packages/ipykernel_launcher.py:8: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead
```

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)

/Users/oansari/Documents/marketing/src/knaill/sim-team-z/learning-simpy/venv/lib/python3.7/site-packages/ipykernel\_launcher.py:9: SettingWithCopyWarning:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: [https://pandas.pydata.org/pandas-docs/stable/user\\_guide/indexing.html#returning-a-view-versus-a-copy](https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)  
if \_\_name\_\_ == '\_\_main\_\_':

## Occupancy over time

In [24]:

```
# Prep the data - Occupancy over months
# =====

# occ_monthly1=run1
# occ_monthly2=run2
# occ_monthly3=run3

# occ_monthly1=occ_monthly1.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))
# occ_monthly2=occ_monthly2.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))
# occ_monthly3=occ_monthly3.assign(daily_occ= lambda x: (35-x['shelter_capacity_left']))

occ_monthly1 = occ_monthly1.groupby(["run_number", "month"]).agg(monthly_occupancy = ("daily_occupancy", "sum"))
occ_monthly2 = occ_monthly2.groupby(["run_number", "month"]).agg(monthly_occupancy = ("daily_occupancy", "sum"))
occ_monthly3 = occ_monthly3.groupby(["run_number", "month"]).agg(monthly_occupancy = ("daily_occupancy", "sum"))

# .agg(min_height=('height', 'min'))
# occ_monthly.rename_col_by_index(0, 'monthly_occupancy')
# occ_monthly=occ_monthly.rename(columns={occ_monthly.columns[0]: 'monthly_occupancy'})
occ_monthly1.reset_index(inplace=True)
occ_monthly2.reset_index(inplace=True)
occ_monthly3.reset_index(inplace=True)

occ_monthlyall = pd.concat([occ_monthly1, occ_monthly2, occ_monthly3])

occ_months1=occ_monthlyall[(occ_monthlyall['run_number'] == 1)]
occ_months2=occ_monthlyall[(occ_monthlyall['run_number'] == 2)]
```

```

occ_months3=occ_monthlyall[(occ_monthlyall['run_number'] == 3)]

months = ["January", "February", "March", "April", "May", "June", "July", "August", "September",
          "November", "December"]
occ_monthly1['month'] = pd.Categorical(occ_monthly1['month'], categories=months, ordered=True)
occ_monthly1=occ_monthly1.sort_values('month', ascending=False)
occ_monthly2['month'] = pd.Categorical(occ_monthly2['month'], categories=months, ordered=True)
occ_monthly2=occ_monthly2.sort_values('month', ascending=False)
occ_monthly3['month'] = pd.Categorical(occ_monthly3['month'], categories=months, ordered=True)
occ_monthly3=occ_monthly3.sort_values('month', ascending=False)
occ_monthly_mean = occ_monthlyall.groupby(["month"]).agg(monthly_occupancy = ("monthly_occupancy", "sum"))
occ_monthly_mean['run_number']=0
occ_monthly_mean.reset_index(inplace=True)
occ_monthly_mean['month'] = pd.Categorical(occ_monthly_mean['month'], categories=months, ordered=True)
occ_monthly_mean=occ_monthly_mean.sort_values('month', ascending=False)

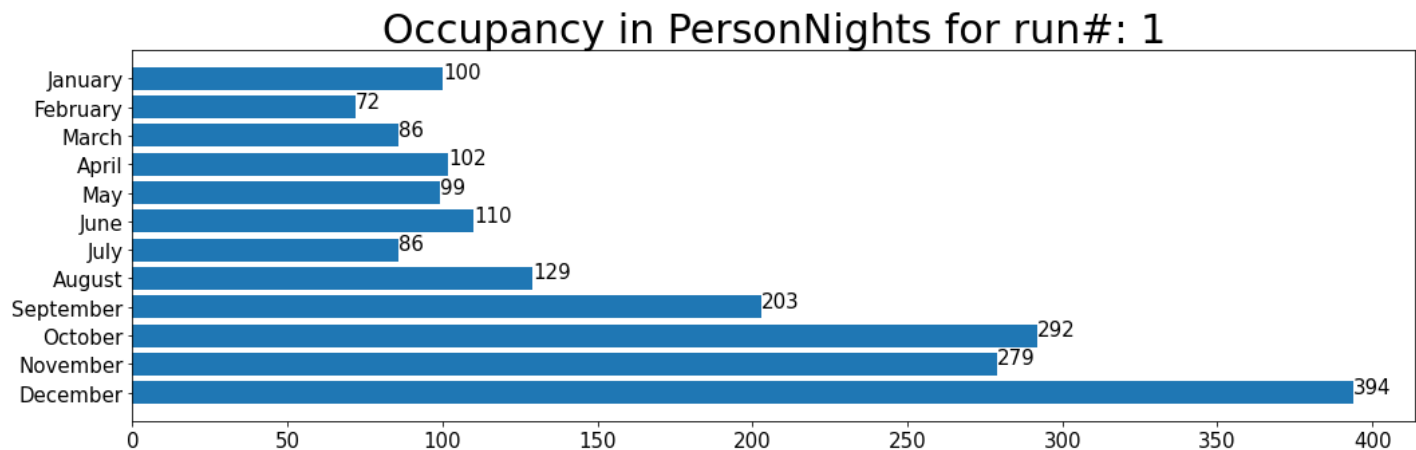
## Visualize - Over Months
# =====

titlestr = 'Occupancy in PersonNights for run#: ' + str(occ_monthly1.loc[1,'run_number'])
plt.title(titlestr, fontsize=30)
plt.barh(occ_monthly1['month'], occ_monthly1['monthly_occupancy'])

for index, value in enumerate(occ_monthly1['monthly_occupancy']):
    plt.text(value, index,
             str(value))

plt.show()

```



## Mean Occupancy

In [25]:

```

## Visualize - Over Runs
# =====

occ_monthly_mean=occ_monthly_mean.sort_values('month', ascending=True)
occ_monthly1=occ_monthly1.sort_values('month', ascending=True)
occ_monthly2=occ_monthly2.sort_values('month', ascending=True)
occ_monthly3=occ_monthly3.sort_values('month', ascending=True)

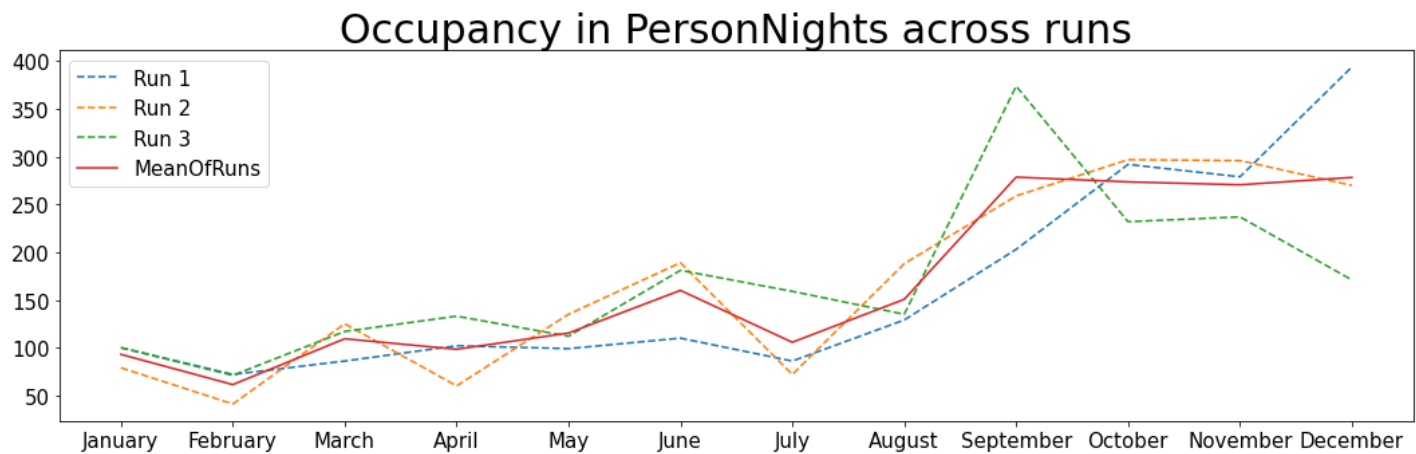
titlestr = 'Occupancy in PersonNights across runs'
plt.title(titlestr, fontsize=30)

plt.rcParams["figure.figsize"] = [15, 5]

```

```
plt.rcParams["figure.autolayout"] = True
#fig = plt.figure() # HINT: first uncomment it, it will print two graphs, one weird one.
#then comment and re-run it will just print 1 nice graph

plt.plot(occ_monthly1['month'], occ_monthly1['monthly_occupancy'], label = "Run 1", linestyle='dashed')
plt.plot(occ_monthly2['month'], occ_monthly2['monthly_occupancy'], label = "Run 2", linestyle='dashed')
plt.plot(occ_monthly3['month'], occ_monthly3['monthly_occupancy'], label = "Run 3", linestyle='dashed')
plt.plot(occ_monthly_mean['month'], occ_monthly_mean['monthly_occupancy'], label = "MeanOfRuns", linestyle='solid')
occ_monthly_mean
plt.legend()
spacing = 0.100
fig.subplots_adjust(bottom=spacing)
plt.show()
```



## Surplus capacity over time

In [26]:

```
# Prep the data - Surplus capacity over months
# =====

spc_monthly1=run1
spc_monthly2=run2
spc_monthly3=run3

spc_monthly1 = spc_monthly1.groupby(["run_number", "month"]).agg(monthly_spc = ("shelter_capacity", "sum"))
spc_monthly2 = spc_monthly2.groupby(["run_number", "month"]).agg(monthly_spc = ("shelter_capacity", "sum"))
spc_monthly3 = spc_monthly3.groupby(["run_number", "month"]).agg(monthly_spc = ("shelter_capacity", "sum"))

spc_monthly1.reset_index(inplace=True)
spc_monthly2.reset_index(inplace=True)
spc_monthly3.reset_index(inplace=True)

spc_monthlyall = pd.concat([spc_monthly1, spc_monthly2, spc_monthly3])

spc_months1=spc_monthlyall[(spc_monthlyall['run_number'] == 1)]
spc_months2=spc_monthlyall[(spc_monthlyall['run_number'] == 2)]
spc_months3=spc_monthlyall[(spc_monthlyall['run_number'] == 3)]

months = ["January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December"]

spc_monthly1['month'] = pd.Categorical(spc_monthly1['month'], categories=months, ordered=True)
spc_monthly1=spc_monthly1.sort_values('month', ascending=False)
spc_monthly2['month'] = pd.Categorical(spc_monthly2['month'], categories=months, ordered=True)
spc_monthly2=spc_monthly2.sort_values('month', ascending=False)
spc_monthly3['month'] = pd.Categorical(spc_monthly3['month'], categories=months, ordered=True)
spc_monthly3=spc_monthly3.sort_values('month', ascending=False)
```



```

spc_monthly_mean = spc_monthlyall.groupby(["month"]).agg(monthly_spc = ("monthly_spc", "mean"))
spc_monthly_mean['run_number']=0
spc_monthly_mean.reset_index(inplace=True)
spc_monthly_mean['month'] = pd.Categorical(spc_monthly_mean['month'], categories=months, ordered=True)
spc_monthly_mean=spc_monthly_mean.sort_values('month', ascending=False)

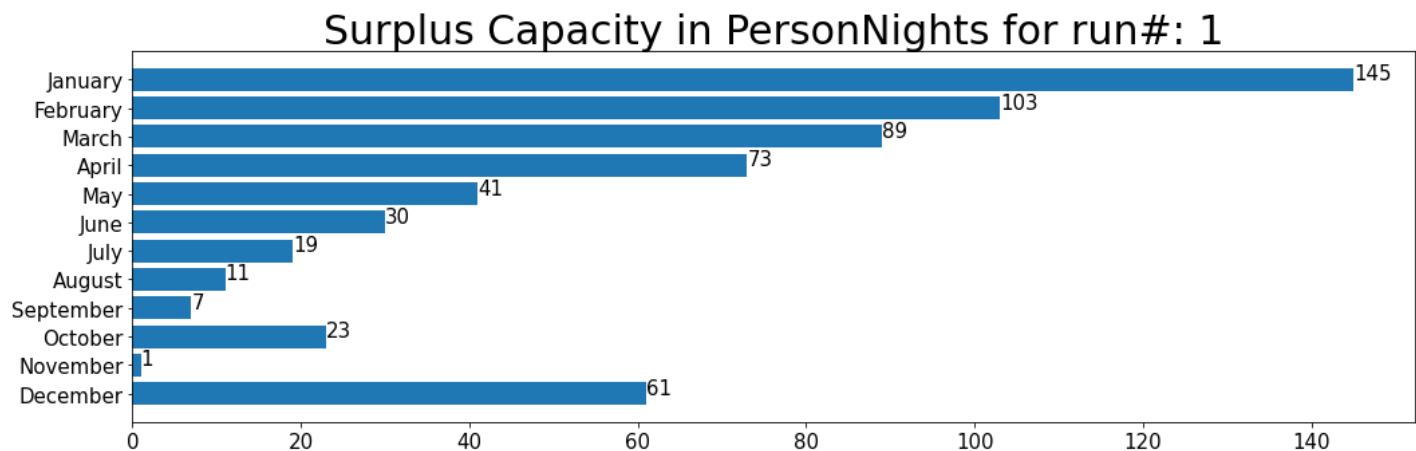
## Visualize - Over Months
# =====

titlestr = 'Surplus Capacity in PersonNights for run#: ' + str(spc_monthly1.loc[1,'run_number'])
plt.title(titlestr, fontsize=30)
plt.barh(spc_monthly1['month'], spc_monthly1['monthly_spc'])

for index, value in enumerate(spc_monthly1['monthly_spc']):
    plt.text(value, index,
             str(value))

plt.show()

```



## mean surplus capacity

In [27]:

```

## Visualize - Over Runs
# =====

spc_monthly_mean=spc_monthly_mean.sort_values('month', ascending=True)
spc_monthly1=spc_monthly1.sort_values('month', ascending=True)
spc_monthly2=spc_monthly2.sort_values('month', ascending=True)
spc_monthly3=spc_monthly3.sort_values('month', ascending=True)

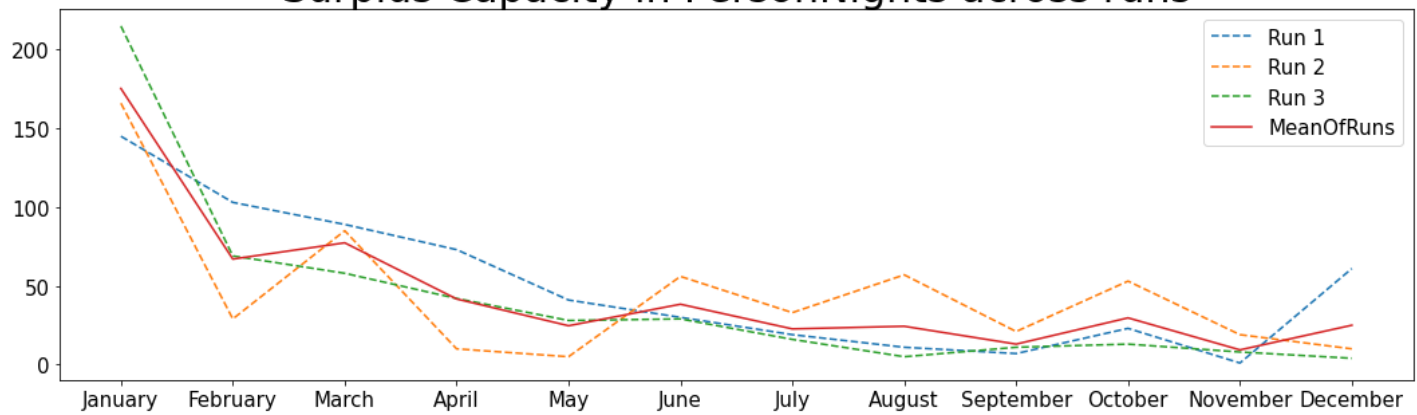
titlestr = 'Surplus Capacity in PersonNights across runs'
plt.title(titlestr, fontsize=30)

plt.rcParams["figure.figsize"] = [15, 5]
plt.rcParams["figure.autolayout"] = True
#fig = plt.figure()

plt.plot(spc_monthly1['month'], spc_monthly1['monthly_spc'], label = "Run 1", linestyle='solid')
plt.plot(spc_monthly2['month'], spc_monthly2['monthly_spc'], label = "Run 2", linestyle='dashed')
plt.plot(spc_monthly3['month'], spc_monthly3['monthly_spc'], label = "Run 3", linestyle='dashed')
plt.plot(spc_monthly_mean['month'], spc_monthly_mean['monthly_spc'], label = "MeanOfRuns",
         linestyle='solid')
plt.legend()
spacing = 0.100
fig.subplots_adjust(bottom=spacing)
plt.show()

```

# Surplus Capacity in PersonNights across runs



## Abuse victims turned away

In [28]:

```
# Prep the data - Abuse victims turned away over months
# =====

avt_monthly1=run1
avt_monthly2=run2
avt_monthly3=run3

avt_monthly1 = avt_monthly1.groupby(["run_number", "month"]).agg(monthly_avt = ("ppl_turned", "sum"))
avt_monthly2 = avt_monthly2.groupby(["run_number", "month"]).agg(monthly_avt = ("ppl_turned", "sum"))
avt_monthly3 = avt_monthly3.groupby(["run_number", "month"]).agg(monthly_avt = ("ppl_turned", "sum"))

avt_monthly1.reset_index(inplace=True)
avt_monthly2.reset_index(inplace=True)
avt_monthly3.reset_index(inplace=True)

avt_monthlyall = pd.concat([avt_monthly1,avt_monthly2,avt_monthly3])

avt_months1=avt_monthlyall[(avt_monthlyall['run_number'] == 1)]
avt_months2=avt_monthlyall[(avt_monthlyall['run_number'] == 2)]
avt_months3=avt_monthlyall[(avt_monthlyall['run_number'] == 3)]

months = ["January", "February", "March", "April", "May", "June","July", "August", "September", "October", "November", "December"]
avt_monthly1['month'] = pd.Categorical(avt_monthly1['month'], categories=months, ordered=True)
avt_monthly1=avt_monthly1.sort_values('month', ascending=False)
avt_monthly2['month'] = pd.Categorical(avt_monthly2['month'], categories=months, ordered=True)
avt_monthly2=avt_monthly2.sort_values('month', ascending=False)
avt_monthly3['month'] = pd.Categorical(avt_monthly3['month'], categories=months, ordered=True)
avt_monthly3=avt_monthly3.sort_values('month', ascending=False)
avt_monthly_mean = avt_monthlyall.groupby(["month"]).agg(monthly_avt = ("monthly_avt", "sum"))
avt_monthly_mean['run_number']=0
avt_monthly_mean.reset_index(inplace=True)
avt_monthly_mean['month'] = pd.Categorical(avt_monthly_mean['month'], categories=months, ordered=True)
avt_monthly_mean=avt_monthly_mean.sort_values('month', ascending=False)

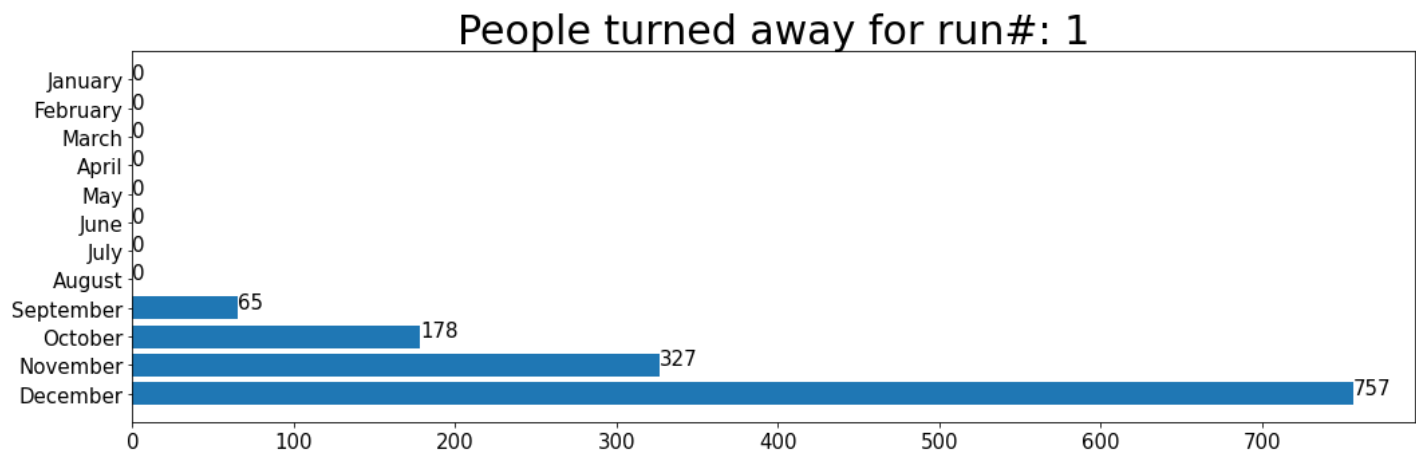
## Visualize - Over Months
# =====

titlestr = 'People turned away for run#: ' + str(avt_monthly1.loc[1,'run_number'])
plt.title(titlestr,fontsize=30)
plt.barh(avt_monthly1['month'],avt_monthly1['monthly_avt'])

for index, value in enumerate(avt_monthly1['monthly_avt']):
```

```
plt.text(value, index,
        str(value))

plt.show()
```



## Mean number of abuse victims turned away

In [29]:

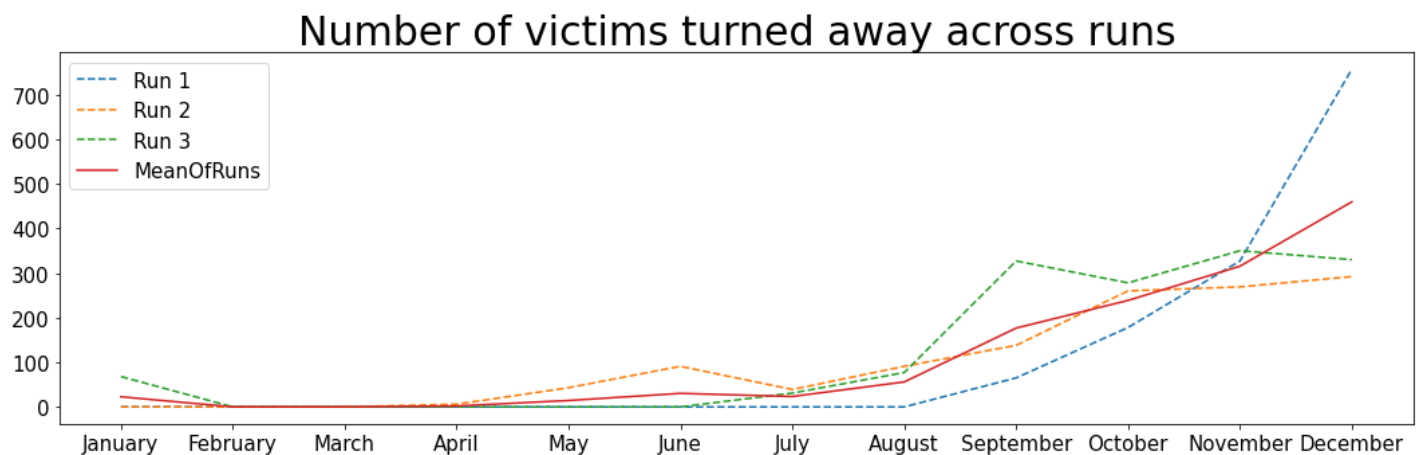
```
## Visualize - Over Runs
# =====

avt_monthly_mean=avt_monthly_mean.sort_values('month', ascending=True)
avt_monthly1=avt_monthly1.sort_values('month', ascending=True)
avt_monthly2=avt_monthly2.sort_values('month', ascending=True)
avt_monthly3=avt_monthly3.sort_values('month', ascending=True)

titlestr = 'Number of victims turned away across runs'
plt.title(titlestr, fontsize=30)

plt.rcParams["figure.figsize"] = [15, 5]
plt.rcParams["figure.autolayout"] = True
#fig = plt.figure()

plt.plot(avt_monthly1['month'], avt_monthly1['monthly_avt'], label = "Run 1", linestyle='dashed')
plt.plot(avt_monthly2['month'], avt_monthly2['monthly_avt'], label = "Run 2", linestyle='dashed')
plt.plot(avt_monthly3['month'], avt_monthly3['monthly_avt'], label = "Run 3", linestyle='dashed')
plt.plot(avt_monthly_mean['month'], avt_monthly_mean['monthly_avt'], label = "MeanOfRuns",
plt.legend()
spacing = 0.100
fig.subplots_adjust(bottom=spacing)
plt.show()
```



victims sent to hotels

In [30]:

```
# Prep the data - Abuse victims turned away over months
# =====

vsh_monthly1=run1
vsh_monthly2=run2
vsh_monthly3=run3

vsh_monthly1 = vsh_monthly1.groupby(["run_number", "month"]).agg(monthly_vsh = ("sent_to_hotel", "sum"))
vsh_monthly2 = vsh_monthly2.groupby(["run_number", "month"]).agg(monthly_vsh = ("sent_to_hotel", "sum"))
vsh_monthly3 = vsh_monthly3.groupby(["run_number", "month"]).agg(monthly_vsh = ("sent_to_hotel", "sum"))

vsh_monthly1.reset_index(inplace=True)
vsh_monthly2.reset_index(inplace=True)
vsh_monthly3.reset_index(inplace=True)

vsh_monthlyall = pd.concat([vsh_monthly1,vsh_monthly2,vsh_monthly3])

vsh_months1=vsh_monthlyall[(vsh_monthlyall['run_number'] == 1)]
vsh_months2=vsh_monthlyall[(vsh_monthlyall['run_number'] == 2)]
vsh_months3=vsh_monthlyall[(vsh_monthlyall['run_number'] == 3)]

months = ["January", "February", "March", "April", "May", "June","July", "August", "September",
           "November", "December"]
vsh_monthly1['month'] = pd.Categorical(vsh_monthly1['month'], categories=months, ordered=True)
vsh_monthly1=vsh_monthly1.sort_values('month', ascending=False)
vsh_monthly2['month'] = pd.Categorical(vsh_monthly2['month'], categories=months, ordered=True)
vsh_monthly2=vsh_monthly2.sort_values('month', ascending=False)
vsh_monthly3['month'] = pd.Categorical(vsh_monthly3['month'], categories=months, ordered=True)
vsh_monthly3=vsh_monthly3.sort_values('month', ascending=False)
vsh_monthly_mean = vsh_monthlyall.groupby(["month"]).agg(monthly_vsh = ("monthly_vsh", "mean"))
vsh_monthly_mean['run_number']=0
vsh_monthly_mean.reset_index(inplace=True)
vsh_monthly_mean['month'] = pd.Categorical(vsh_monthly_mean['month'], categories=months, ordered=True)
vsh_monthly_mean=vsh_monthly_mean.sort_values('month', ascending=False)

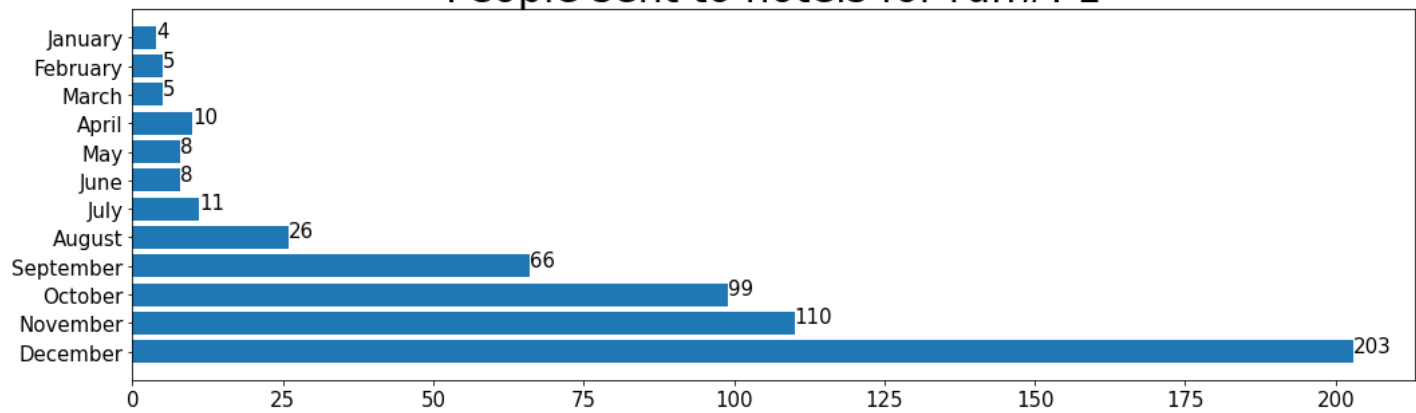
## Visualize - Over Months
# =====

titlestr = 'People sent to hotels for run#: ' + str(vsh_monthly1.loc[1,'run_number'])
plt.title(titlestr,fontsize=30)
plt.barh(vsh_monthly1['month'],vsh_monthly1['monthly_vsh'])

for index, value in enumerate(vsh_monthly1['monthly_vsh']):
    plt.text(value, index,
             str(value))

plt.show()
```

## People sent to hotels for run#: 1



## mean number of victims sent to hotels

In [31]:

```
## Visualize - Over Runs
# =====

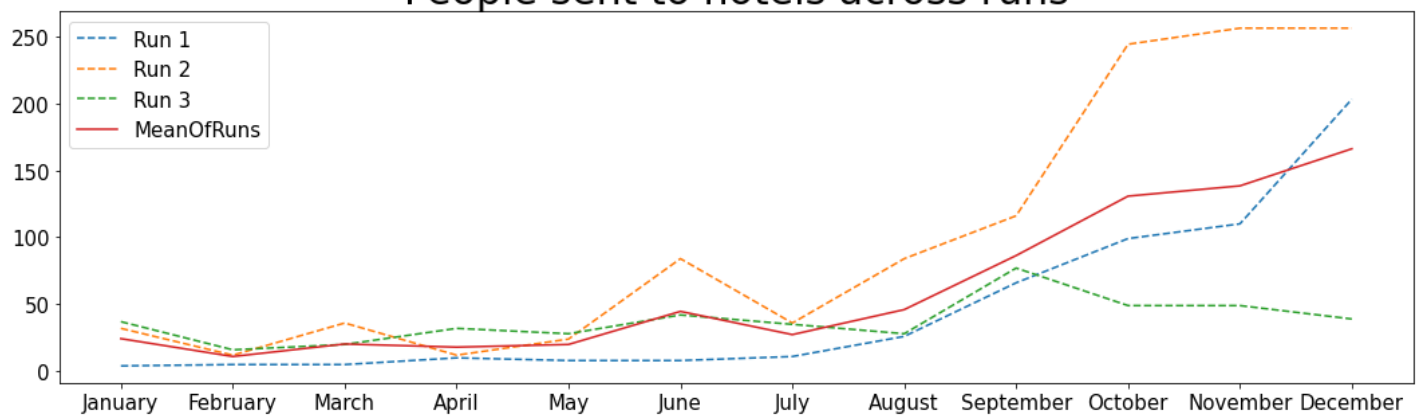
vsh_monthly_mean=vsh_monthly_mean.sort_values('month', ascending=True)
vsh_monthly1=vsh_monthly1.sort_values('month', ascending=True)
vsh_monthly2=vsh_monthly2.sort_values('month', ascending=True)
vsh_monthly3=vsh_monthly3.sort_values('month', ascending=True)

titlestr = 'People sent to hotels across runs'
plt.title(titlestr,fontsize=30)

plt.rcParams["figure.figsize"] = [15, 5]
plt.rcParams["figure.autolayout"] = True
#fig = plt.figure()

plt.plot(vsh_monthly1['month'], vsh_monthly1['monthly_vsh'], label = "Run 1", linestyle='dashed')
plt.plot(vsh_monthly2['month'], vsh_monthly2['monthly_vsh'], label = "Run 2",linestyle='dashed')
plt.plot(vsh_monthly3['month'], vsh_monthly3['monthly_vsh'], label = "Run 3",linestyle='dashed')
plt.plot(vsh_monthly_mean['month'], vsh_monthly_mean['monthly_vsh'], label = "MeanOfRuns",
plt.legend()
spacing = 0.100
fig.subplots_adjust(bottom=spacing)
plt.show()
```

## People sent to hotels across runs



## NHPP implementation for incoming clients

This is actually working NHPP code. While we didn't integrate this into our model above, this is part of the future todo [list](#)

The work that is required here is to convert this one run model to a more real-time model. Currently this code runs once and generates all the incoming arrivals all together. However, our code requires a more real-time update, in that the code wants to call a function and a real-time "stay\_duration". That is the extra work needed here.

In [32]:

```
## Lets assume the average number of entries in the shelter on non-holiday season is 20 ar
## Each entry could be between 1 to 4 women arriving at shelter
#defining non-homogenous poisson process with arrival rates varying between 1 to 4 in the c
def nhpp_arrival():
    t = 0
    potential_arr_time = 0
    arrival_times = []
    arrival_rate = []

    #defining a period function where arrival rate varies from 1 to 4
    ld = 3.5 + 2.5*math.sin(t/2)

    #max_arrivals
    ld_0 = 6

    for month in range(1,12):
        if (month <= 8):
            n = 20
        else:
            n = 30

        #generates arrival for each month
        for i in range(0,n):
            ld = 3.5 + 2.5*math.sin(t/2)

            #generate a uniform sample
            U = random.uniform(0,1)

            #calculating exponential arrival time
            potential_intr_arr = -1/ld_0 * math.log(U)

            #bootstraping to get arrival times for each arrival
            potential_arr_time += potential_intr_arr

            #assign the new arrival time to t
            t = potential_arr_time

            #generate a uniform to test the probability of accepting or rejecting the pote
            V = random.uniform(0,1)
            probab = ld / ld_0

            #accept t if V < probab
            if V <= probab:
                arrival_times.append(t)
                i+=1

    for j in range(0,len(arrival_times)):
        x = 3.5 + 2.5*math.sin(arrival_times[j]/2)
        arrival_rate.append(x)

    #generate client type for each arrival
    client_type = list(np.random.choice([1,2,3,4],len(arrival_times), p=[0.25,0.25,0.25,0.25]))

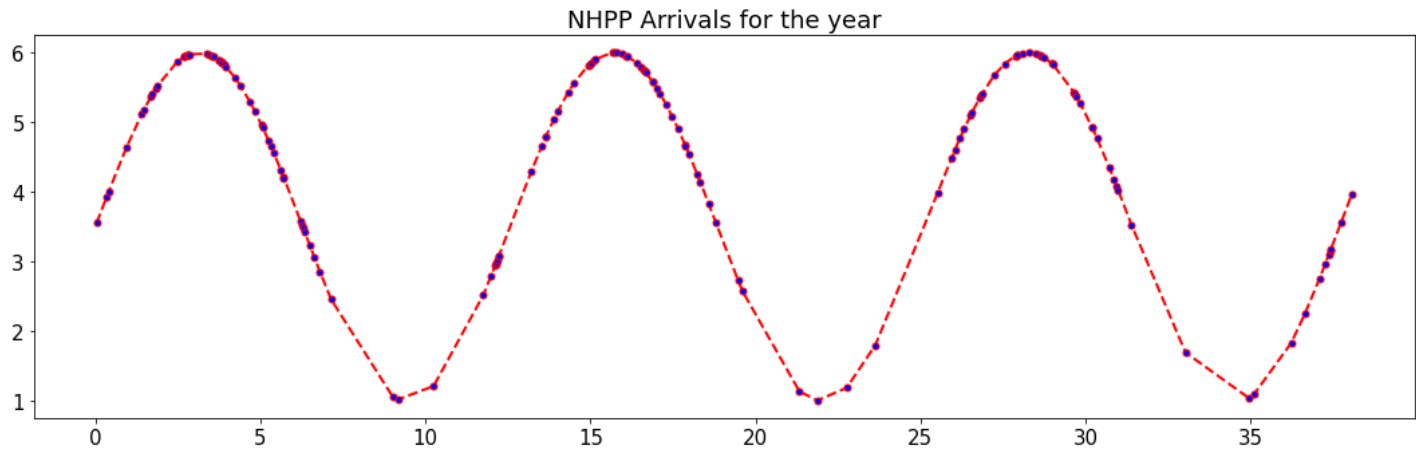
    return(arrival_times,arrival_rate,client_type)
```

In [33]:

```
# Arrivals on a weekday:
arrival_times,arrival_rate,client_type = nhpp_arrival()
```

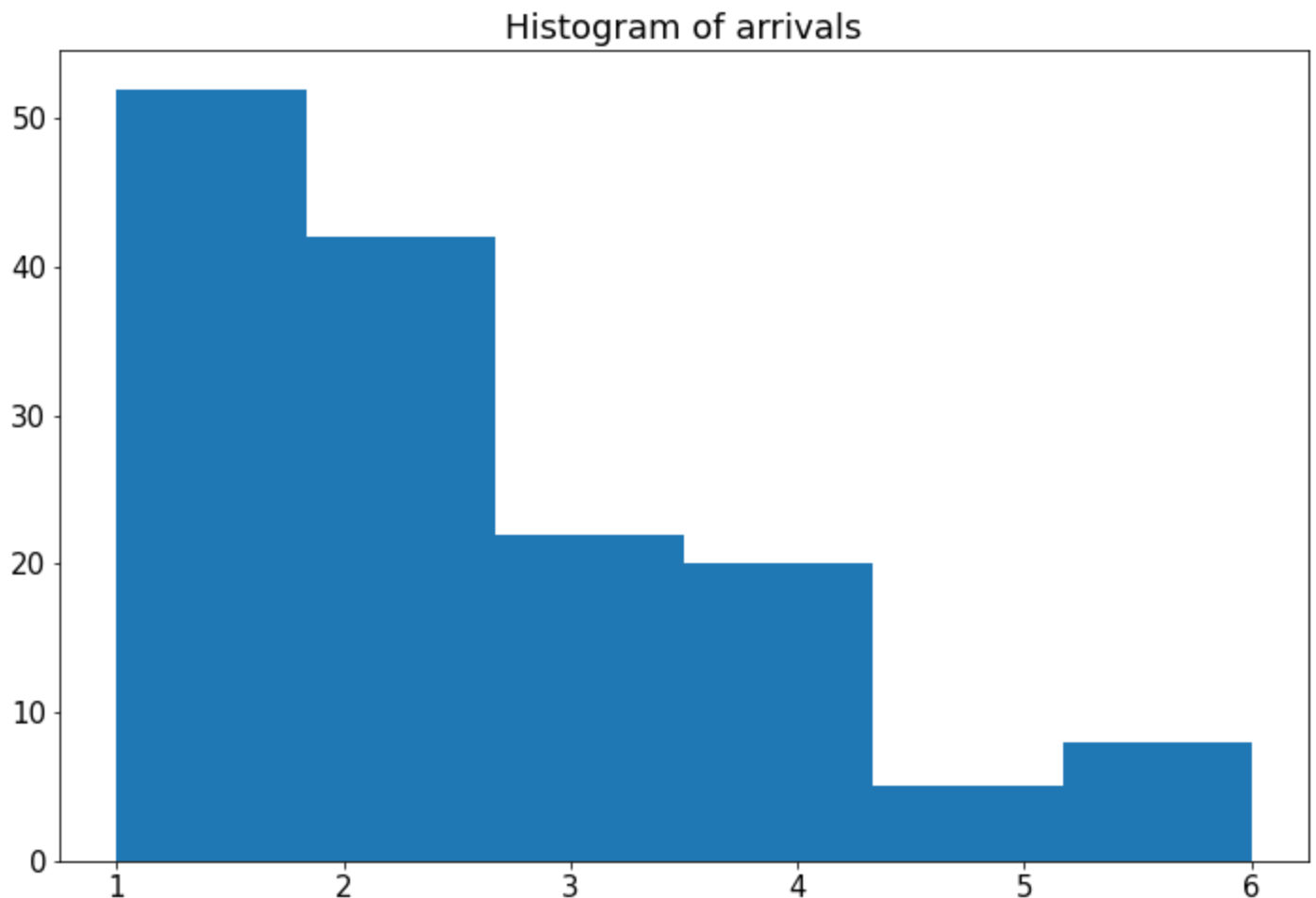
```
# plotting the arrival rates at each arrival time ---> non-homogeneous poisson process
plt.plot(arrival_times,arrival_rate, color='red', linestyle='dashed', linewidth = 2,
         marker='o', markerfacecolor='blue', markersize=5 )
plt.title('NHPP Arrivals for the year')
```

Out[33]: Text(0.5, 1.0, 'NHPP Arrivals for the year')



```
In [34]: # round off arrivals
fig, ax = plt.subplots(figsize =(10, 7))
# mirror the arrivals to make it skewed for smaller arrivals compared to larger ones (can
ax.hist([7-round(i) for i in arrival_rate],bins=6)
plt.title('Histogram of arrivals')
```

Out[34]: Text(0.5, 1.0, 'Histogram of arrivals')



References :

<https://hpaulkeeler.com/simulating-an-inhomogeneous-poisson-point-process/>

<https://stackoverflow.com/questions/32712409/how-to-sample-inhomogeneous-poisson-processes-in-python-faster-than-this>

The original bones of this simpy model is Inspired by car wash example  
<https://simpy.readthedocs.io/en/latest/examples/carwash.html>