

MALAWI PROTOTYPE  
**NEONATAL INTENSIVE CARE UNIT**

Audrey Swanson | Design 10 | Spring 2021

# 01

## OVERVIEW

Project Trajectory:  
Research Question  
Methodology

# 02

## FINDINGS

Case Study Evaluation:  
Kasungu District Hospital  
Rwinkwavu District Hospital  
Comparison

# 03

## CONCLUSIONS

District Level Prototype:  
Program Kit of Parts  
Adjacency Diagrams  
Nursery Design

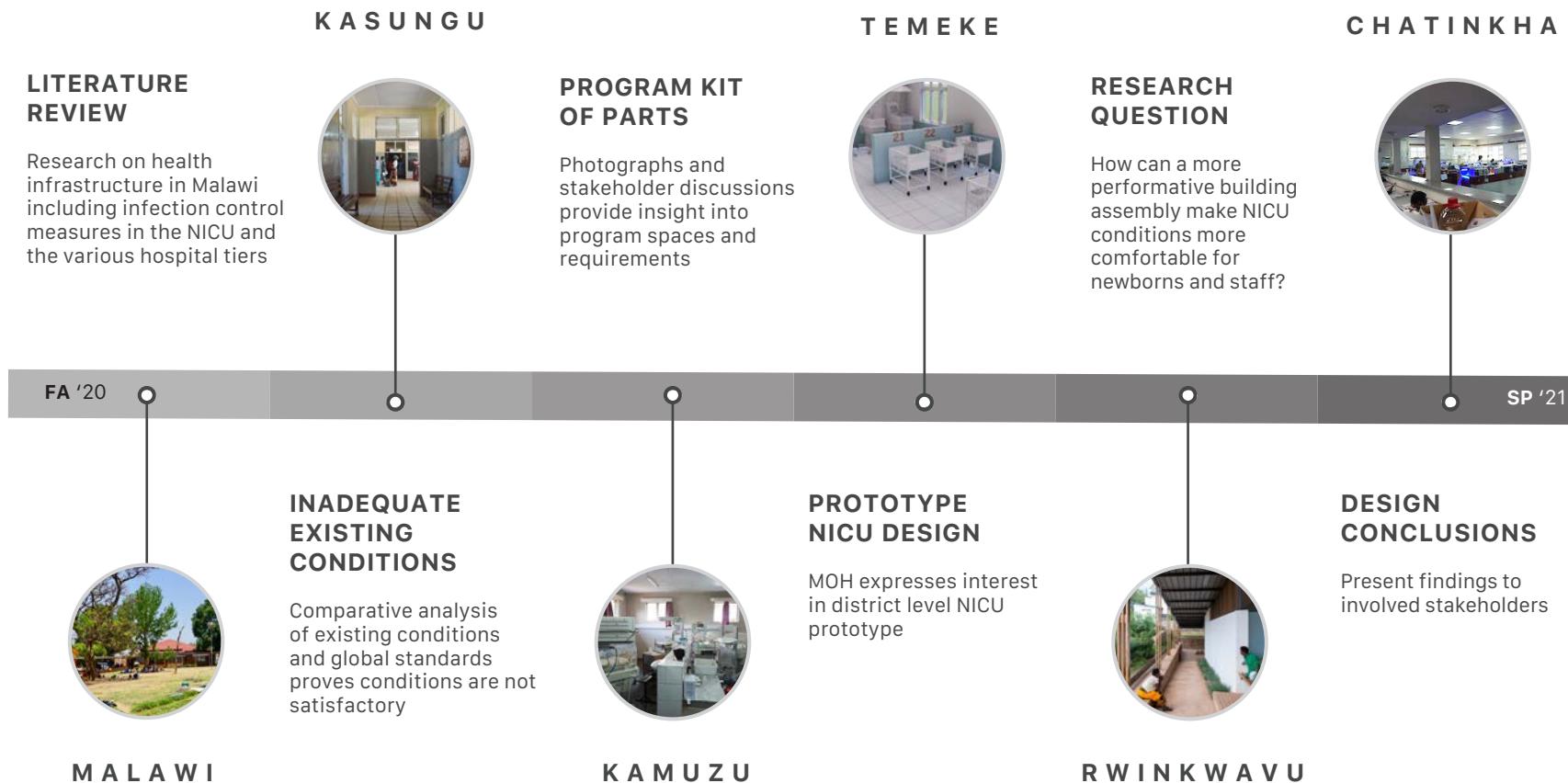
# 01

## OVERVIEW

Project Trajectory:  
Research Question  
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# PROJECT TRAJECTORY

OVERVIEW FINDINGS CONCLUSIONS



# 02

## FINDINGS

Case Study Evaluation:  
Kasungu District Hospital  
Rwinkwavu District Hospital  
Comparison

# KASUNGU DISTRICT HOSPITAL NICU

OVERVIEW FINDINGS CONCLUSIONS



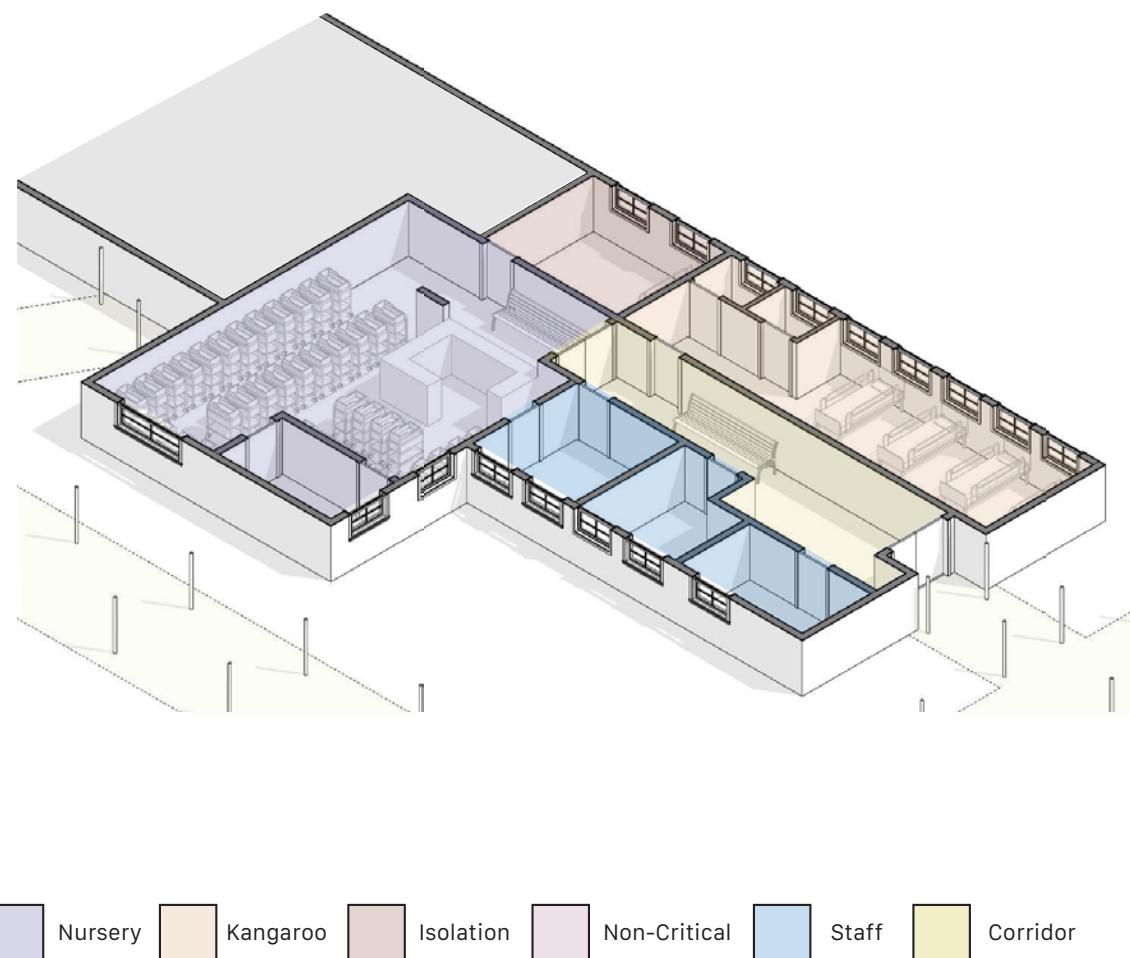
# PROGRAMMATIC EVALUATION

OVERVIEW FINDINGS CONCLUSIONS

## KASUNGU DISTRICT HOSPITAL NICU

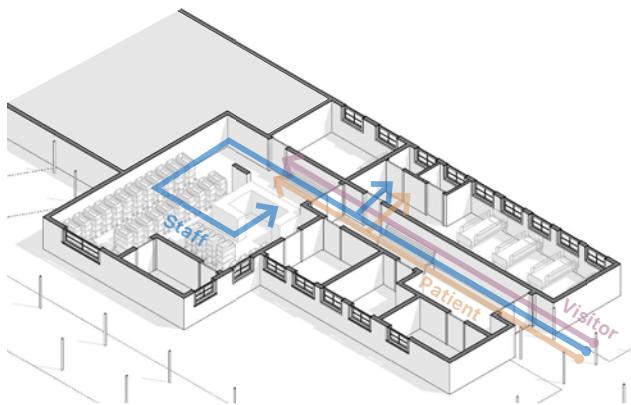
Bed Count:  
40 nursery, 4+ KMC, 3+ isolation

Program Space	SM	SF
Nursery	58.4	629
Nurse's Station	6.8	73
Sluice	7.2	77
Isolation	14.7	158
Shower	2.0	22
WC	2.0	22
Kangaroo Ward	35.3	380
Break Room	10.5	113
Storage	9.0	97
Office	8.6	92
Corridor	28.7	309
<b>Total</b>	<b>183.2</b>	<b>1,972</b>

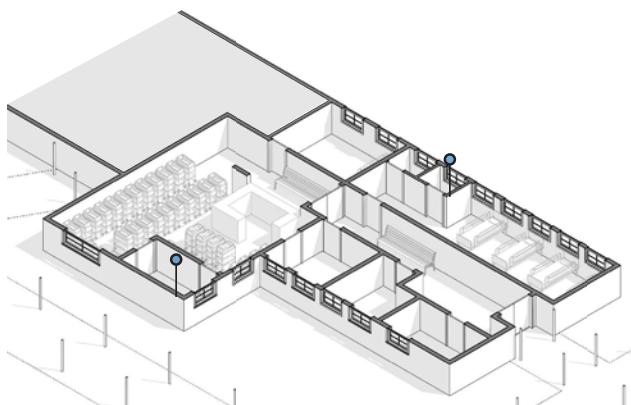


# PROGRAMMATIC EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



CIRCULATION PER USER GROUP

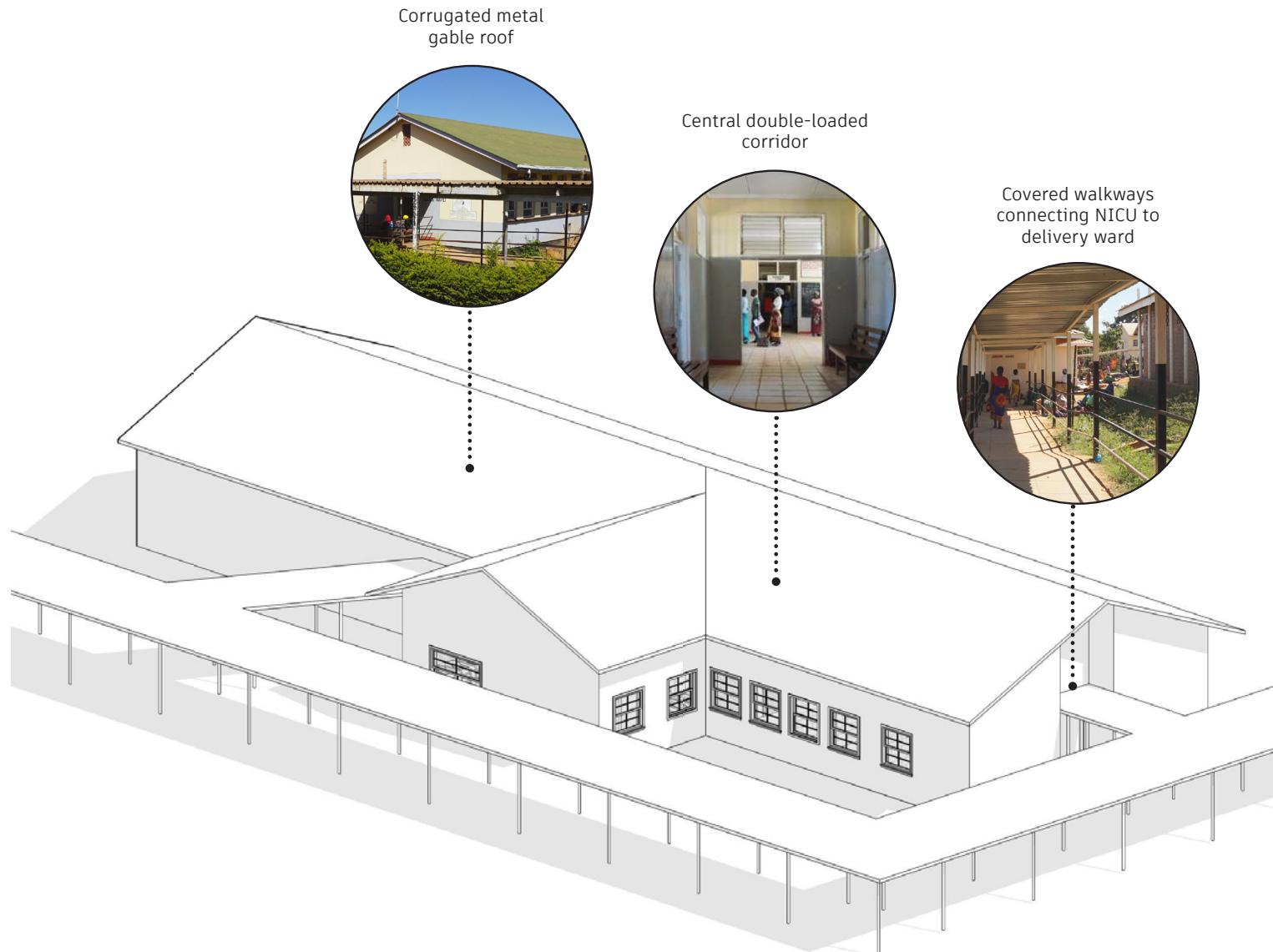


WATER, SANITATION, HYGIENE (WASH)



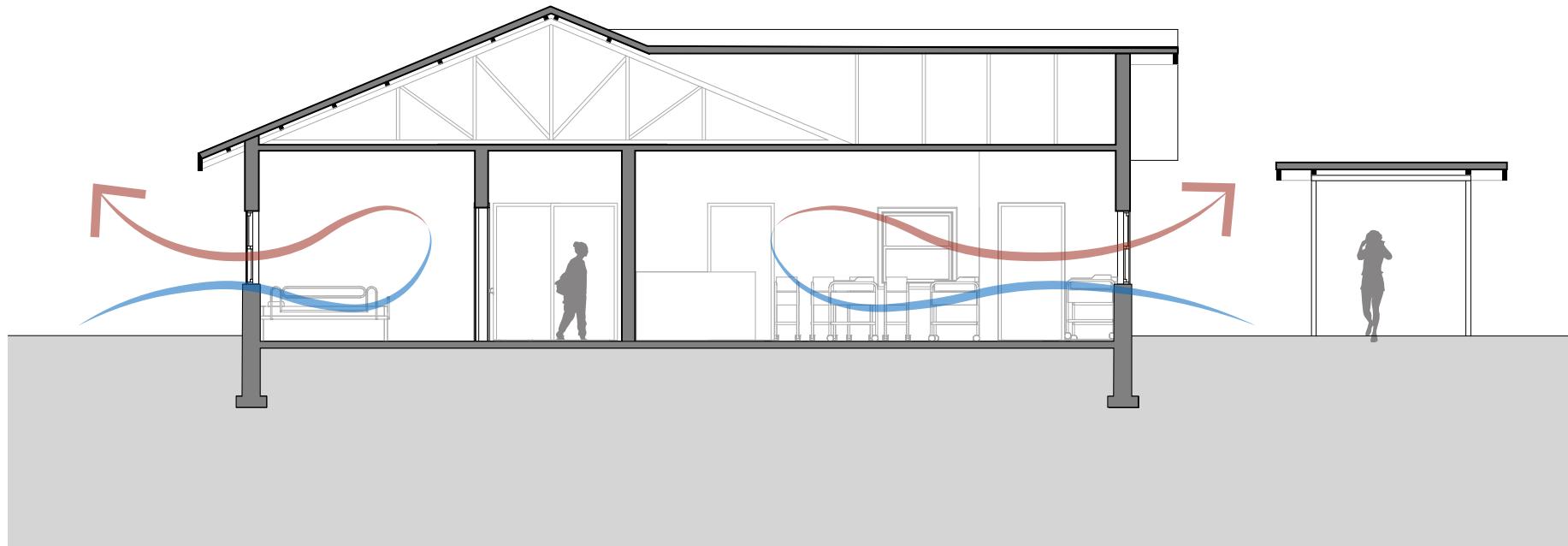
# PERFORMANCE EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



# PERFORMANCE EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



## VENTILATION

Interior partitions prevent cross ventilation

# RWINKWAVU DISTRICT HOSPITAL NICU

OVERVIEW FINDINGS CONCLUSIONS



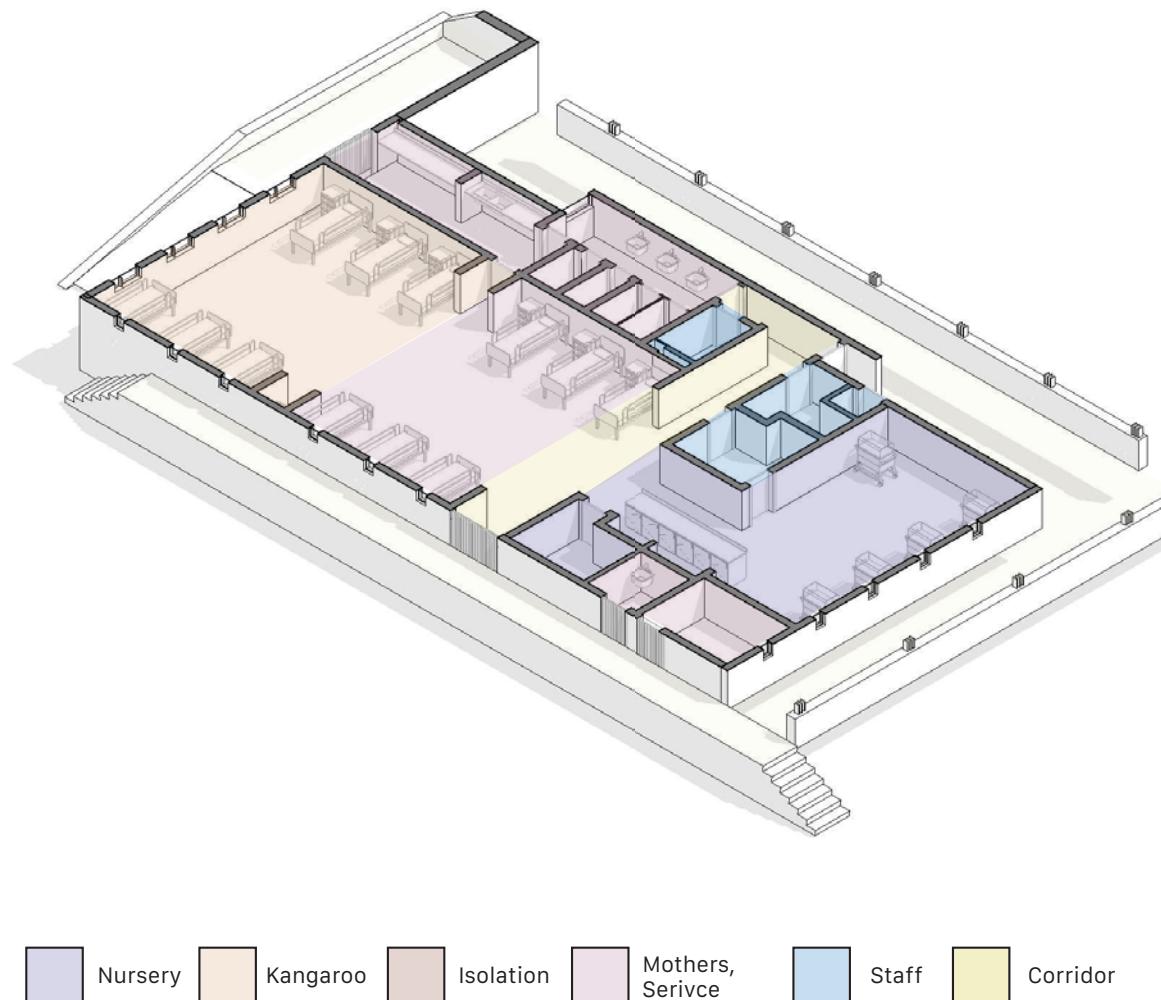
# PROGRAMMATIC EVALUATION

OVERVIEW FINDINGS CONCLUSIONS

## RWINKWAVU DISTRICT HOSPITAL NICU

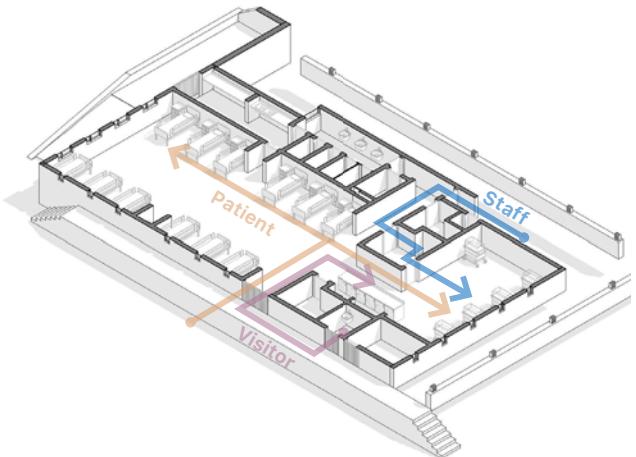
Bed Count:  
5 nursery, 6 KMC, 6 NICU mothers

Program Space	SM	SF
Nursery	33.4	360
Nurse's Station	17.8	192
Consult/Office	7.1	76
Storage (2)	10.1	109
Visitor Changing	3.0	32
Staff Changing	6.0	64
Elec. Closet	1.0	11
NICU Mothers'	51.6	555
Kangaroo Ward	52.0	559
Baby Bath	7.3	78
Milk Prep	8.1	87
Patient WC	16.5	178
Staff WC	3.3	35
Exterior Patio	8.3	90
Corridor	21.8	235
<b>Total</b>	<b>183.2</b>	<b>2,661</b>

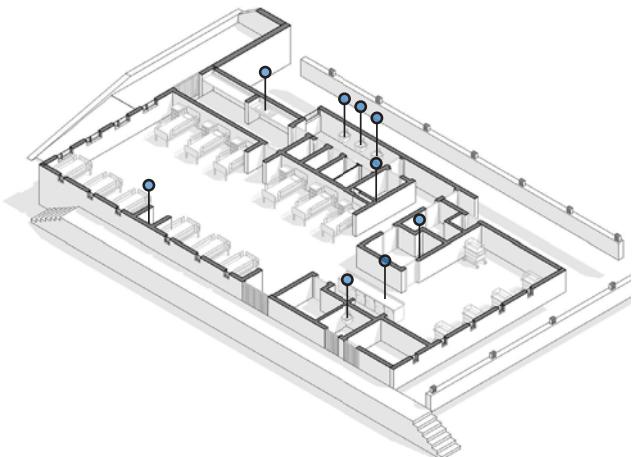


# PROGRAMMATIC EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



CIRCULATION PER USER GROUP

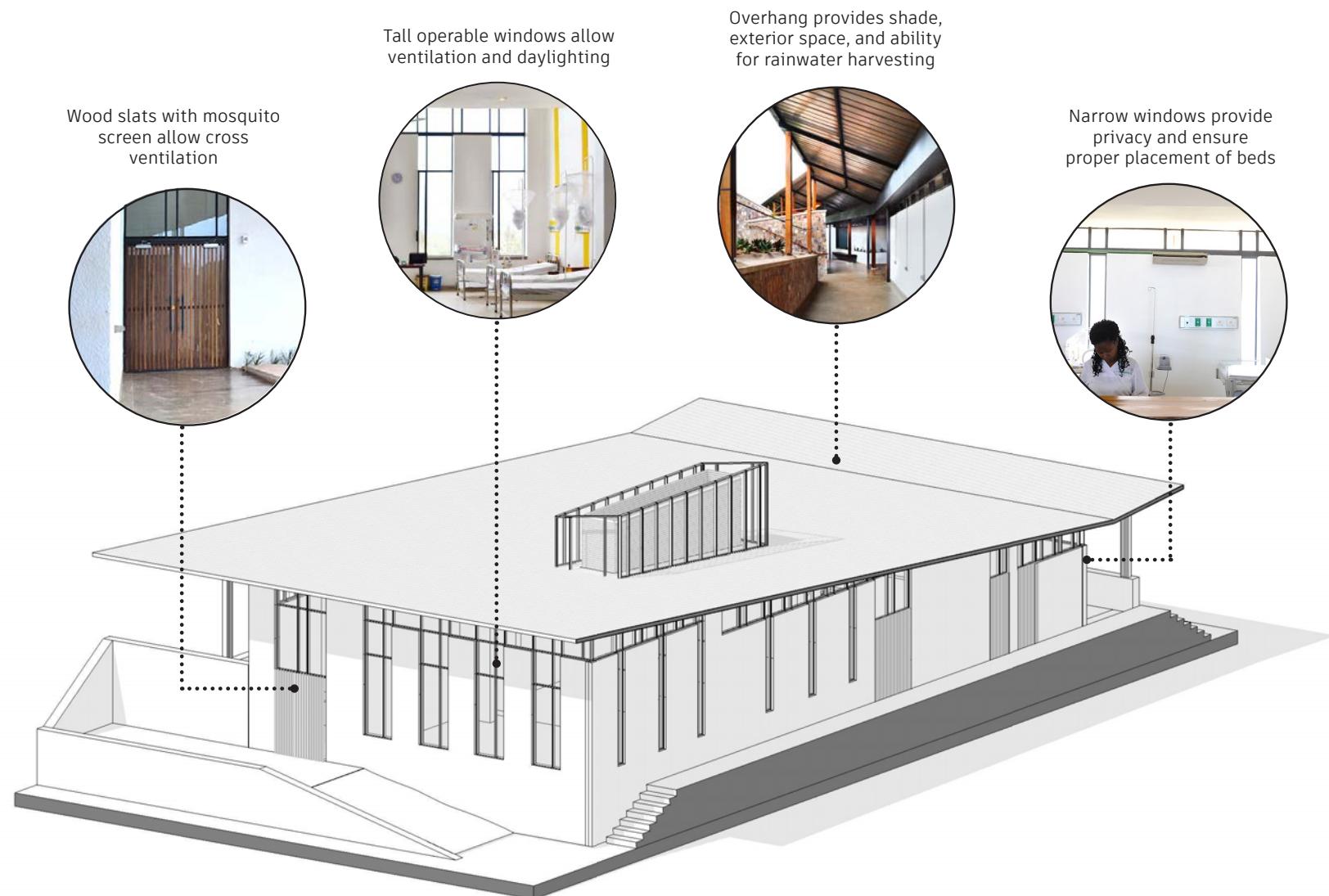


WATER, SANITATION, HYGIENE (WASH)



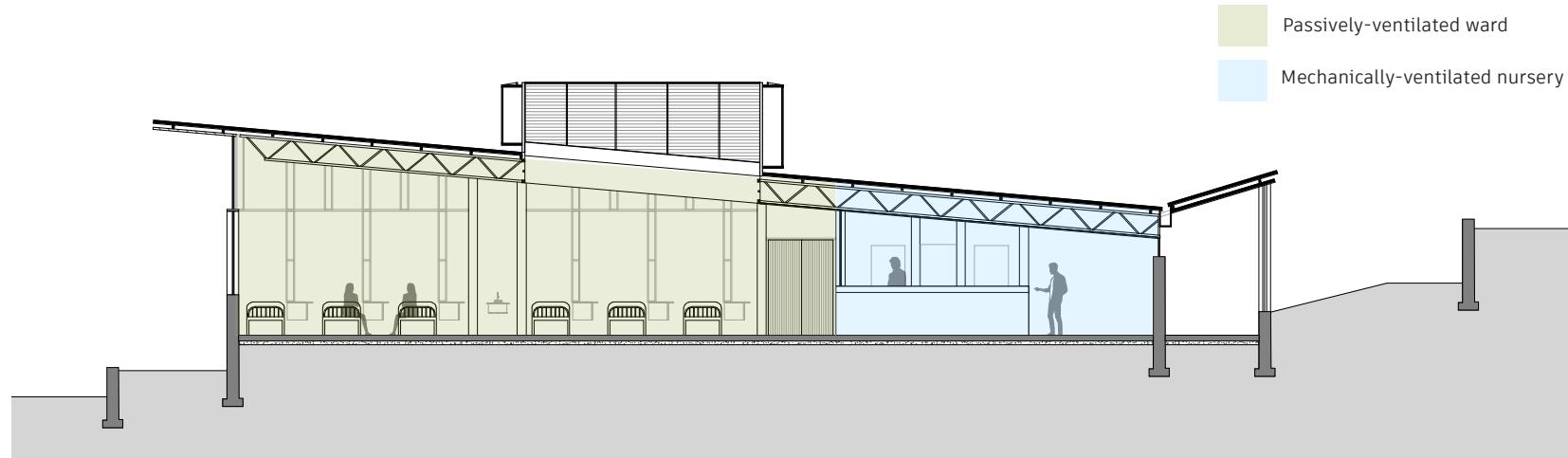
# PERFORMANCE EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



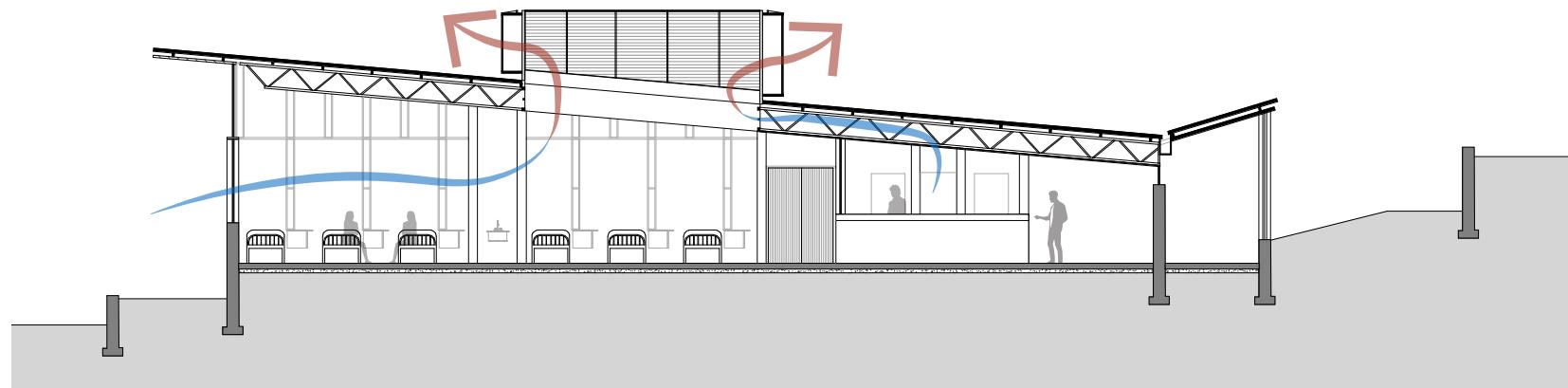
# PERFORMANCE EVALUATION

OVERVIEW FINDINGS CONCLUSIONS



## PASSIVE AND MECHANICAL VENTILATION ZONES

Mechanical fan in nursery prevents uncontrolled outside air from coming into the nursery, while the rest of the NICU is passively ventilated

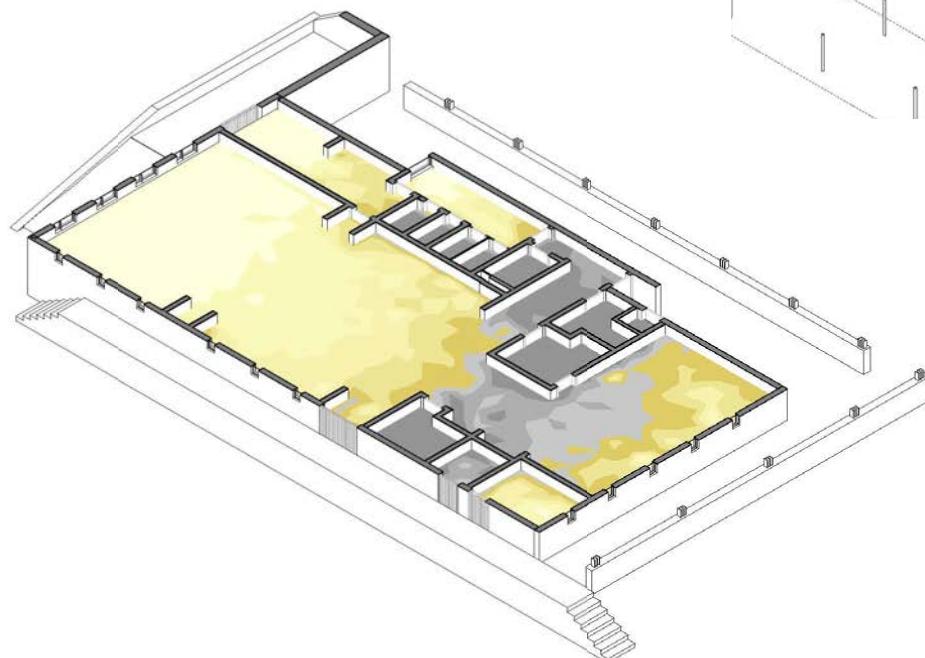


## STACK VENTILATION

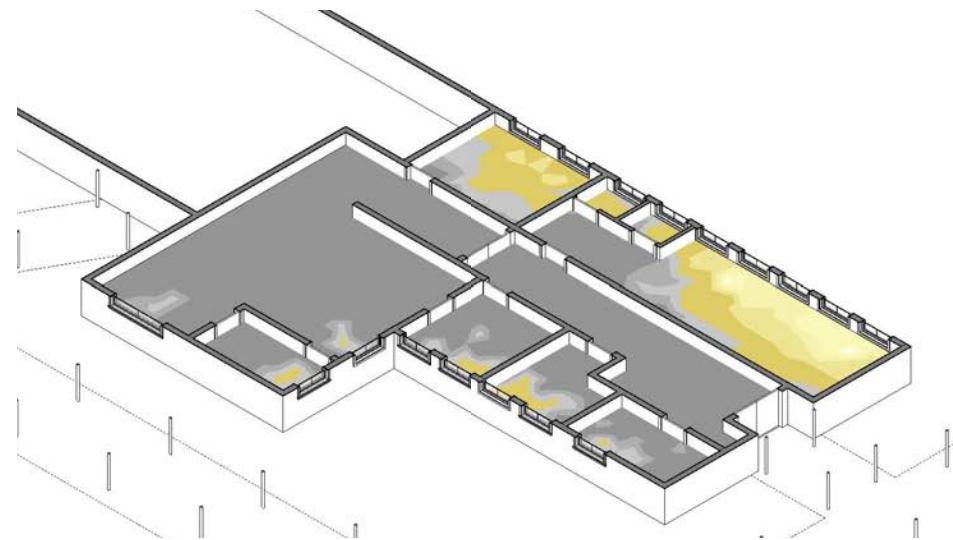
The proposed ventilation strategy relies on intake from three sides of the building and exhaust out the top

# CASE STUDY COMPARISON

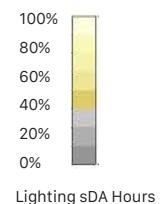
OVERVIEW FINDINGS CONCLUSIONS



RWINKWAVU DISTRICT HOSPITAL



KASUNGU DISTRICT HOSPITAL



Lighting sDA Hours

SPATIAL DAYLIGHT AUTONOMY

# 03

## CONCLUSIONS

District Level Prototype:  
Program Kit of Parts  
Adjacency Diagrams  
Nursery Design

# PROGRAM SPACES

OVERVIEW FINDINGS CONCLUSIONS

## Screening

Mandatory screening for infectious diseases prior to entrance

## Check-in and Waiting

Main public access point with restricted access; desk with staff

## Reception

Seating area for family and visitors bringing food or looking for patient; hand hygiene encouraged

## Counseling and Grieving

Private room near reception with support for emotional and psychological challenges including grieving; acoustic and visual privacy; comfortable seating

## High Dependency Unit

Approximately 15 beds with 4 SM each; views and easy access by staff

## Low Dependency Unit

Approximately 15 beds with 3 SM each; all beds in view from nurse's station

## Isolated Nursery

Approximately 10 beds for non-referral babies from home; negative pressure if possible; views and access from nurse's station

## Nurse's Station

Central desk in nursery located for maximum patient views; hand wash basin; administrative component

## Sluice

Dirty utility room for waste disposal; direct access to exterior preferred

## Storage

Storage spaces for linen, equipment, and supplies

## Fatalities

Location near mortuary; access from nursery and separate from patient view if possible

## Feeding Room

Area for expression of milk; feeding instruction and motivation; comfortable chairs; storage; hand wash basin

## Milk Bank

Space for preparation and storage of milk; clean-up area

## Bathroom

Toilet and showers with maximum natural light and ventilation

## Kangaroo Mother Care

Sleeping area with reclining beds and storage units for mothers during skin-skin care; nurse's station and ability for patient rounds; private room; includes lounge and exterior access

## Isolated Kangaroo Mother Care

Restricted access to exterior space; negative pressure if possible

## Mothers' Room

Bedroom for mothers while baby is receiving care in nursery; ability to return to nursery for feeding every few hours

## Staff Rest Area

Private break room for staff including comfortable seating, prep. area, toilets, and showers; flexible with conference room; access to exterior

## Conference

Table with seating for education, training, and meetings

## Office

Private office for unit manager

## Doctors' Sleeping

Private housing for doctors with bathroom and exterior access

## Staff Changing

Male and female pass-through rooms with lockers, prominent sink, gowning

## Guardian Space

Open space and shaded space for family members providing patient support including laundry, washing/drying, cooking

## Play Area

Sheltered exterior space for children

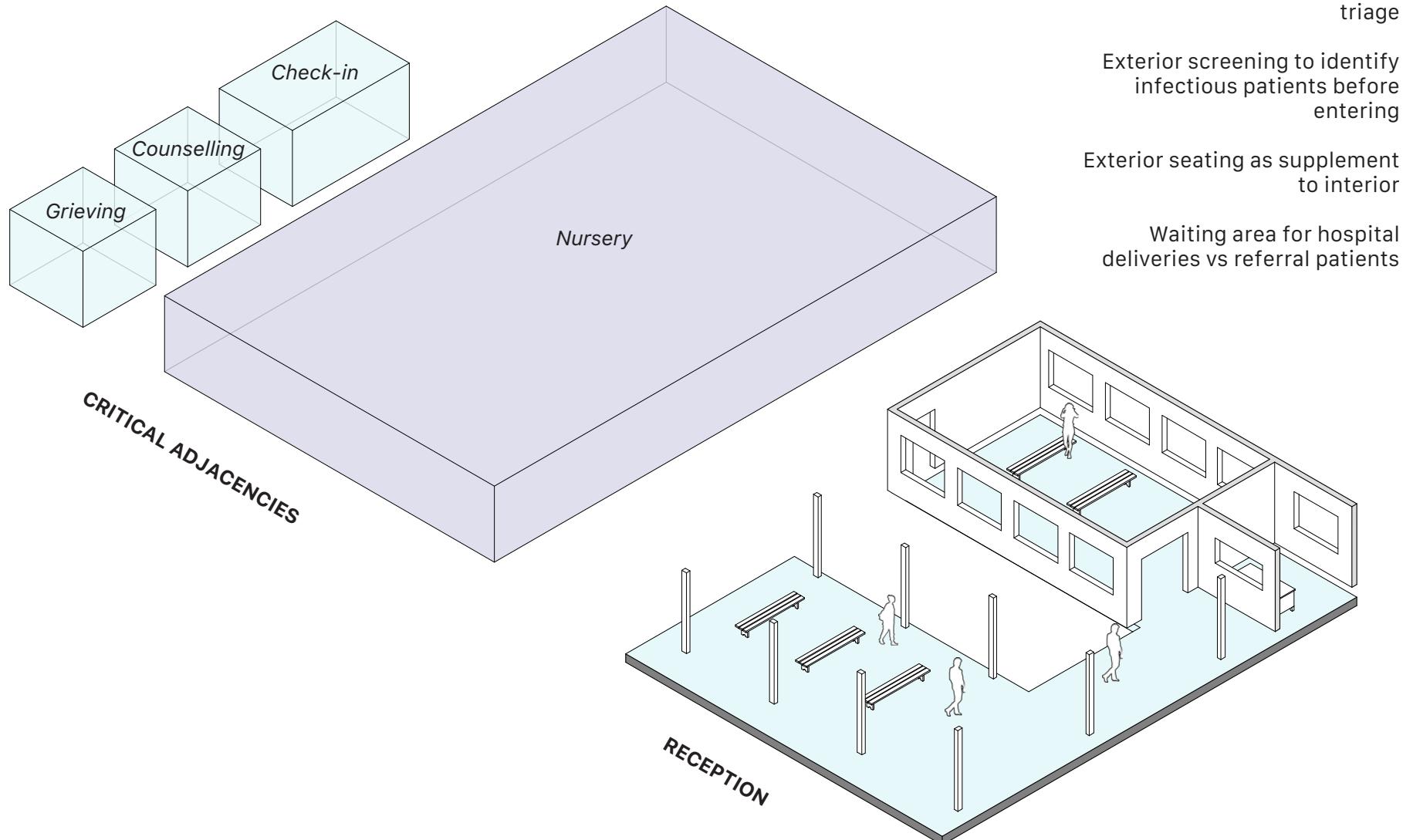
## Circulation

Single-loaded corridor when possible for maximum daylight and ventilation

# RECEPTION ADJACENCIES

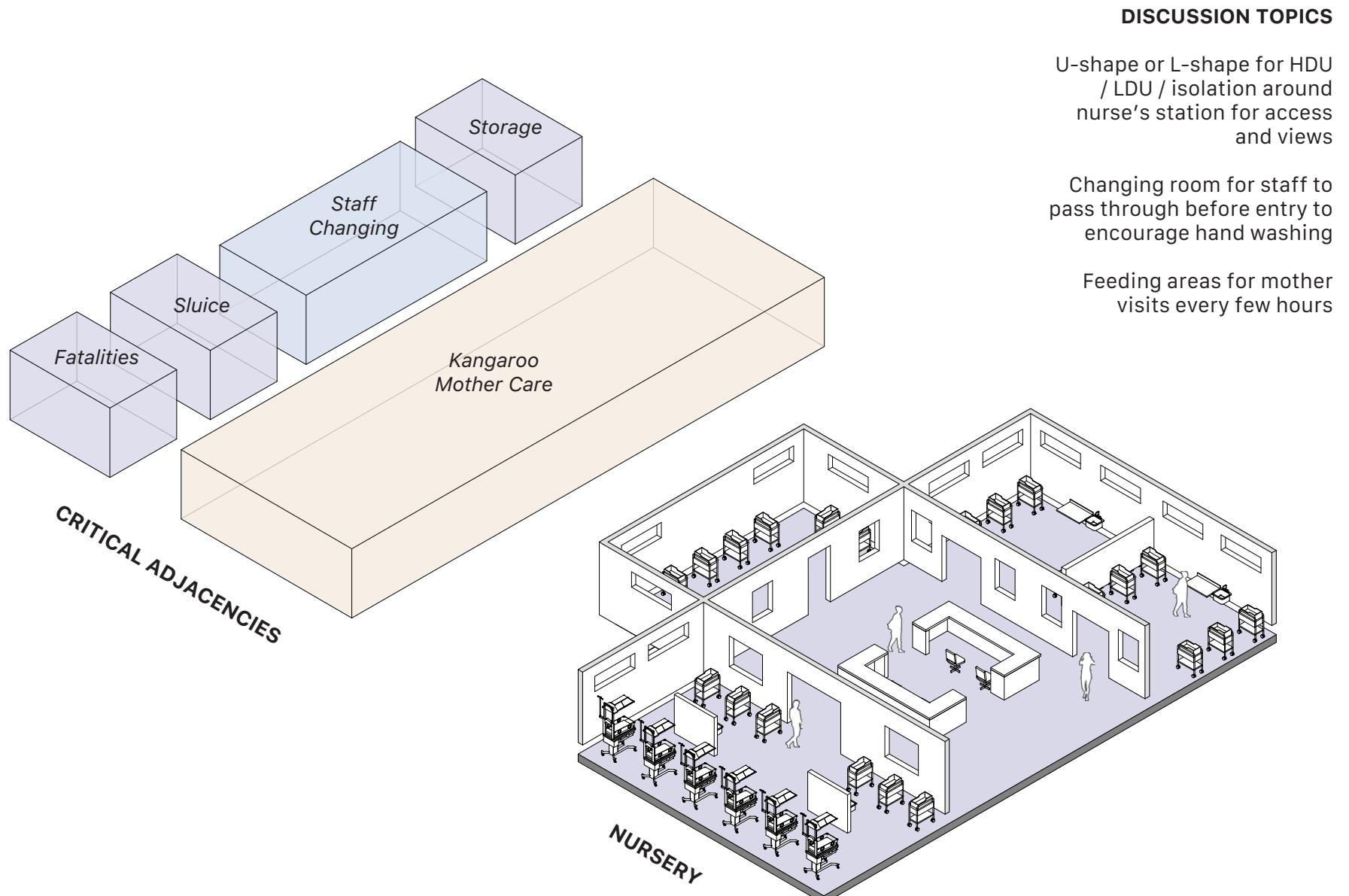
OVERVIEW FINDINGS CONCLUSIONS

## DISCUSSION TOPICS



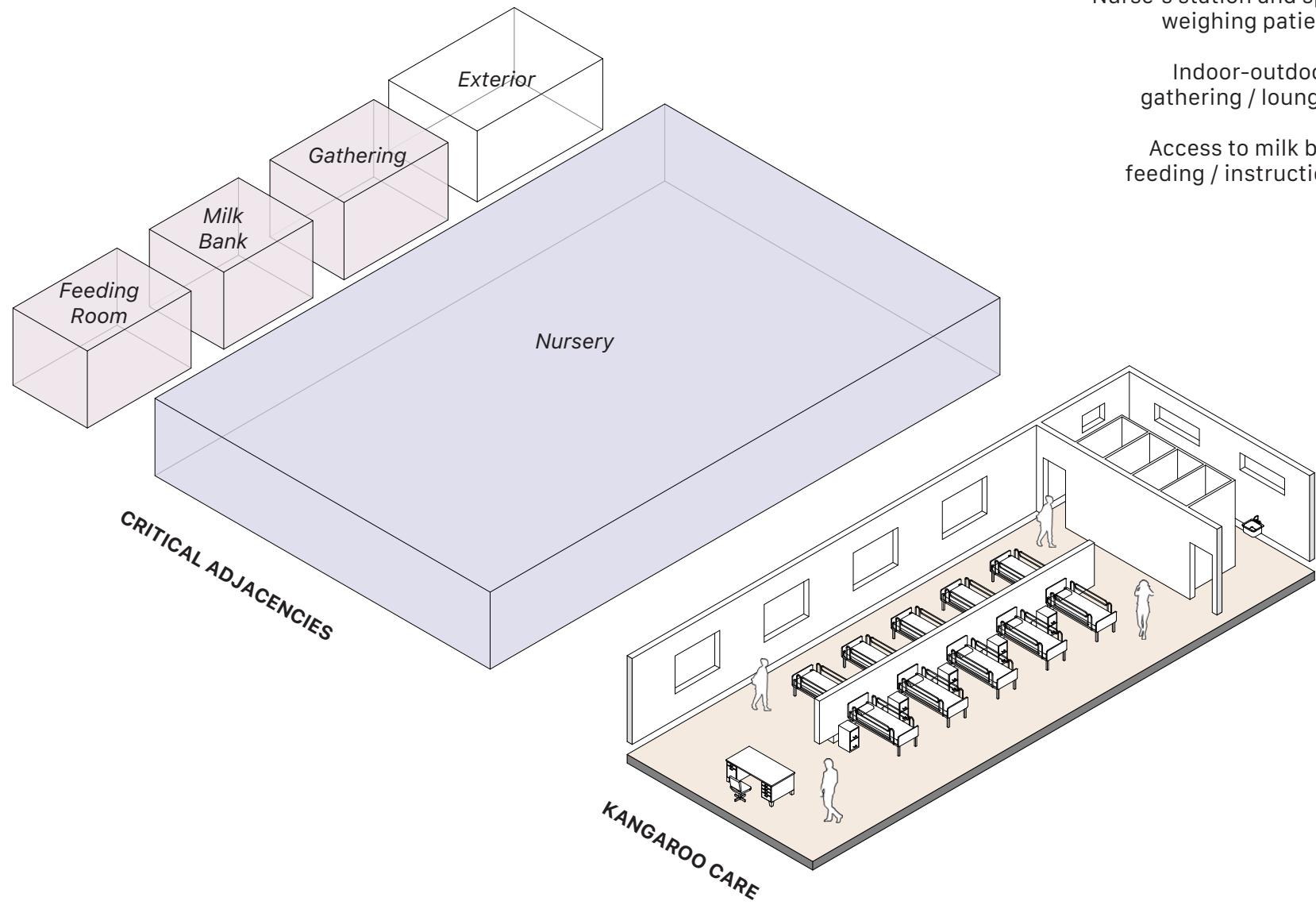
# NURSERY ADJACENCIES

OVERVIEW FINDINGS CONCLUSIONS



# KANGAROO CARE ADJACENCIES

OVERVIEW FINDINGS CONCLUSIONS



# STAFF REST AREA ADJACENCIES

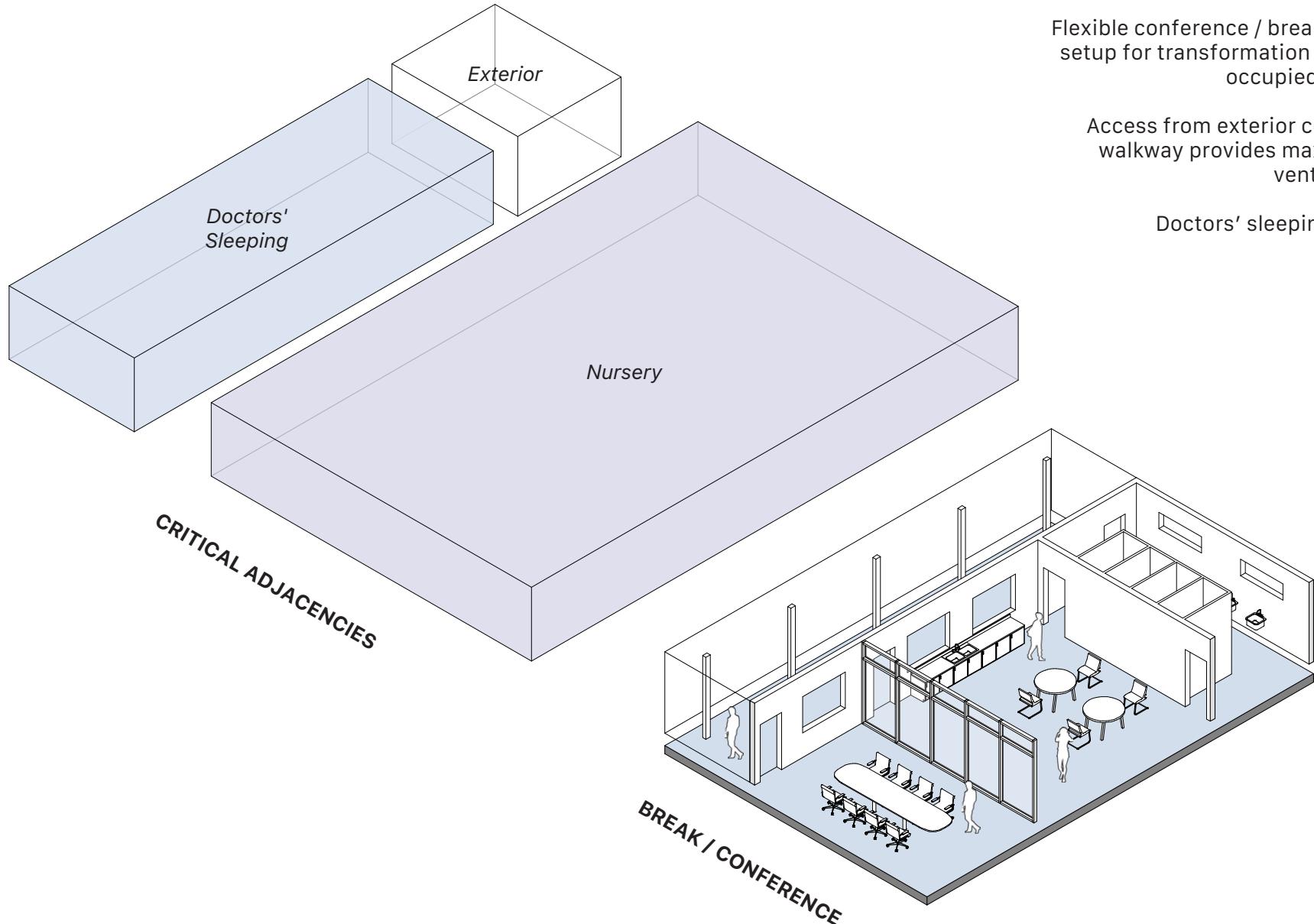
OVERVIEW FINDINGS CONCLUSIONS

## DISCUSSION TOPICS

Flexible conference / break room setup for transformation during occupied hours

Access from exterior covered walkway provides maximum ventilation

Doctors' sleeping area



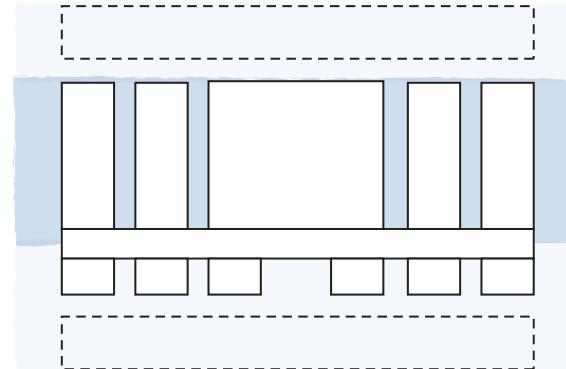
# DISTRICT LEVEL PROTOTYPE

OVERVIEW FINDINGS CONCLUSIONS

## PROPOSED PROGRAM SPACES

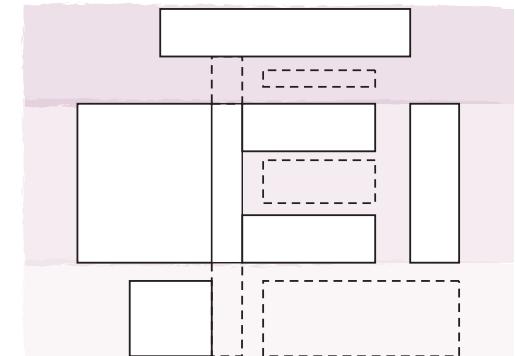
Bed Count:  
40 nursery, 10 KMC, 10 Isolated KMC,  
10 mothers' room

Program Space	SM	SF
Screening	6.5	80
Reception	2.8	300
Counselling	13.0	190
HD Nursery	88.3	950
LD Nursery	88.3	950
Isolated Nursery	46.5	500
Nurse's Station	37.2	400
Sluice	13.9	150
Storage	18.6	200
Fatalities	13.9	150
Feeding	23.2	250
Milk Bank	11.1	120
WC (4 total)	120.8	1300
KMC	130.1	1400
Isolated KMC	130.1	1400
Mothers' Room	130.1	1400
Break / Conference	41.8	450
Office	9.3	100
Doctors' Housing	92.9	1000
Staff Changing (m/f)	18.5	200
Circulation	-	-
<b>Total</b>	<b>1067.5</b>	<b>11,490</b>



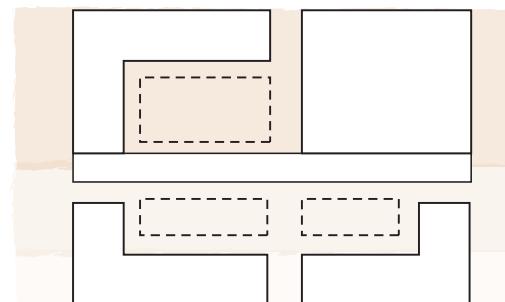
### CENTRAL SPINE

Critical and non-critical spaces divided by the central corridor and spaced to allow gaps for ventilation



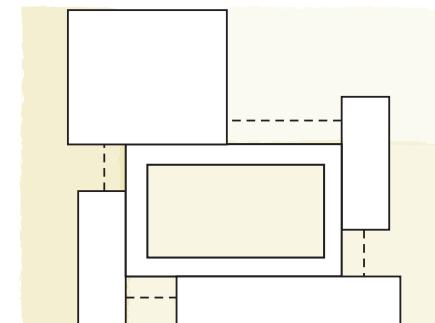
### LAYERS

Program spaces layered in order of public to private based on user groups



### DOUBLE BAR

Linear courtyards separate critical and non-critical care program bars

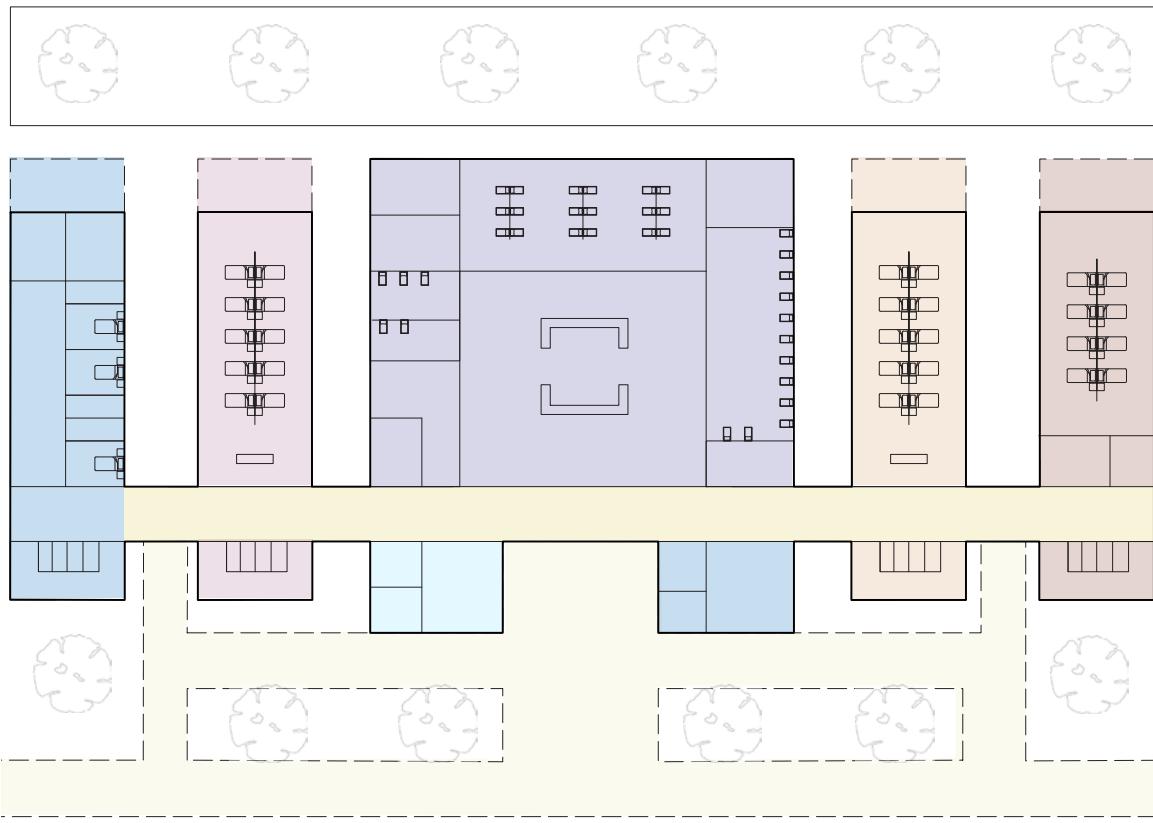


### COURTYARD

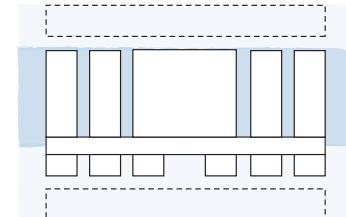
Program spaces arranged around central courtyard

# CENTRAL SPINE SCHEME

OVERVIEW FINDINGS CONCLUSIONS



Nursery  
  Kangaroo  
  Isolation  
  Mothers  
  Entry  
  Circulation  
  Staff



## CENTRAL SPINE

*Scheme 1*

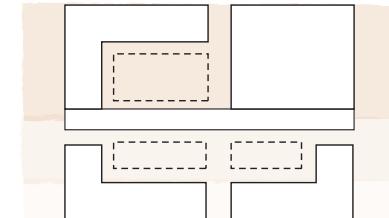
Areas of critical care are located north of the corridor; less critical spaces are on the south

Gaps between program spaces allow ventilation while prioritizing spatial constraints and circulation distances

Primary exterior open spaces for mothers and guardians are located on the periphery

# DOUBLE BAR SCHEME A

OVERVIEW FINDINGS CONCLUSIONS



## DOUBLE BAR Scheme 2-A

Layout consists of 2 program bars: one made up of critical care and associated spaces, and another for the less critical spaces

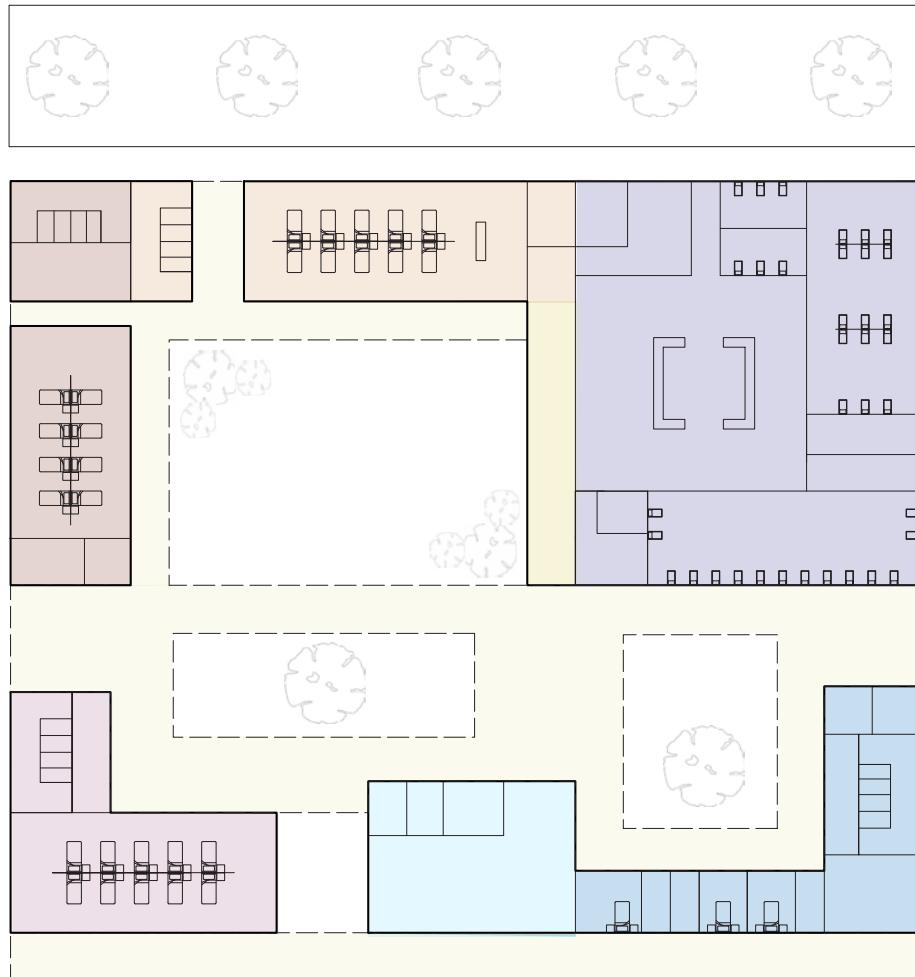
The critical care bar uses interior circulation, while the less critical care bar uses exterior circulation

A series of courtyards are created by the in-between space

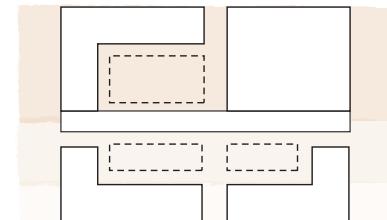
Staff zone on the west side is separated from the patient-centered spaces on the east side

# DOUBLE BAR SCHEME B

OVERVIEW FINDINGS CONCLUSIONS



Nursery  
  Kangaroo  
  Isolation  
  Mothers  
  Entry  
  Circulation  
  Staff



## DOUBLE BAR Scheme 2-B

Areas of critical care are located in the north bar; less critical spaces are in the south bar

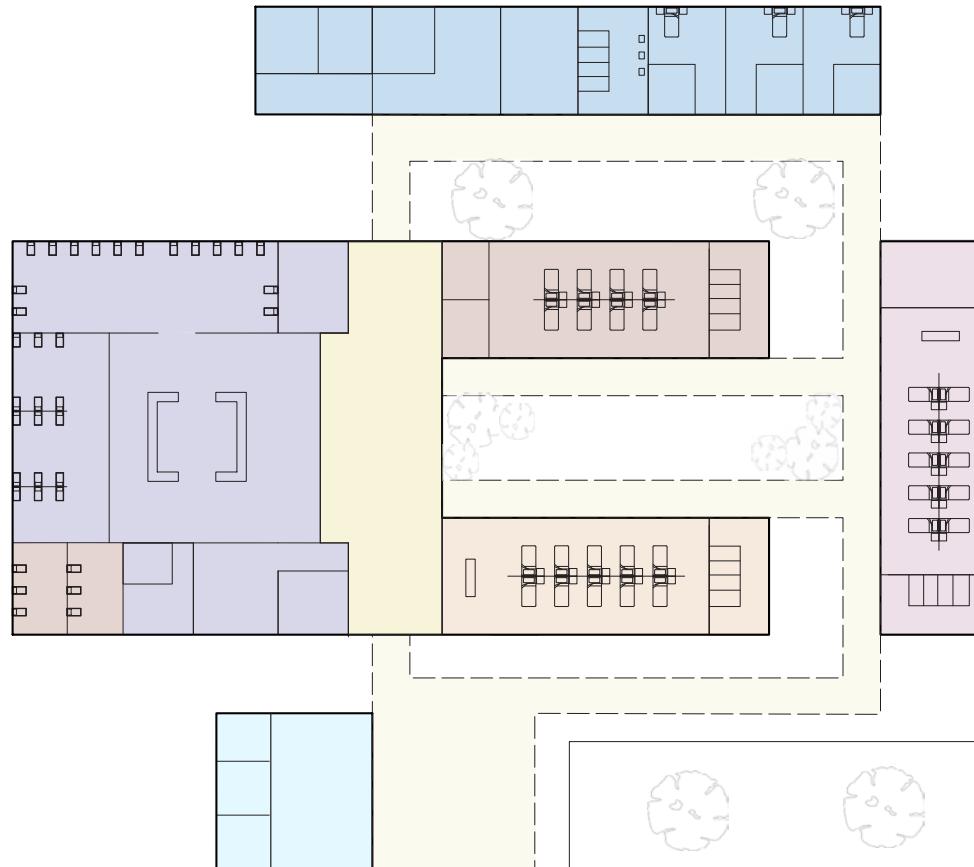
Each main program space has designated courtyard

Critical care bar circulation is enclosed, while the less critical care bar uses exterior circulation where desirable

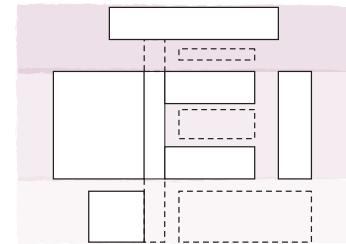
Orientation of wards maximizes connection to courtyard for communal feel

# LAYERS SCHEME

OVERVIEW FINDINGS CONCLUSIONS



Nursery  
  Kangaroo  
  Isolation  
  Mothers  
  Entry  
  Circulation  
  Staff



## LAYERS

*Scheme 3*

Patient-centered spaces located in the center; staff spaces to the north; guardian, family, and visitors to the south

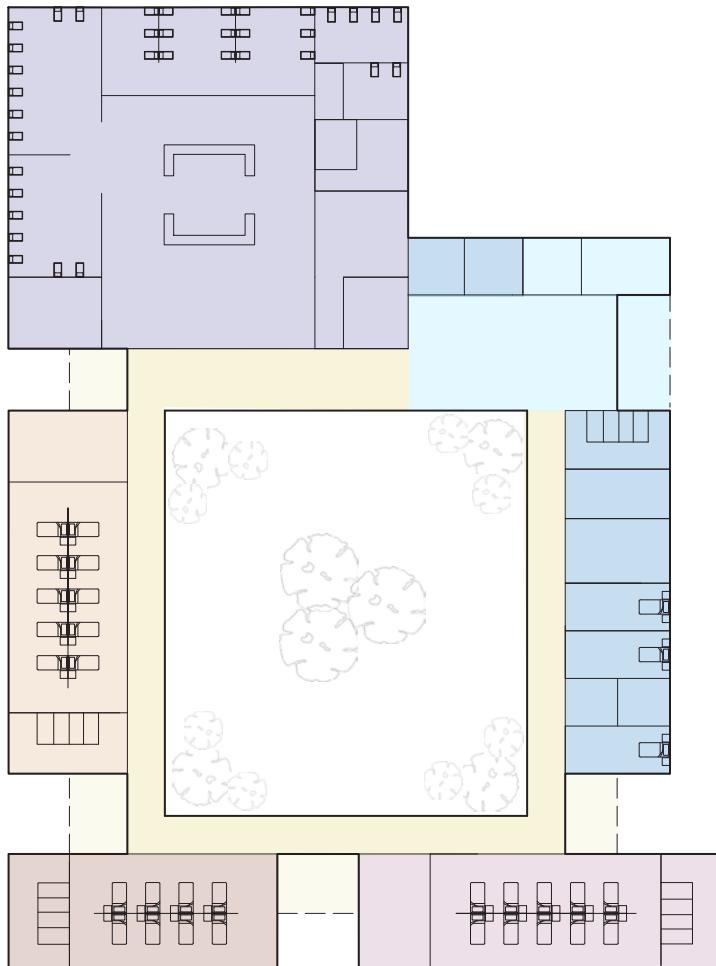
Mothers share central courtyard; various additional courtyards are created by the in-between spaces

Corridor provides efficient circulation path between nursery and kangaroo mother care

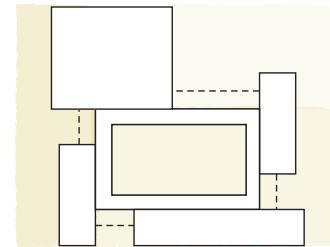
Staff zone is accessed via the separate entrance and separated from the patient-centered spaces by exterior buffer

# COURTYARD SCHEME

OVERVIEW FINDINGS CONCLUSIONS



Nursery   Kangaroo   Isolation   Mothers   Entry   Circulation   Staff



## COURTYARD *Scheme 4*

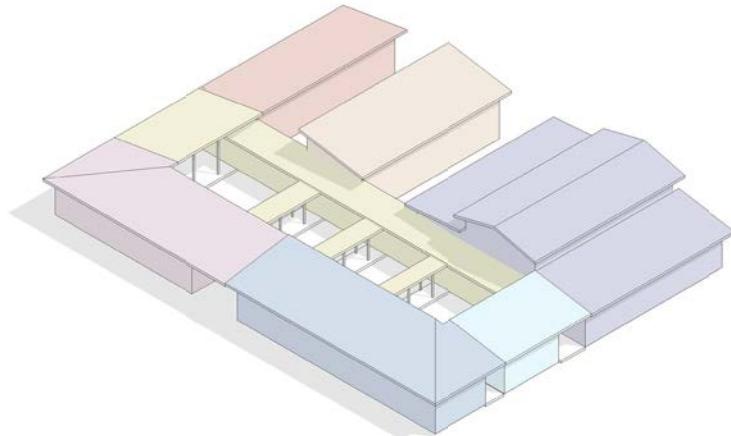
Central courtyard is surrounded by perimeter program spaces

Spaces are oriented parallel to corridors allowing views in and out

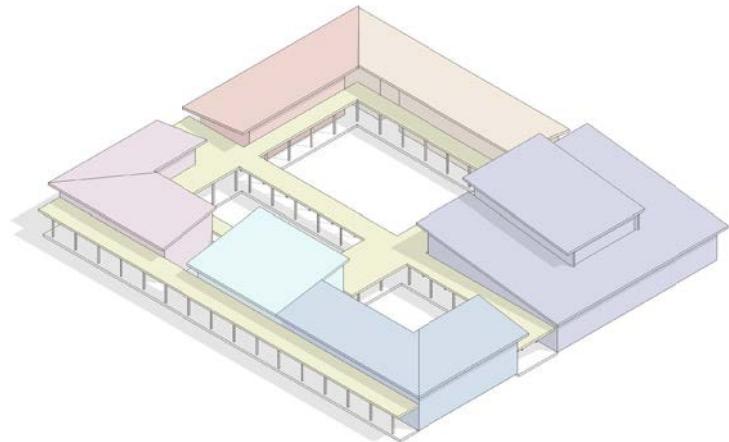
Main circulation path between nursery and kangaroo mother care is linear, but long

# MASSING SCHEMES

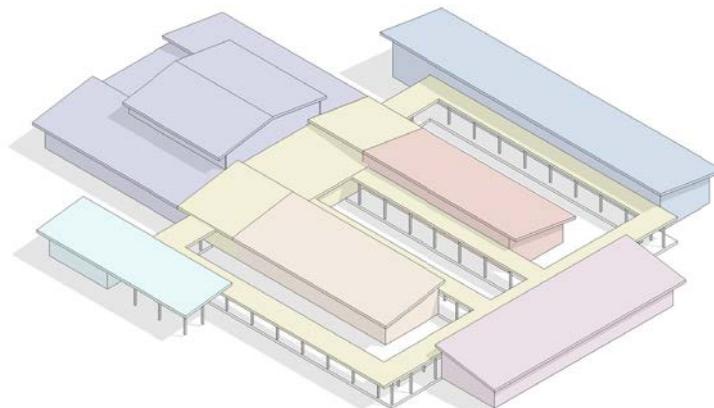
OVERVIEW FINDINGS CONCLUSIONS



DOUBLE BAR SCHEME A



DOUBLE BAR SCHEME B

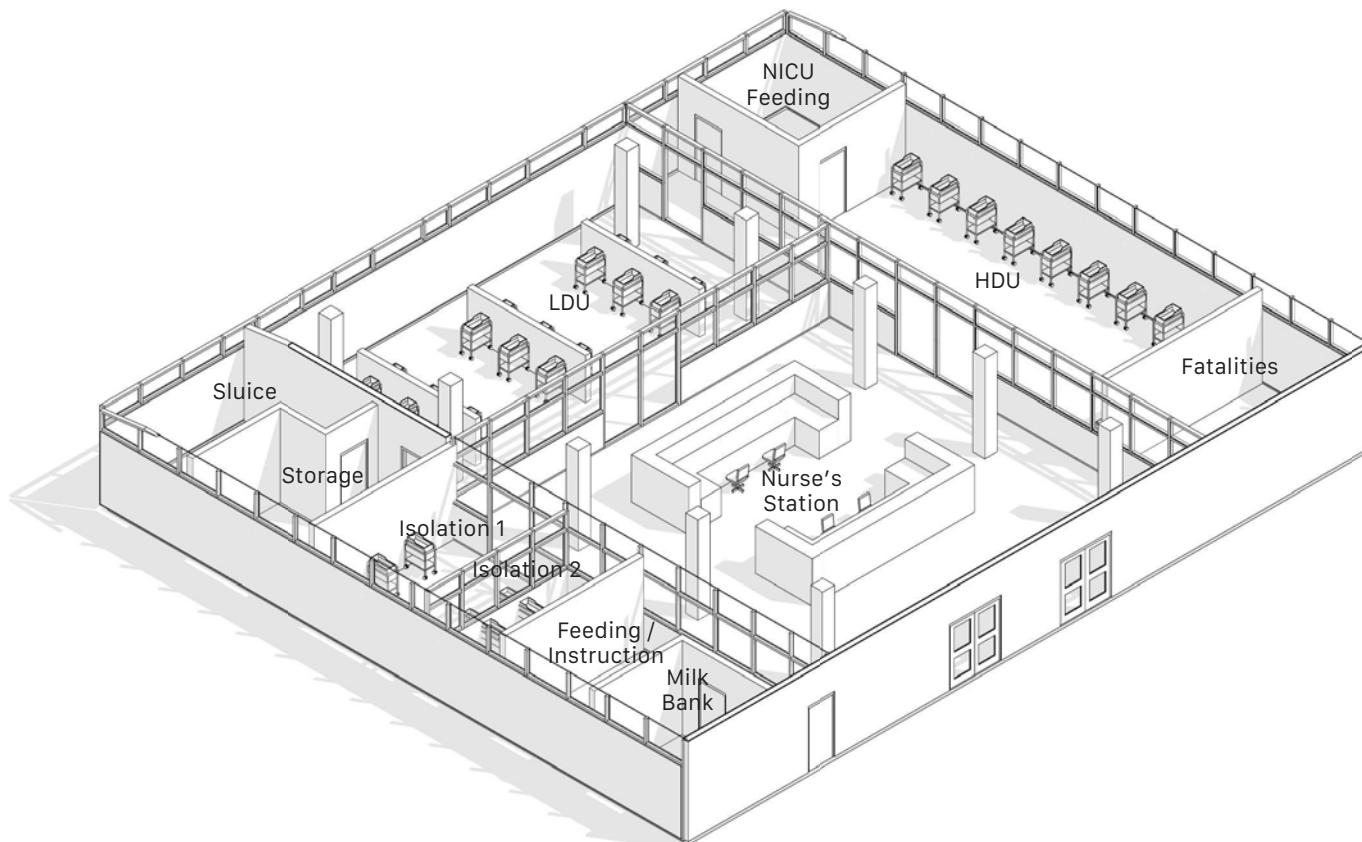


LAYERS SCHEME



# NURSERY DESIGN

OVERVIEW FINDINGS CONCLUSIONS



## DISCUSSION TOPICS:

- Bed spacing of high dependency vs low dependency
- Location of beds along wall vs center of room
- Prioritizing nurse's station views vs immediate access
- Feeding space for mothers within care space
- Use of isolation room
- Inclusion of sluice, storage, feeding, milk bank, fatalities
- Enclosure of critical care spaces with half-glass walls for thermal comfort