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# Revealing hunter-gatherer social networks

[whobbes.com](http://whobbes.com)

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# Intro

- **Ask questions**
- **MSc. Telecoms and Signal Processing**
- **Previous** - Qualcomm, UCL, Entia
- **Current** - working on connected medical devices at Zuhlke





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Do you want to go live in the  
middle of the jungle for a  
year?



# Anthropology



# Anthropology

**Collins:** the scientific study of people, society and culture.

## Social

- Culture, material, rituals
- Immersive
- Qualitative

## Biological

- Behaviour, genetics, physiology
- Observation
- Quantitative



# Hunter-Gatherer Resilience

- UCL, Leverhulme Trust
- 2012 - 2017
- Team of 26

# Small-scale societies

- Limited general understanding
- Link with root of humanity
- All encompassing studies

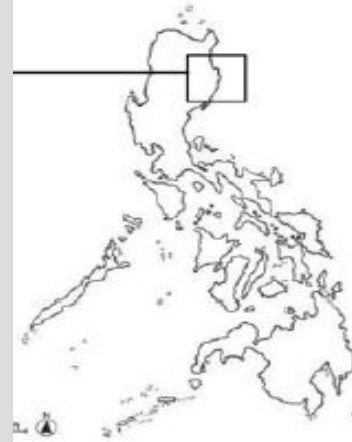


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# Research

- Data
    - Anthropomorphics
    - Social networks
    - Geography
    - Occupation
  - Methods
    - Interview
    - Observations
    - Measurements
-

# The Agta of Palanan, Isabela



[1]





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How can we use new  
technology to reinvent  
research methods and  
gather novel insights ?



# Research

## Methods

### → Data

- ◆ Anthropomorphics
- ◆ Social networks
- ◆ Maps
- ◆ Occupation

### → Methods

- ◆ Interview
- ◆ Observations
- ◆ Measurements

## Improvements

→ GPS

→ Mobile

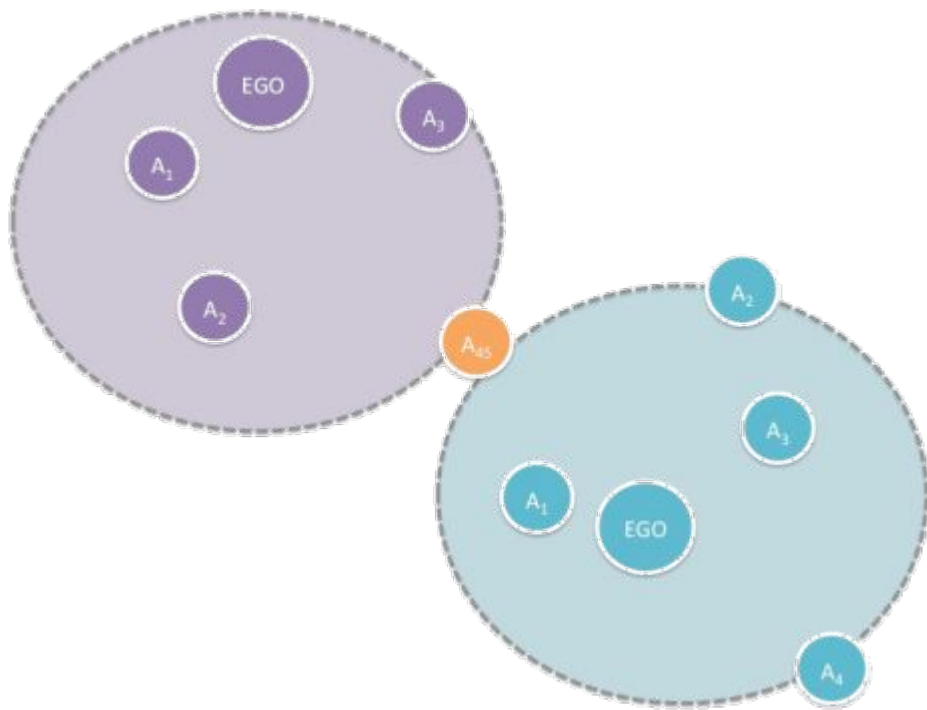
→ Wearables



# Hunter-Gatherer World Map Project

- 21 populations
- 130 Camps
- Collaborative work
- Maps
- Mobile and GPS

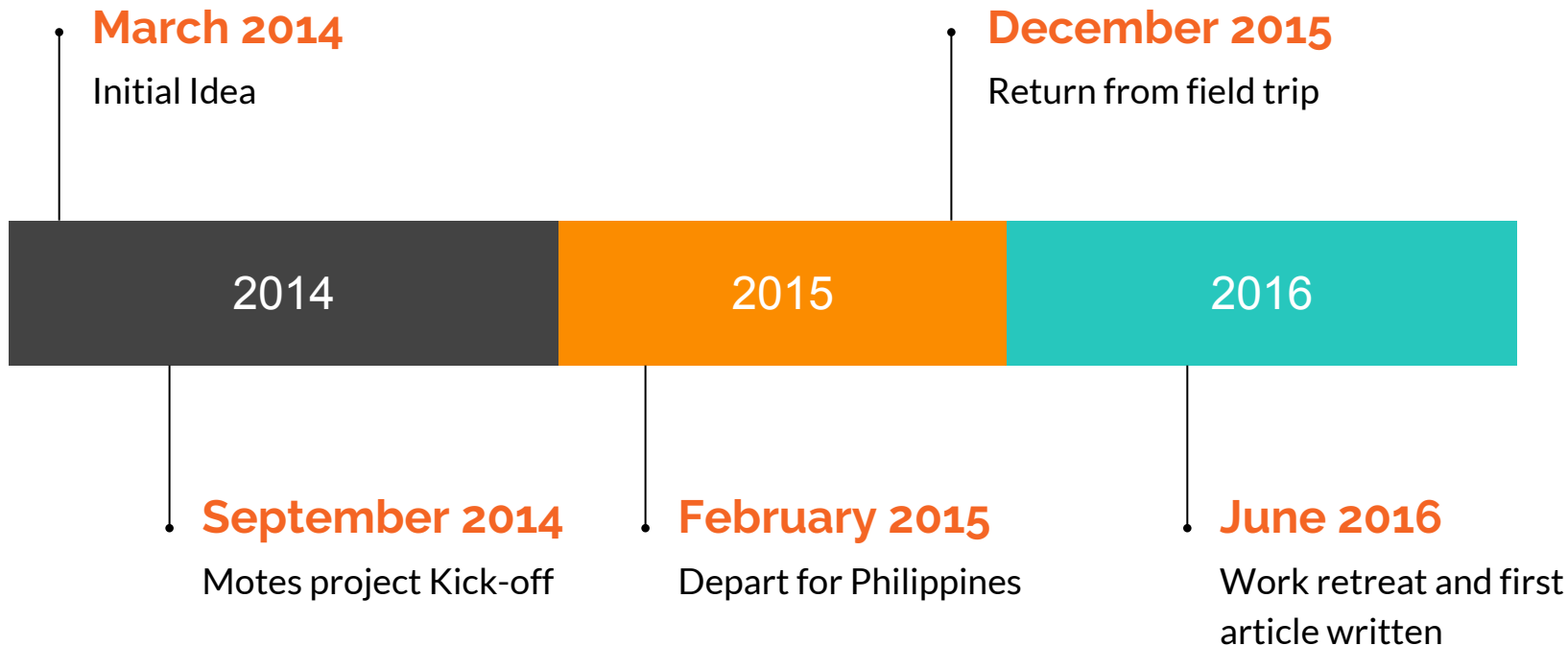
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## Motes

- WSN
- First use at conference
- Social networks
- Wearables

# Timeline



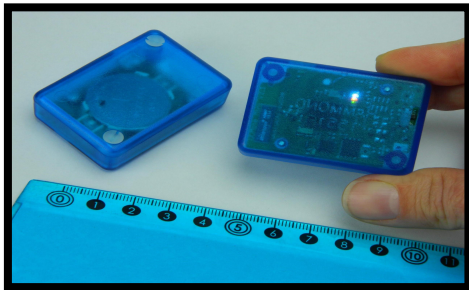


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# Motes

## Requirements

- 12 weeks to departure
  - 250 devices
  - <£28 per unit with enclosure
  - 30 days+ battery life
  - 1 message every two minutes
  - Waterproof & ShockProof
  - Compatible for babies, children and adults
  - Resilient to loss of some devices and corrupted data
-



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# Motes

## Steps

- Requirements Analysis
- Rapid prototyping
- Hardware sourcing
- Testing and Verification
- Training
- Deployment and Ethics
- Data Processing

## Specifications

- ATmega128RFA1 MCU
  - 16MHz
  - 4kB RAM
  - 128kB Flash
  - 2MB external Flash
  - IEEE 802.15.4 2.4GHz ISM Band
  - Power options
    - 110mAh USB rechargeable
    - 660mAh coin battery
-

# Challenges

**Ethics**

**Battery life  
optimisations**

**Price point  
adjustment**

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# Software

## Embedded

- nesC
- TinyOS
- Low Power Listening
- CLI tool in JAVA
- Streaming of live data or Flash

## Data Processing

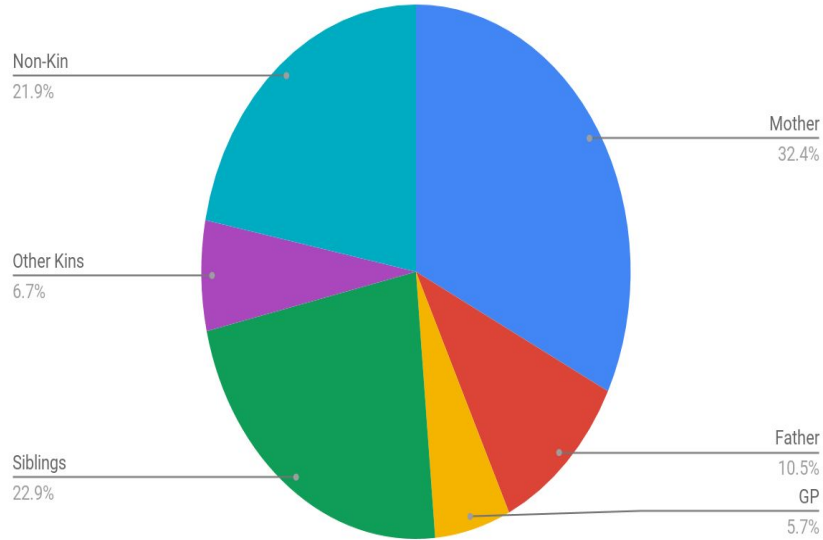
- Python
  - numPy, SQLite3
  - Timeline reconstruction
  - Corrupted data detection
  - Data Repair where possible
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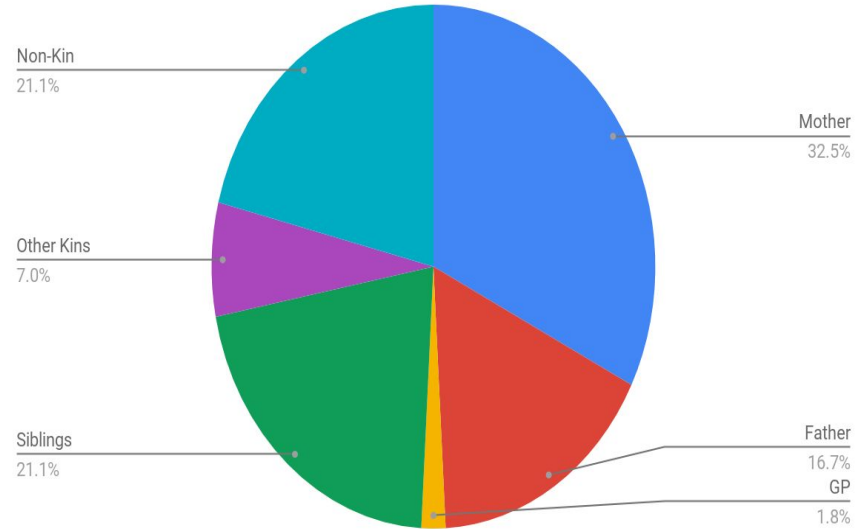
**What did we learn from the  
data ?**

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## Motes



## Focals



# Comparative study

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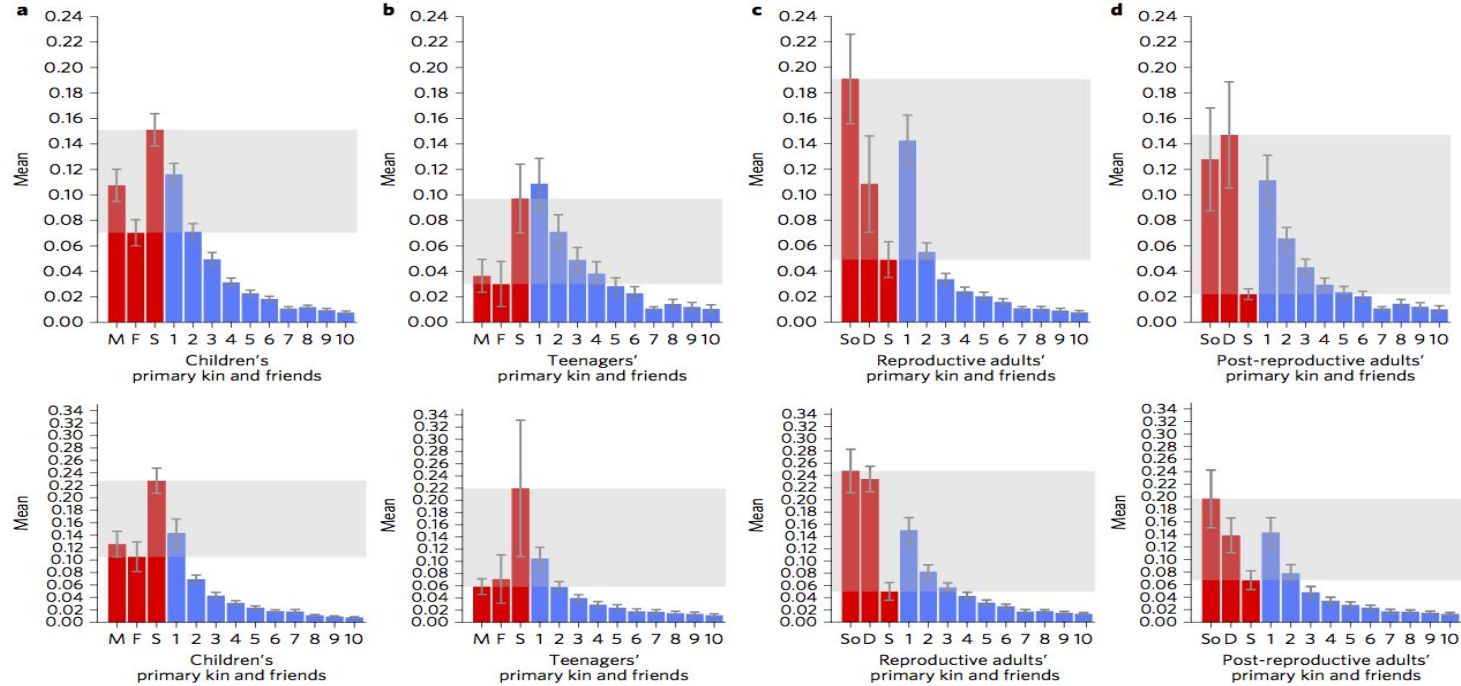


# High-resolution characterization of hunter-gatherer interaction networks

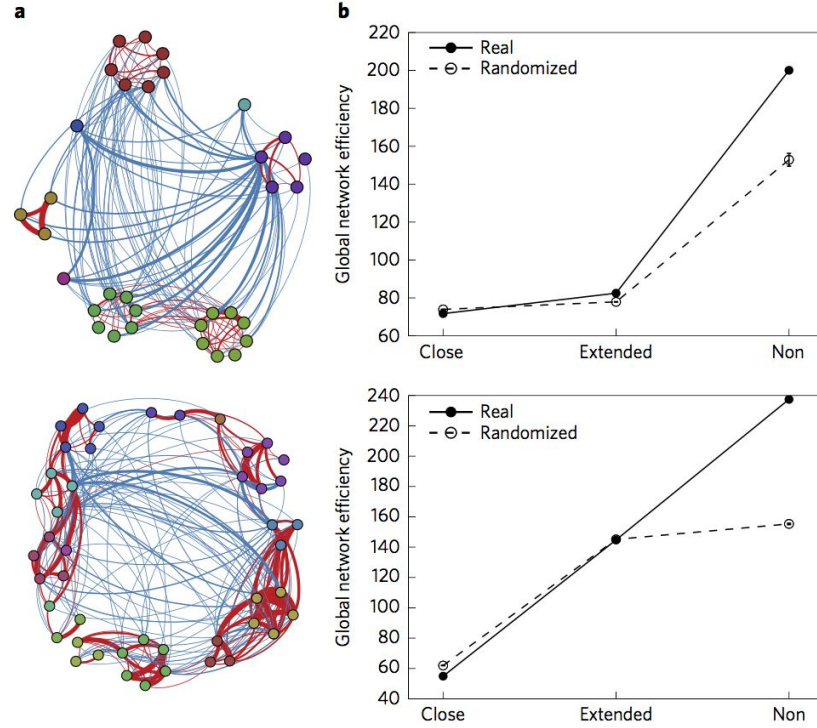
Migliano, A. B., Page, A. E., Gómez-Gardeñes, J, **Viguié, S.**, Dyble, M., Thompson, J., Chaudhary, N., Salali, G., Smith, D., Strods, J., Latora, V., Thomas, M., Mace, R., Vinicius, L. (2017) High-resolution characterisation of hunter-gatherer interaction networks. *Nature Human Behaviour*. Volume1, Issue 2, pages 1-6.

- Weeklong experiments in Philippines and Congo
- Social network analysis
- Focus on global indicators

## High-resolution characterization of hunter-gatherer interaction networks



## High-resolution characterization of hunter-gatherer interaction networks





# Between and Between; Social network effects on allocare and reproductive success in Agta foragers

Page, A. E., **Viguer, S.**, Dyble, M., Smith, D., Chaudhary, N., Salali, G., Thompson, J., Mace, R., and Migliano, A. B. Why care? Testing adaptive hypotheses in Agta foragers. *Ecology Letters*.

- Data combination: notes, reproductive histories, fitness
- Dyadic ties and betweenness
- Interpretation

# Betweenness and Between

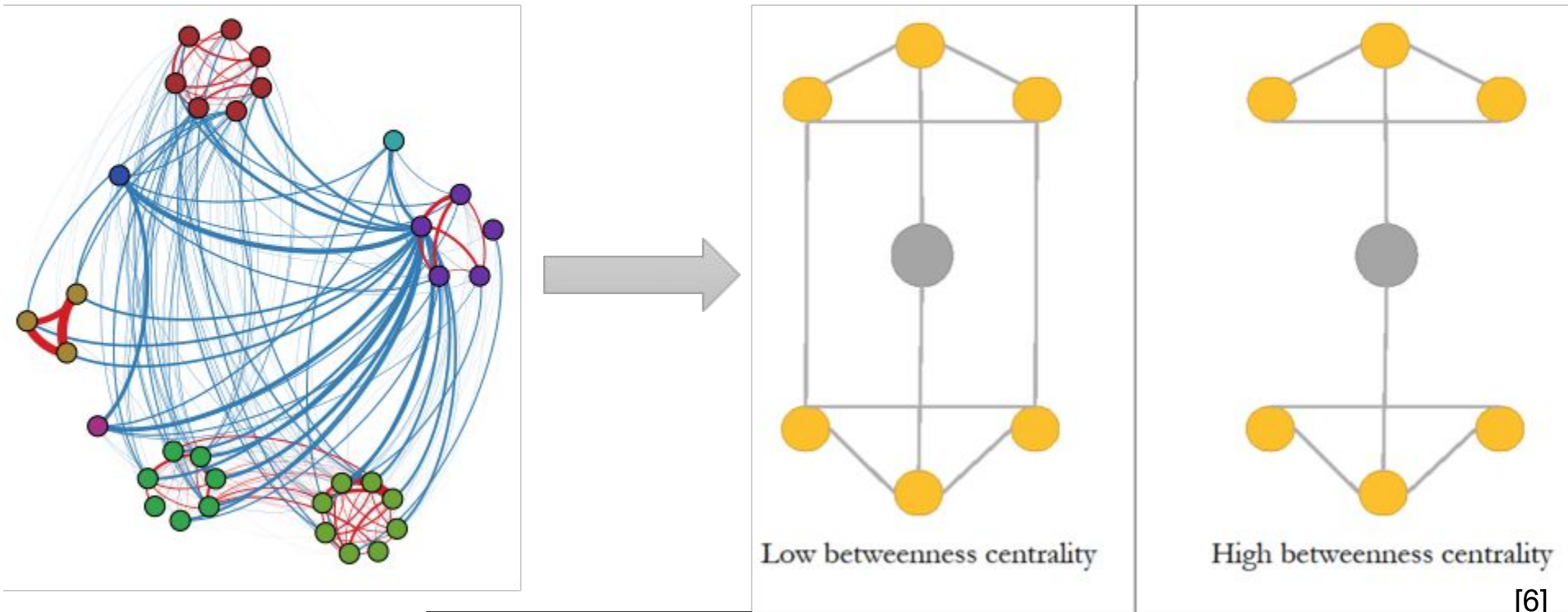
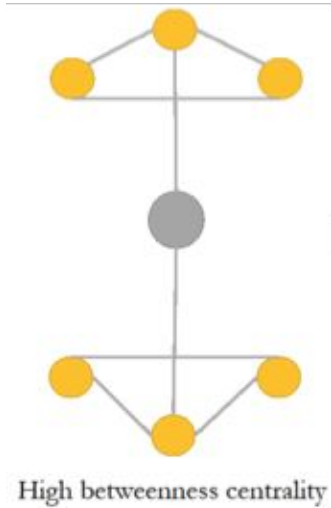


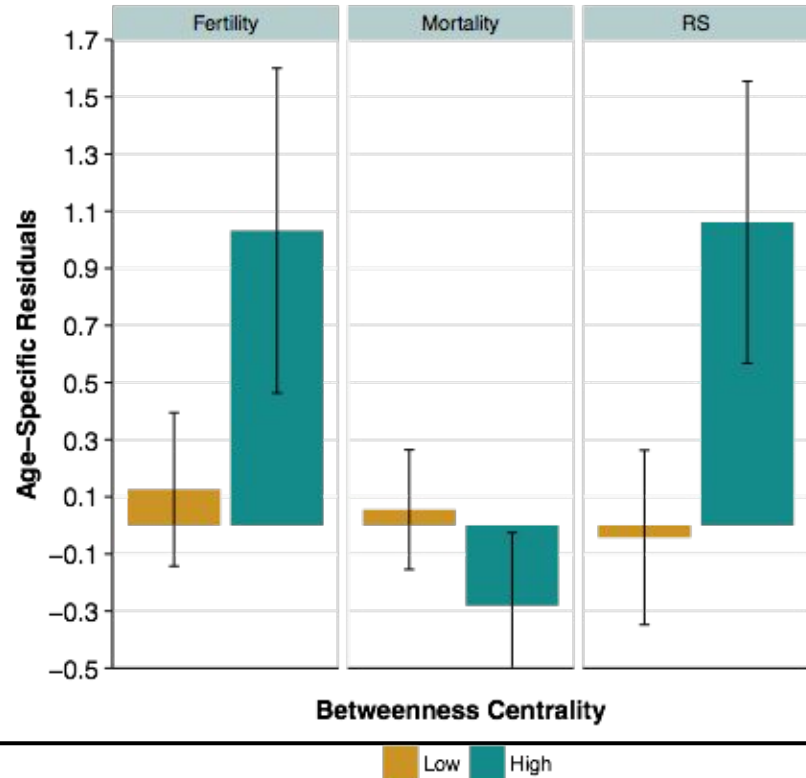
Figure from Migliano *et al.* (under review)

Betweenness was standardised for each camp

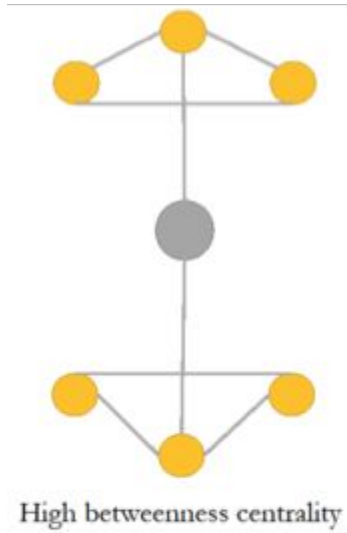
# Betweenness and Between



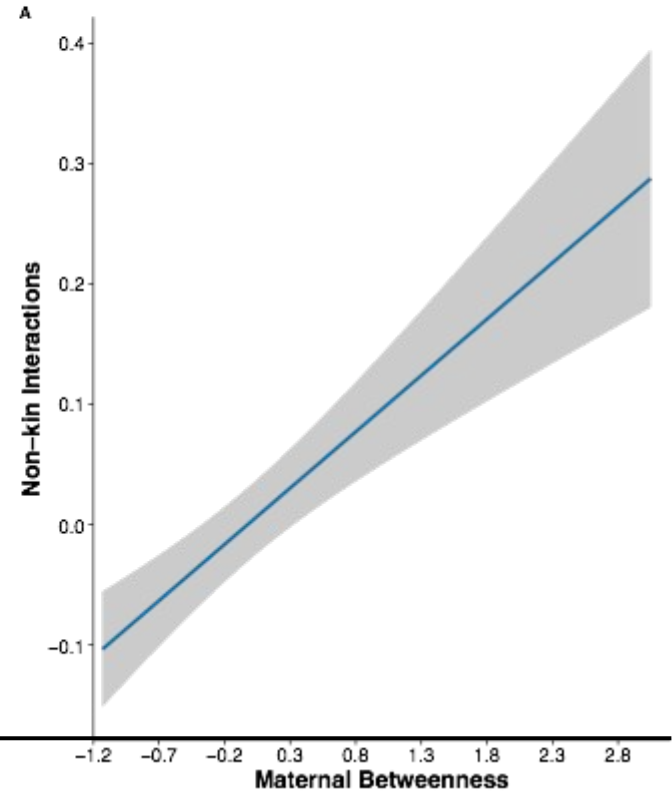
$B = 0.03, p = 0.01, 95\% \text{ CI } [0.01, 0.04]$



# Betwixt and Between



$B = 0.54, p = 0.01, 95\% \text{ CI } [0.01, 1.1]$



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# Between and Between



- Betweenness → Non-kin social link → higher fitness
  - Allocare reduces maternal workload
  - Reinvest in fertility and soma
  - High Disease, high mortality environment result in shift of balance in quality/quantity trade-off
-



# Why is this important?



- Local - Information sharing
- Science - Knowledge base extending
- Global - Understanding



## More

### Current

- Intra-camp experiments
- Reproductive success
- Comparative Studies

### Future

- Verification
- Scaling up
- Dynamic networks

# — Wrap-up

Hunter-Gatherer

STEM everywhere

Transformation



The Leverhulme Trust



[7]

**Thanks!**

**Your Question  
here**

**Whobbes.com**

**wallacehobbes@gmail.com**

# Sources

- [1] Map by T. Minter
- [2] Map from Google Maps
- [3] View from Google Earth
- [4] [5] Diagrams from High-resolution characterisation of hunter-gatherer interaction networks. Nature Human Behaviour. Volume1, Issue 2, pages 1-6.
- [6] EBHEA 2016 presentation by A. E. Page
- [7] Logos from <https://www.ucl-hg.co.uk/>
- **Pictures** by S. Viguier and A. E. Page