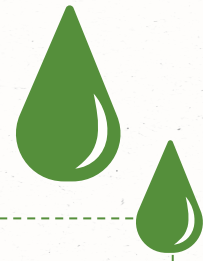
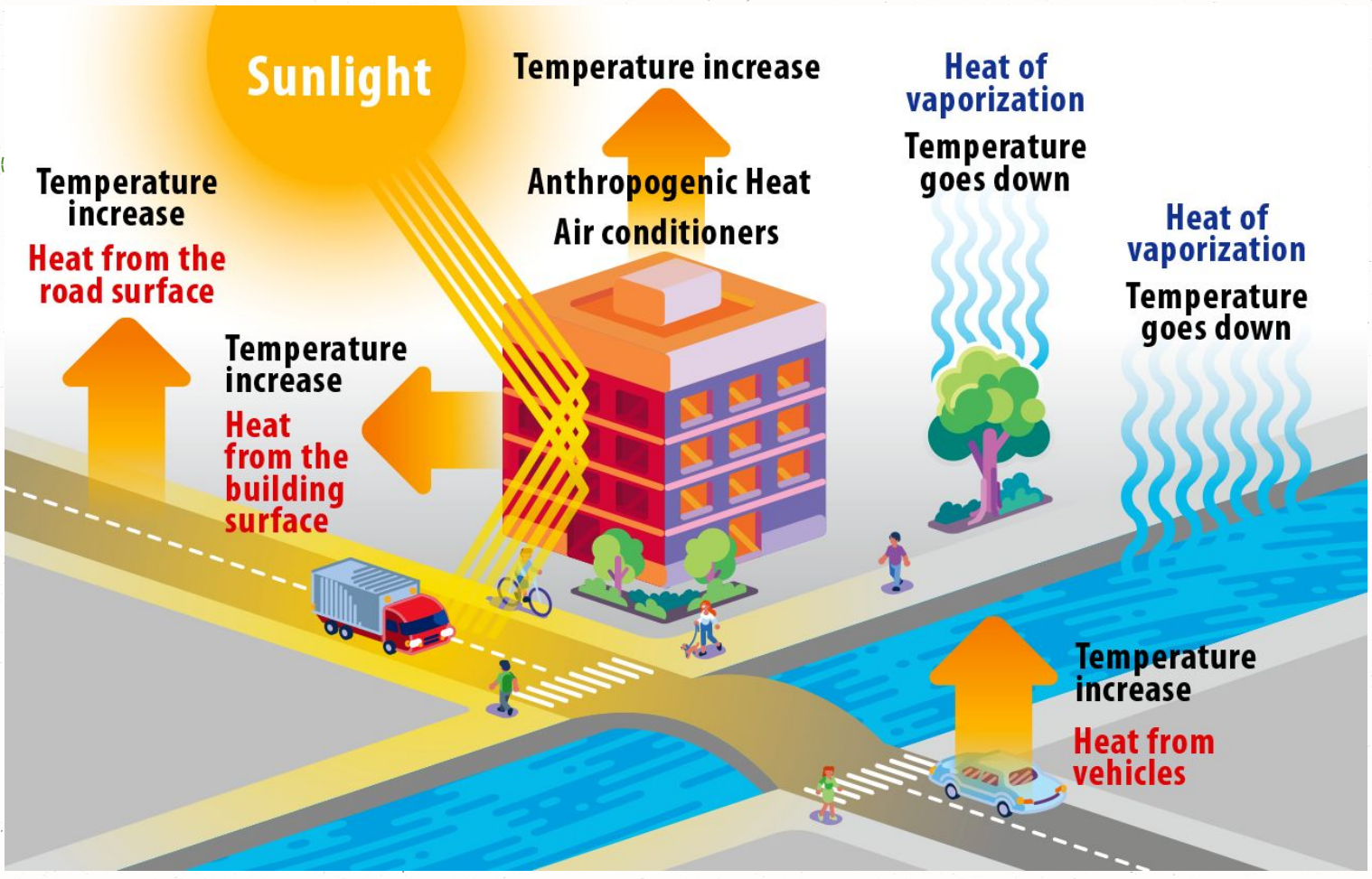


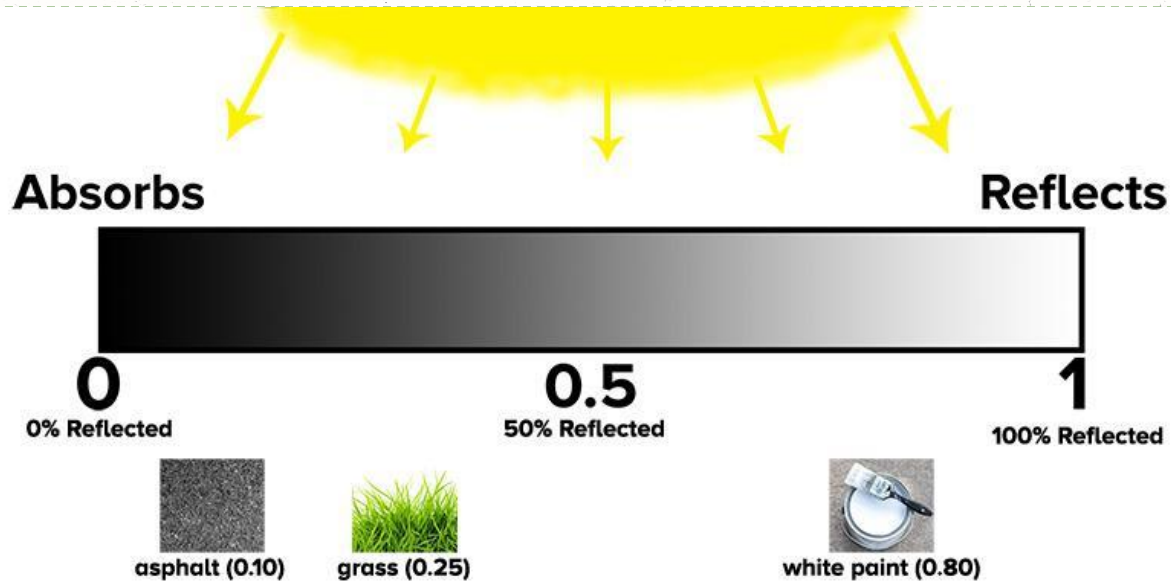
How a Building's Roofing Materials Affect The Inside Temperature

Kaylin Palmer, Dexter Noggle, and Ashley Calderon

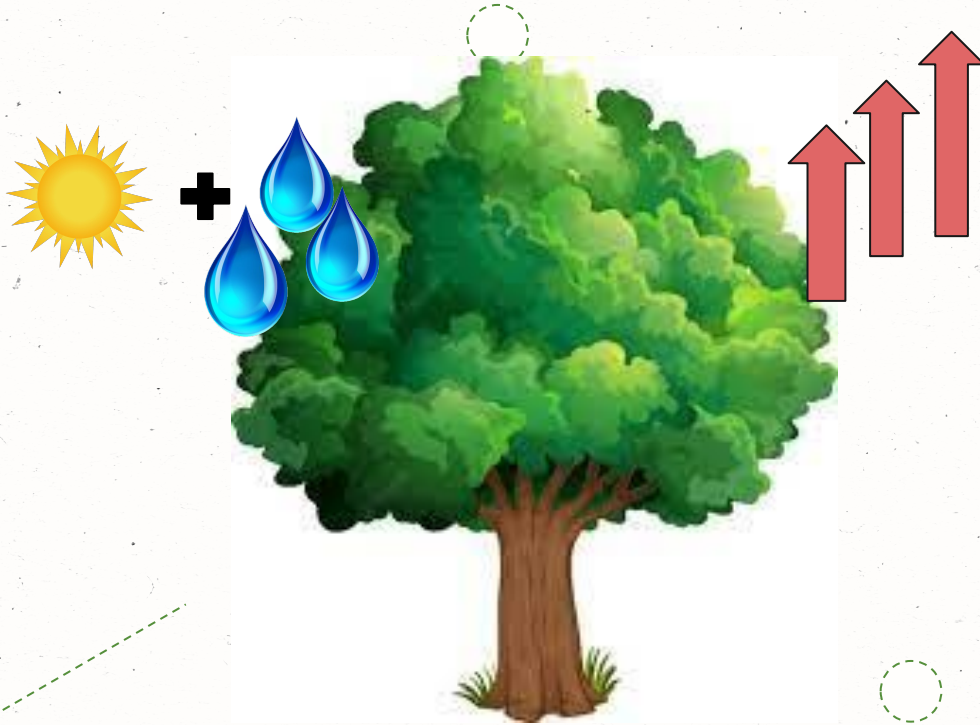




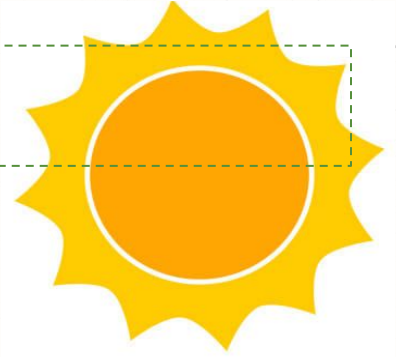
What is Albedo?



Why are trees important?



Heat Impacts Everyone



Our Goals for The Rooftop Models

We were commissioned by the Christa McAuliffe Center to build a model that could...

- Show the impacts of different roofing materials on indoor temperatures
- Educate and reach out to the community
- Generate data to support proposals to mitigate extreme heat effects on Framingham, especially in marginalized populations



The Requirements

Our model had to...

- Measure the temperature of the roof and the air inside
- Be durable, portable, and reliable
- Be able to operate indoors and outdoors
- Be suitable for use in educational and outreach campaigns



Our Prototypes

White plated box model



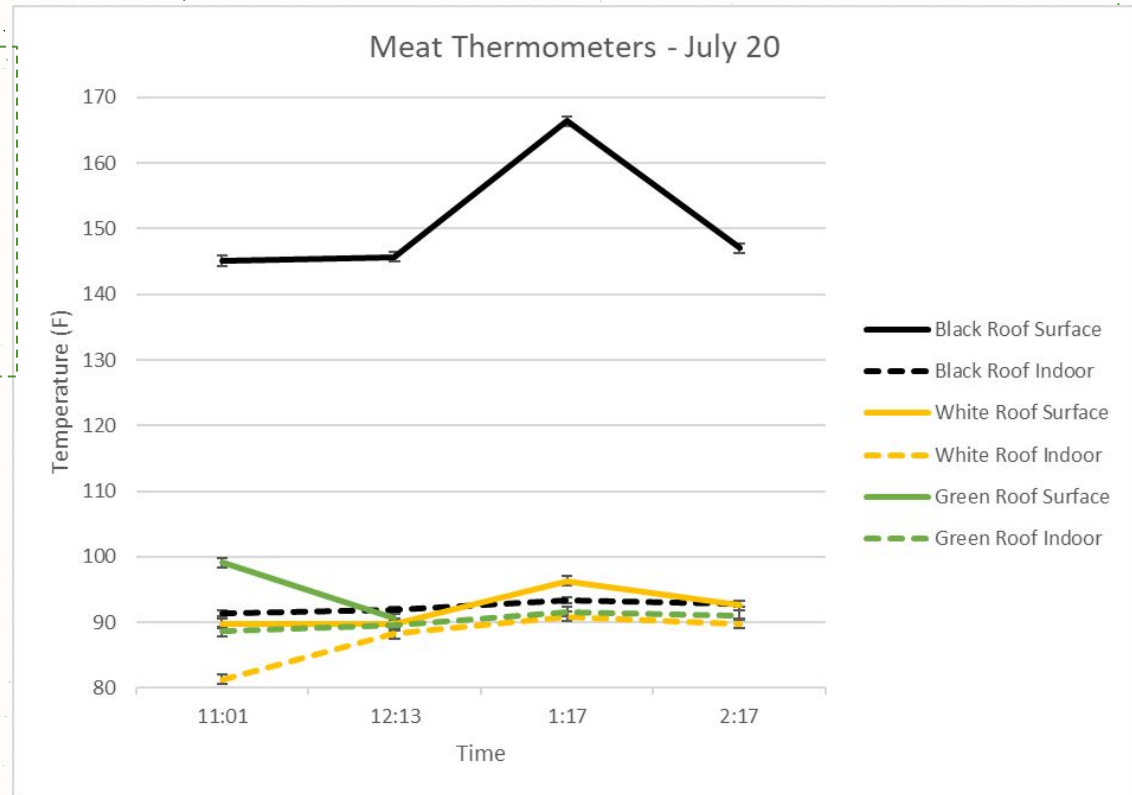
Apartment building model



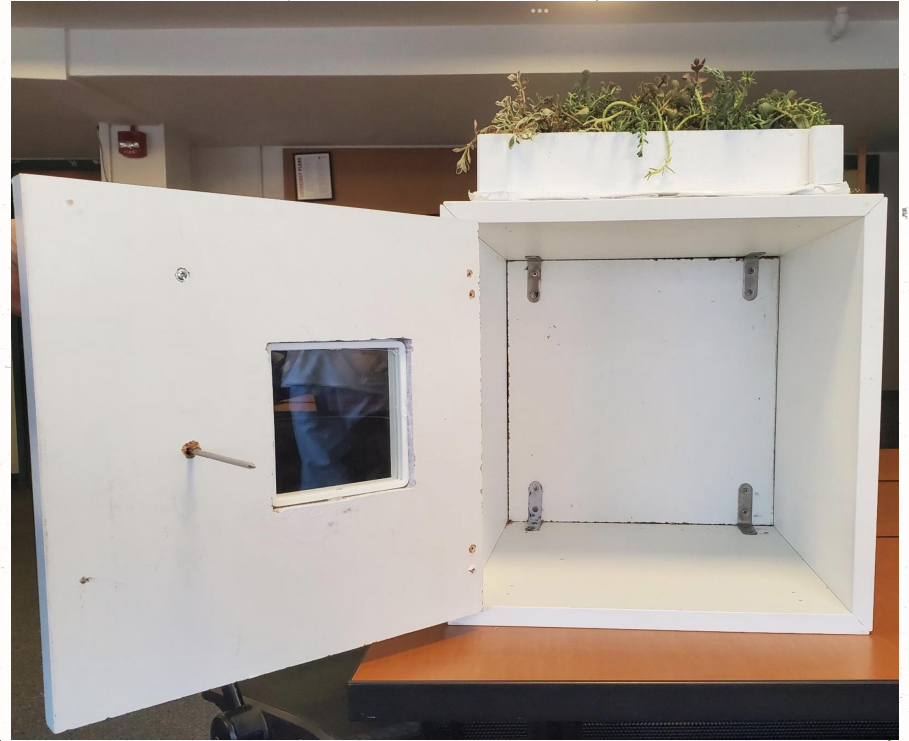
Cardboard box model



Temperature Data from prototypes



Frankenstein Model:



Frankenstein Model lineup:



Green
Rooftop



Solar
Rooftop



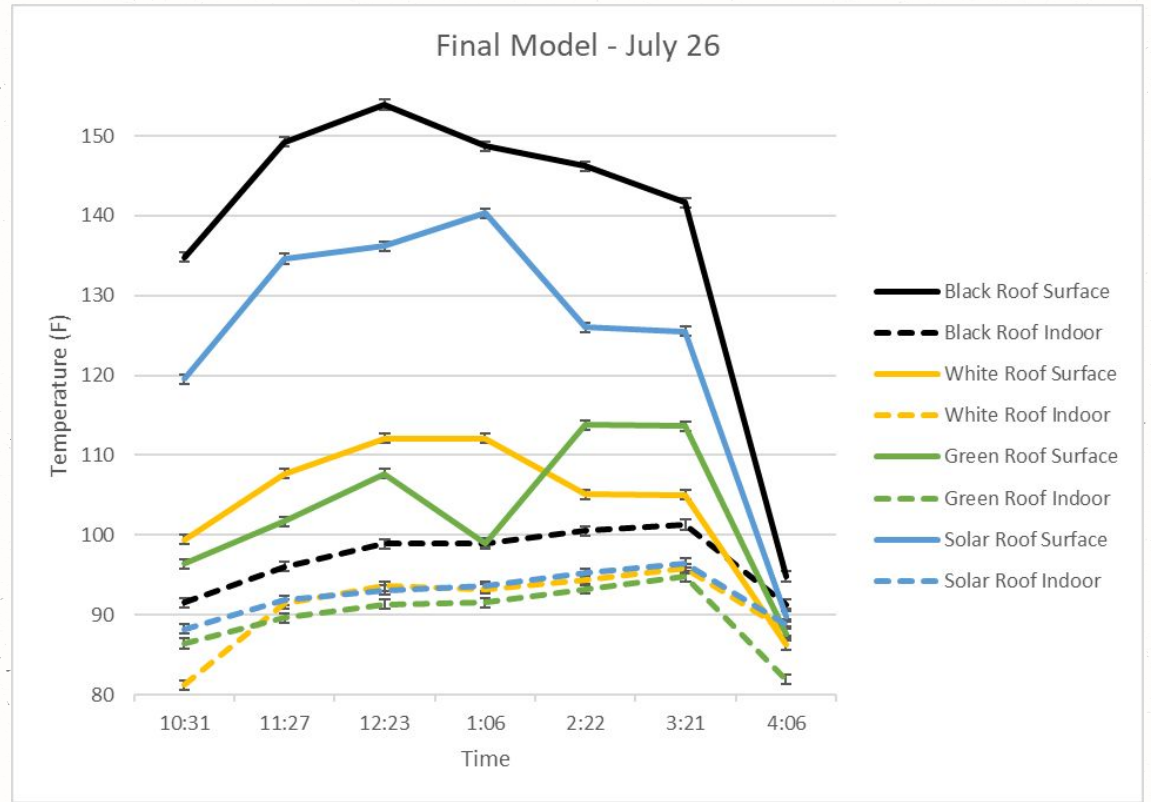
White
Rooftop



Black
Rooftop

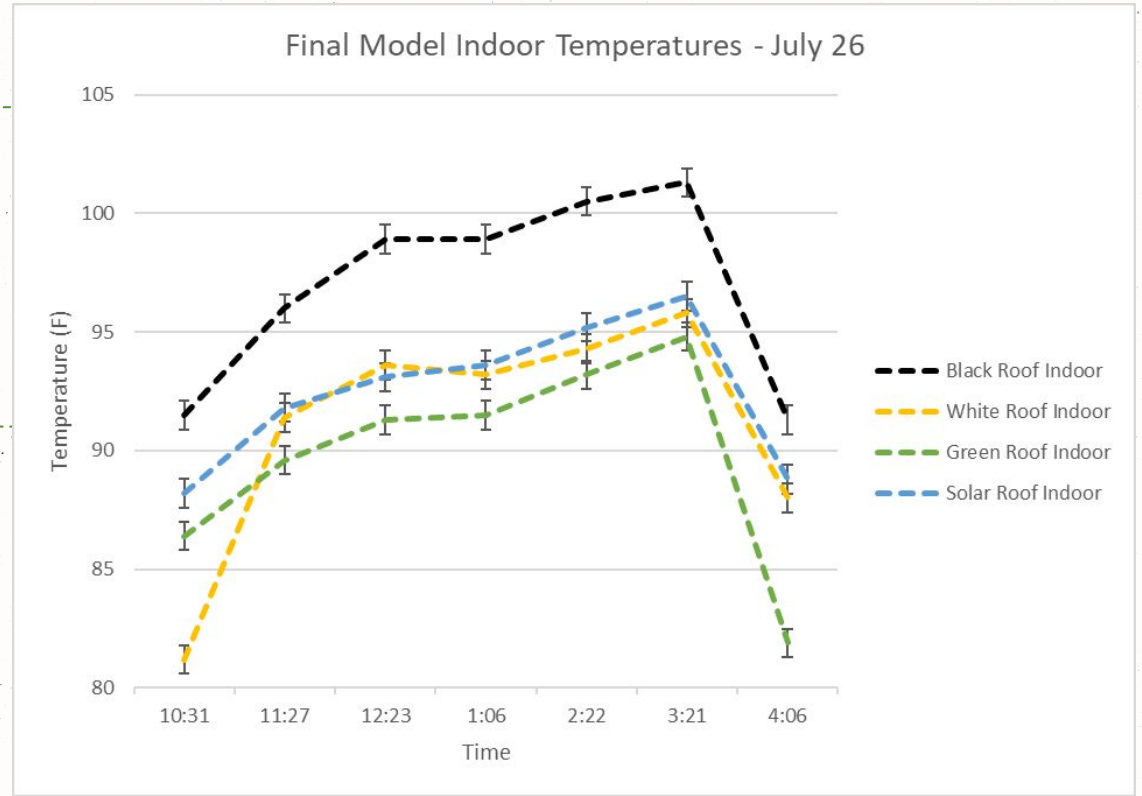
Final Model Results:

(surface and indoor temperatures)



Indoor Air Temperatures:

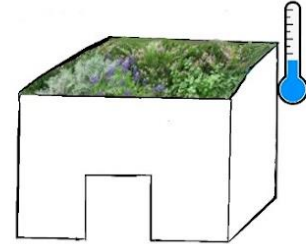
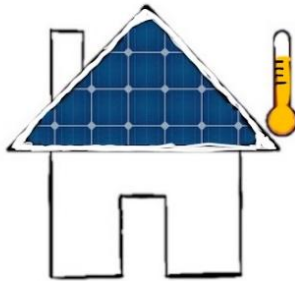
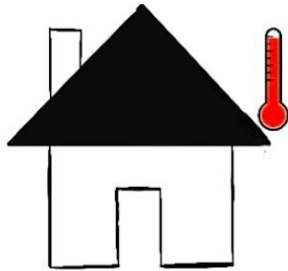
(Indoor temperatures only)



Conclusions:

- There is a significant correlation between roof material and the buildings indoor temperature.
- Out of all roof types tested, green roofs do the best job keeping indoor temperatures low.
- White rooftops perform almost as well as green rooftops.
- Roofs that incorporate solar panels perform better than black roofs, but not as well as white or green roofs. However, solar panels provide renewable energy.

Conclusions:

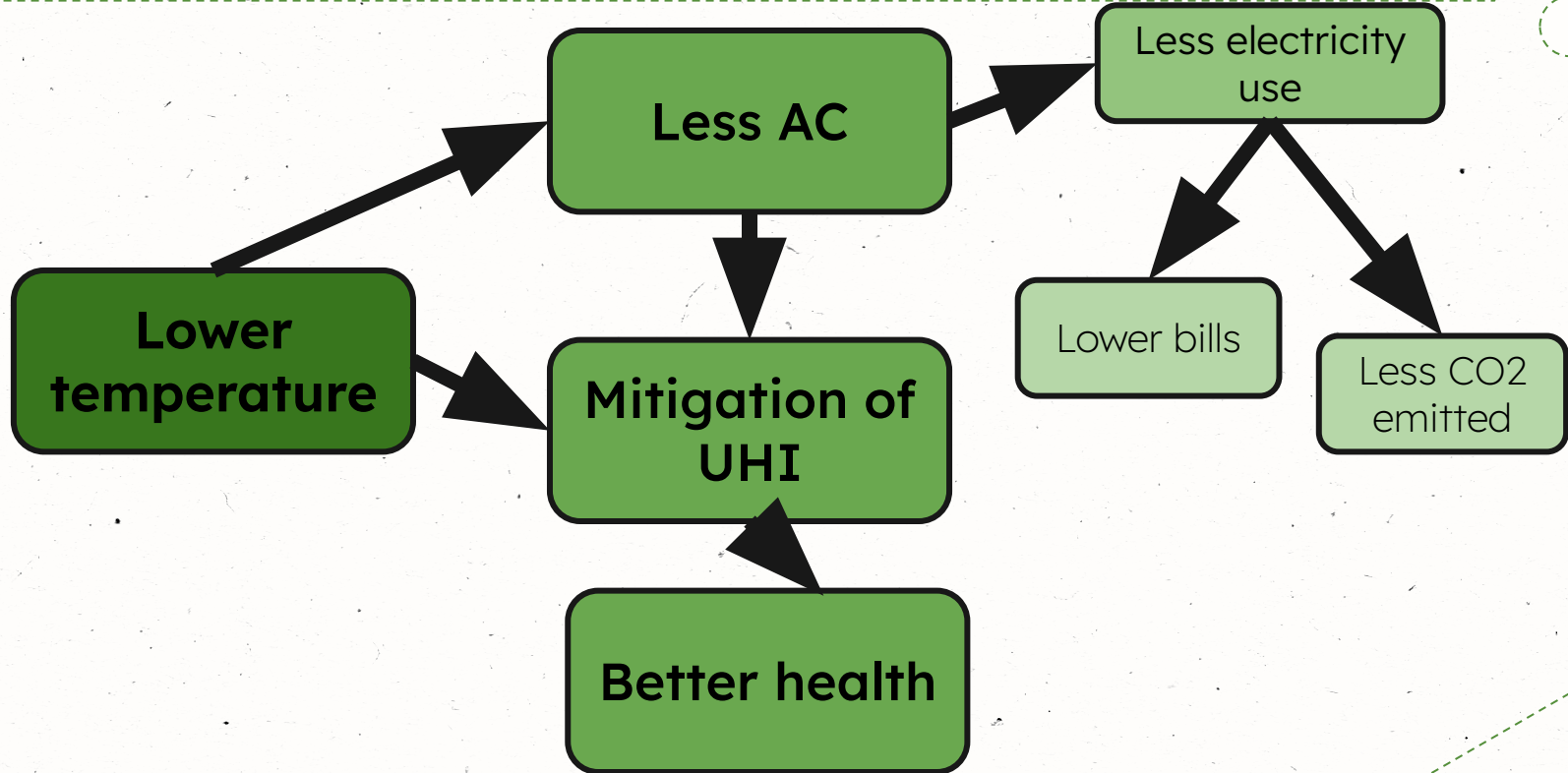


Recommendations:

- At minimum, new and old buildings should have white roofs
- New buildings should consider solar and green roofs as they are designed
- Eligible, old buildings should be retrofitted with solar and green roofs
- Black roofs should never be used



Benefits:



Acknowledgements:

We would like to thank Framingham State University and the Christa McAuliffe Center for Integrated Science Learning for sharing space, staff, and resources.

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