



City Research Online

City St George's, University of London

Citation: Reynolds, C. (2020). Food and Citizen Science. Paper presented at the ESRC Festival of Social Science, 7-15 Nov 2020, Sheffield, UK.

This is the published version of the paper.

This version of the publication may differ from the final published version. To cite this item please consult the publisher's version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/25216/>

Copyright and Reuse: Copyright and Moral Rights remain with the author(s) and/or copyright holders. Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge, unless otherwise indicated, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way. For full details of reuse please refer to [City Research Online policy](#).



Economic
and Social
Research Council



Food
Standards
Agency
food.gov.uk



The University
Of Sheffield.
Institute for
Sustainable Food.

**Centre for
Food Policy**
Educating, researching & influencing
for integrated and inclusive food policy

Food and Citizen Science

**ESRC Festival of Social Science:
FSA Event in partnership with the University of Sheffield
Understanding food in a digital world: 9th Nov 2020**

Dr Christian Reynolds

Centre for Food Policy, City, University of London



@sartorialfoodie

Who am I? Christian Reynolds

Senior Lecturer at the Centre for Food Policy



Focus: healthy sustainable diets and food consumption (including waste)



Previously: Food waste politics/history, social sciences approaches

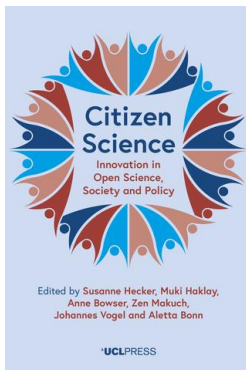
Just about to publish: Sustainability and cooking (16% of UK food GHGE!)

What will we be talking about today?

- Citizen Science – What is it?
- Food and Citizen Science
- How I got into Citizen Science
- Where have I used Citizen Science
 - Online experiments, Gamification and Living Labs

Citizen Science – what is it?

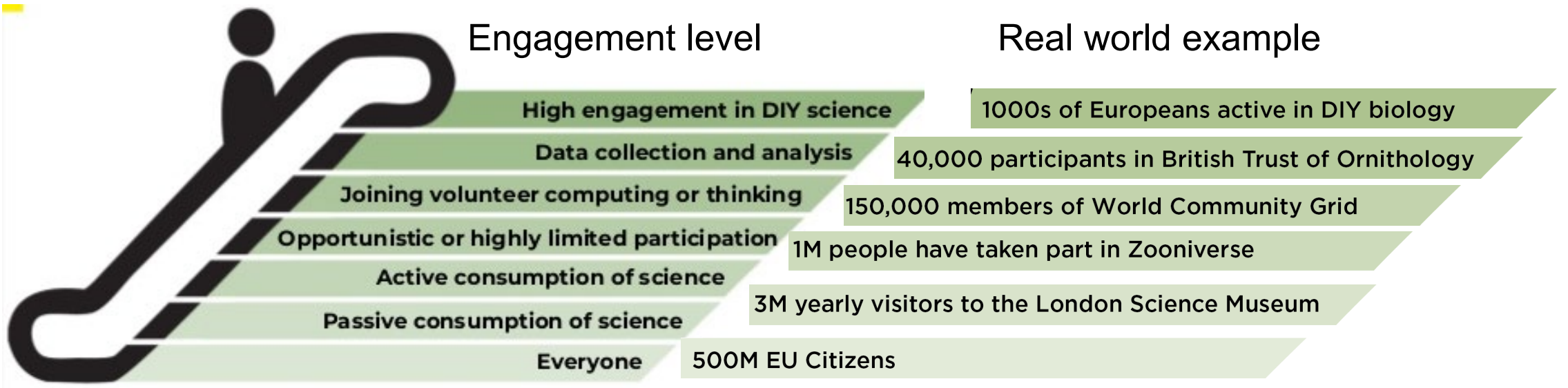
- Research where public citizens **participate** as investigators in research projects alongside professional scientists.
- Citizen science **engages** a diversity of publics (Sauermann et al., 2020) **enabled** by scientists who are advocates (Stilgoe, 2009) is a powerful collaborative approach.
- This is not only about engaging widely, but also about bringing fresh perspectives, solutions and enable a faster and smoother uptake.



For more information please read:

Robinson L.D., Cawthray, J.L., West, S.E., Bonn, A., & Ansine, J. (2018). *Ten principles of citizen science*. In S. Hecker, M. Haklay, A. Bowser, Z. Makuch, J. Vogel, & A. Bonn. *Citizen Science: Innovation in Open Science, Society and Policy*. London, UCL Press. 1–23.

The 'escalator' model of science engagement



Levels of Citizen Science

Level 4 'Extreme'

- Collaborative Science – problem definition, data collection and analysis

Level 3 'Participatory science'

- Participation in problem definition and data collection

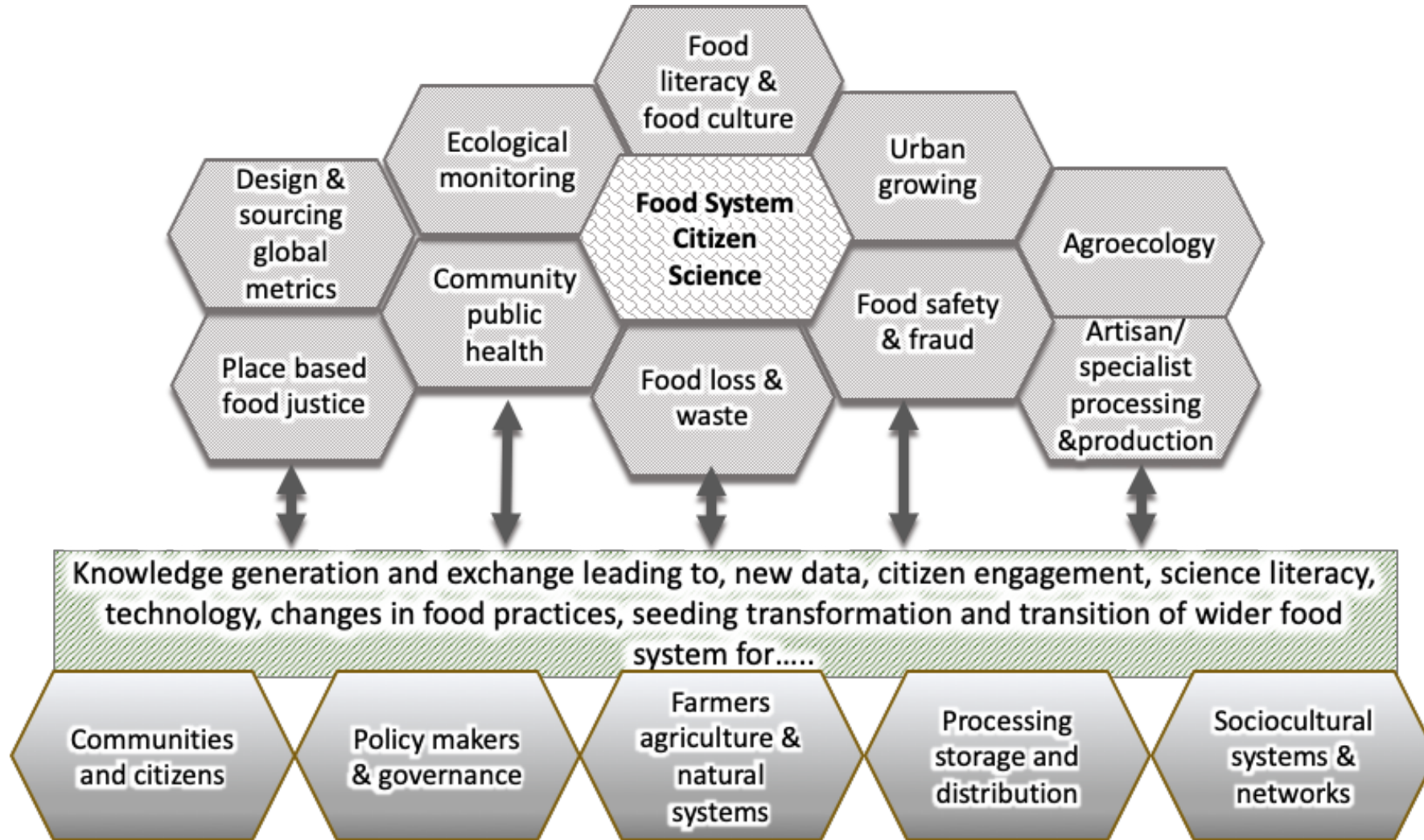
Level 2 'Distributed Intelligence'

- Citizens as basic interpreters

Level 1 'Crowdsourcing'

- Citizens as sensors

Food and Citizen Science



Citizen science engagement with the food system and impact pathways

Ecological monitoring

- School children scientists in a project to monitor soil health
- Mussel pathogen survey to monitor local toxins, collected samples and also carried out sample analysis, allowing survey sites number to rise from 60 to 108.
- Local Environmental Observer (LEO) is a community situated network that started in Alaska. This group has tested for food pathogens, and monitored for advanced permafrost melting, to safeguard household and community food storage depots



Using data from schools to model variation in soil invertebrates across the UK: The importance of weather, climate, season and habitat

B. Martay^{a,*}, J.W. Pearce-Higgins^{a,b}

^a British Trust for Ornithology, The Nunnery, Thetford, IP24 2PU, UK
^b Conservation Science Group, Department of Zoology, University of Cambridge, Downing Street, Cambridge, CB2 3EJ, UK

ARTICLE INFO

Keywords:
Soil
Invertebrates
Earthworms
Climate
Citizen science
Rainfall

ABSTRACT

Soil invertebrates play important roles in climate regulation. It is likely that climate of information about how soil invertebrate junctions difficult. To address this gap, we the abundance of soil macro-invertebrates. The abundance and biomass of two-died protocols on six occasions over to habitat and soil characteristics, and wea. The abundance of many soil invertebrate that the abundance and biomass of earth little evidence that large-scale variation is climate.

Given the importance of earthworms undertake nutrient cycling and the pro analysis of the impacts of climate change of rain, rather than monthly or seasonal. Our results were generally in accord quality assurance. This indicates that it vertebrates and that it is possible to utili data collection. Not only can this deliver the collection of scientifically valuable d



Puget Sound Ecosystem Monitoring Program (PSEMP)

Mussel Watch Pilot Expansion 2012/2013: a study of toxic contaminants in blue mussels (*Mytilus trossulus*) from Puget Sound Washington, USA

Field Sample Summary and Progress Report
February 19, 2013

Jennifer A. Lanksbury, Andrea J. Carey, Laurie A. Niewolny and James E. West



Environmental observation, social media, and One Health action: A description of the Local Environmental Observer (LEO) Network

Emily Mosites^{a,*}, Erica Lujan^b, Michael Brook^b, Michael Brubaker^b, Desirae Roehl^b, Moses Tcheripanoff^b, Thomas Hennessy^b

^a Arctic Investigations Program, Division of Preparedness and Emerging Infections, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Anchorage, AK, United States
^b Center for Climate and Health, Alaska Native Tribal Health Consortium, Anchorage, AK, United States

ARTICLE INFO

Keywords:
Arctic
One Health action
Citizen science
Social media
Environmental health

ABSTRACT

As a result of the close relationships between Arctic residents and the environment, climate change has a disproportionate impact on Arctic communities. Despite the need for One Health responses to climate change, environmental monitoring is difficult to conduct in Arctic regions. The Local Environmental Observer (LEO) Network is a global social media network that recruits citizen scientists to collect environmental observations on social media. We examined the processes of the LEO Network, numbers of members and observations, and three case studies that depict One Health action enabled by the system. From February 2012 to July 2017, the LEO Network gained 1870 members in 35 countries. In this time period, 670 environmental observations were posted. Examples that resulted in One Health action include those involving food sources, wild fire smoke, and thawing permafrost. The LEO network is an example of a One Health resource that stimulates action to protect the health of communities around the world.

Urban Growing

- Citizens generated data on the suitability of growing conditions in different geographies for up to 10 lines of soya bean plants, aiming to reduce reliance on imported soya
- MY Harvest initiative is investigating the geography of urban food growing, examining the scale of urban cultivation and yields in Leicester and across the UK.



The soybean experiment '1000 Gardens': a case study of citizen science for research, education, and beyond

Tobias Würschum¹ · Willmar L. Leiser¹ · Felix Jähne¹ · Kristina Bachteler² · Martin Miersch² · Volker Hahn¹

Received: 26 January 2018 / Accepted: 21 June 2018 / Published online: 3 July 2018
 © The Author(s) 2018

Abstract

Key message Citizen science provides a platform for plant scientists to describe details of growing conditions in their own gardens, but not the soybean experiment. Citizen scientists participating in the project were able to describe details of growing conditions in their own gardens, but not the soybean experiment. Citizen scientists participating in the project were able to describe details of growing conditions in their own gardens, but not the soybean experiment.



Science of the Total Environment 705 (2020) 135930

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv



Feeding a city – Leicester as a case study of the importance of allotments for horticultural production in the UK

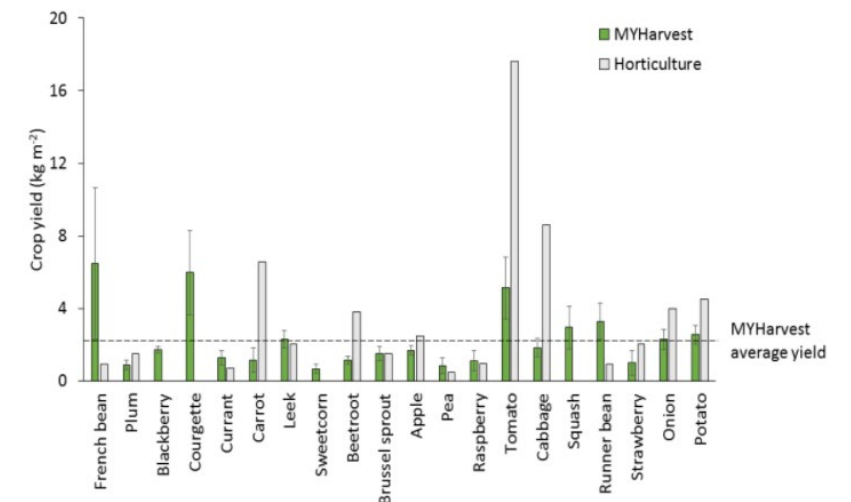
Jill L. Edmondson^{a,*}, Dylan Z. Childs^a, Miriam C. Dobson^a, Kevin J. Gaston^b, Philip H. Warren^a, Jonathan R. Leake^a

^a Department of Animal and Plant Sciences, University of Sheffield, Sheffield S10 2TN, UK
^b Environment and Sustainability Institute, University of Exeter, Exeter, UK

HIGHLIGHTS

- Urban agriculture provides ecosystem services to people in cities.
- Allotment gardening in 1.5% of a city provides fresh produce for 10% of the population.
- Crop yields achieved by owners of allotments were similar to commercial horticulture.
- Availability of land for own-use allotments has significantly declined since 1970.
- Urban food security could be improved by providing more allotments.

Provisional MYHarvest yield data



Artisanal/ Specialist Food Processing & Production

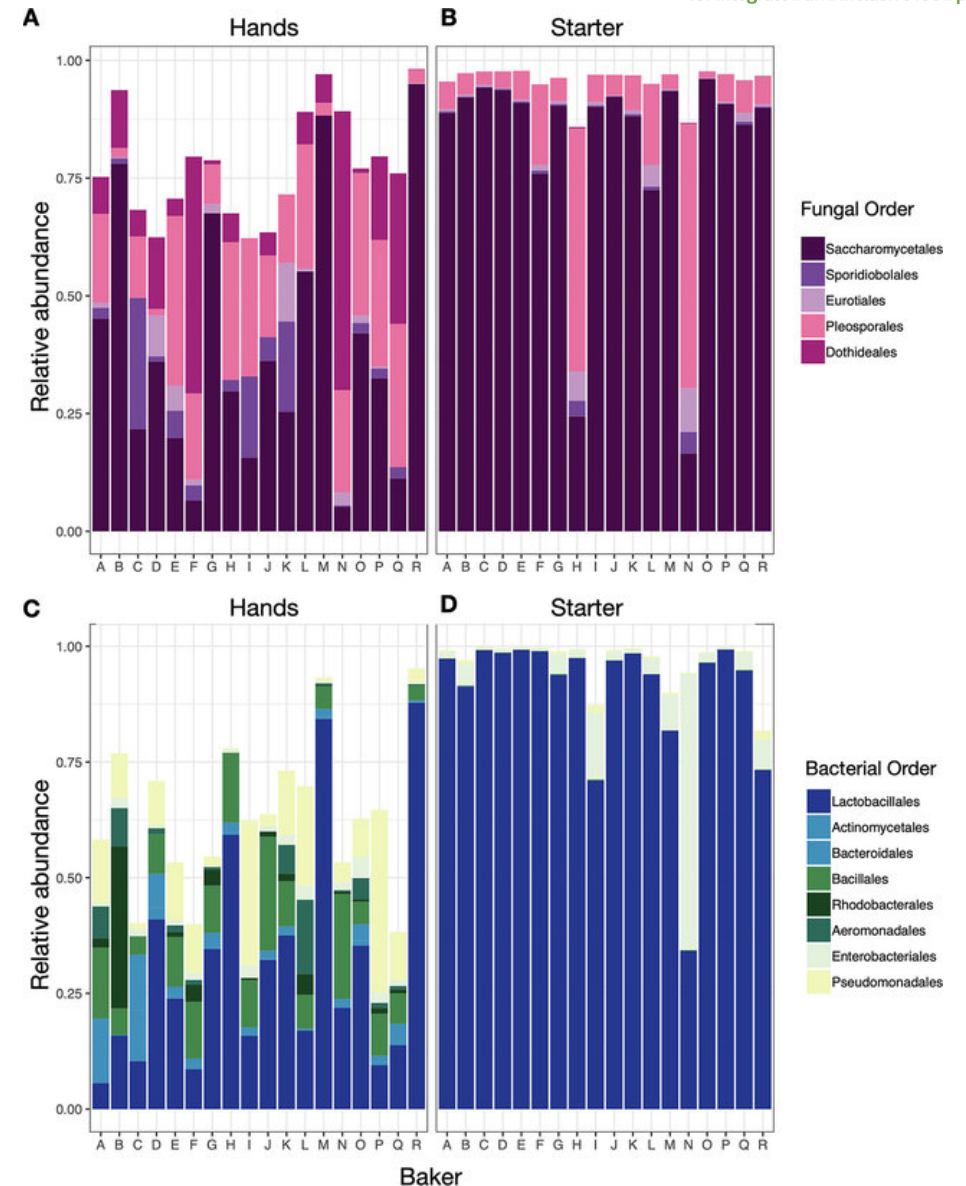
- Peer networks and by experts (e.g. brewers or bakers)
- Commercial food substitute Soylent
- ‘biohackers’ such as Real Vegan Cheese biohacking group (Wilbanks, 2017) or the Shojin Meat project.



RESEARCH ARTICLE
Applied and Environmental Science

Influences of Ingredients and Bakers on the Bacteria and Fungi in Sourdough Starters and Bread

Aspen T. Reese,^a Anne A. Madden,^b Marie Joossens,^{c,d,e} Gylaine Lacaze,^f Robert R. Dunn^{b,g,h}



Artisanal/ Specialist Food Processing & Production

“Shojinmeat Project” - Who we are

“Democratization of cellular agriculture”

Nonprofit non-corporate non-university citizen science community of DIY bio/fab enthusiasts, students, researcher, artists, writers etc. for cellular agriculture



Open source cellular agriculture” by DIY bio



Public communication by art and education



Shojinmeat Project



Food Safety & Fraud

- Allergen testing, food spoilage etc.

See <https://theanalyticalscientist.com/fields-applications/citizen-science-and-food-safety>

- ‘Citizen Radioactivity Monitoring stations’
– Japan post Fukushima

Analytical and Bioanalytical Chemistry
<https://doi.org/10.1007/s00216-018-0989-7>

REVIEW

**Consumer-friendly food allergen detection: moving towards
smartphone-based immunoassays**

Georgina M. S. Ross¹ · Monique G. E. G. Bremer¹ · Michel W. F. Nielen^{1,2}

Received: 29 December 2017 / Revised: 14 February 2018 / Accepted: 26 February 2018
© The Author(s) 2018

ASIEN 140 (Juli 2016), S. 56–73

Refereed article

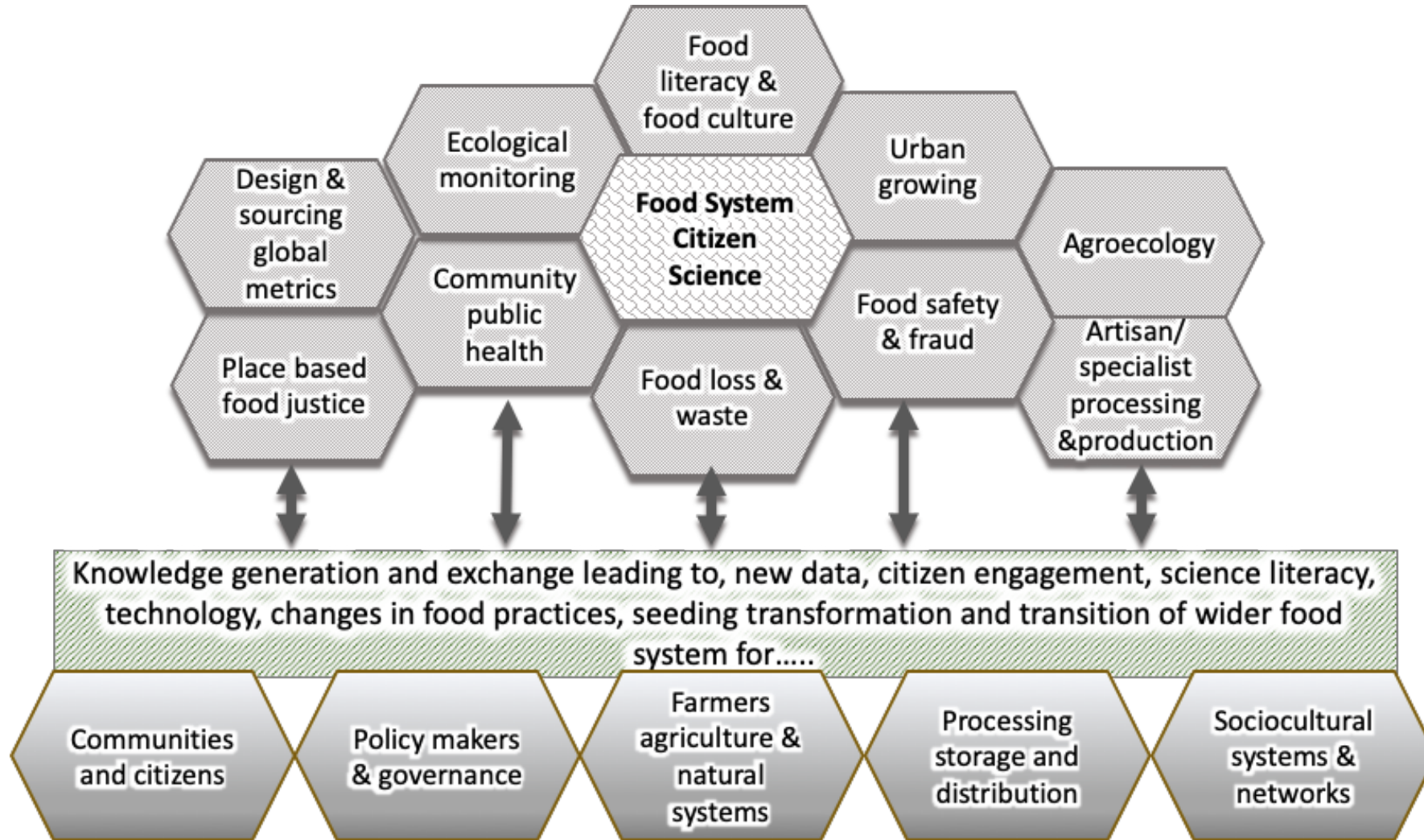
**Lay People and Experts in Citizen Science:
Monitoring Radioactively Contaminated Food in
Post-Fukushima Japan**

Cornelia Reiher

Community Based Public Health

- Onevoice or Photovoice methodology (using smartphones)
- Examine enablers and barriers to health and food practice
- Citizen scientists in New Jersey (USA) identified problems with a Healthy corner stores' scheme and suggested strategies for stores' to modifying logistics together, improving scheme implementation (Chrisinger et al., 2018).
- Sharing recipes and meeting to cook healthier foods together (Rogers et al., 2018).

These were just some of the aspects...



Citizen science engagement with the food system and impact pathways

How I got into Citizen Science

2012-2014

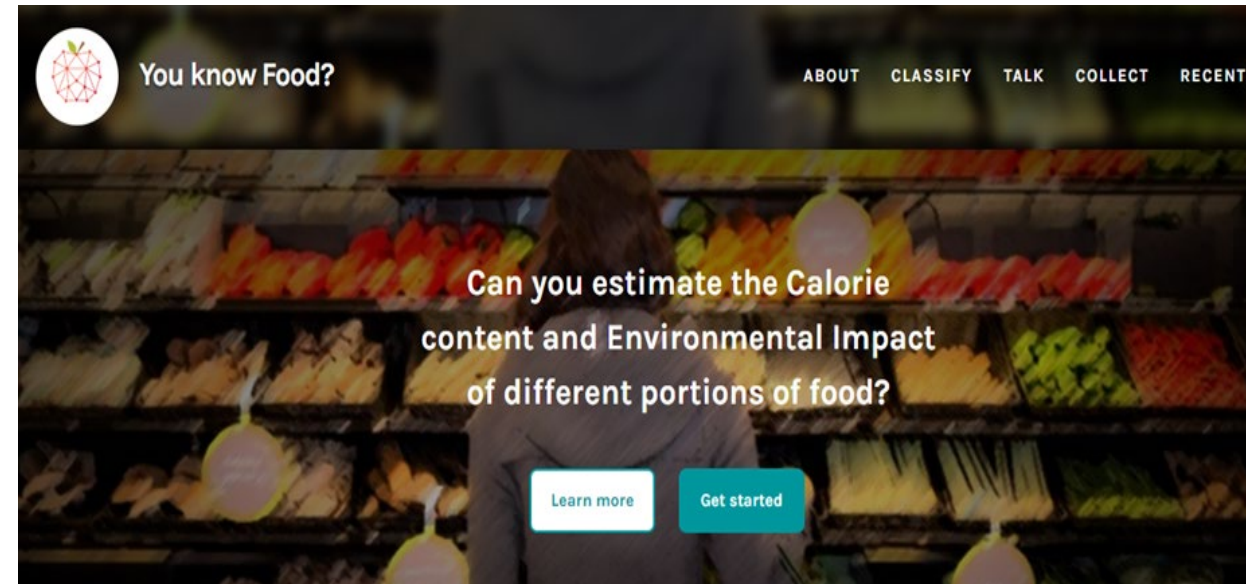


Dr Philip Roetman from the University of South Australia demonstrates the Koala Counting app

2018-2020



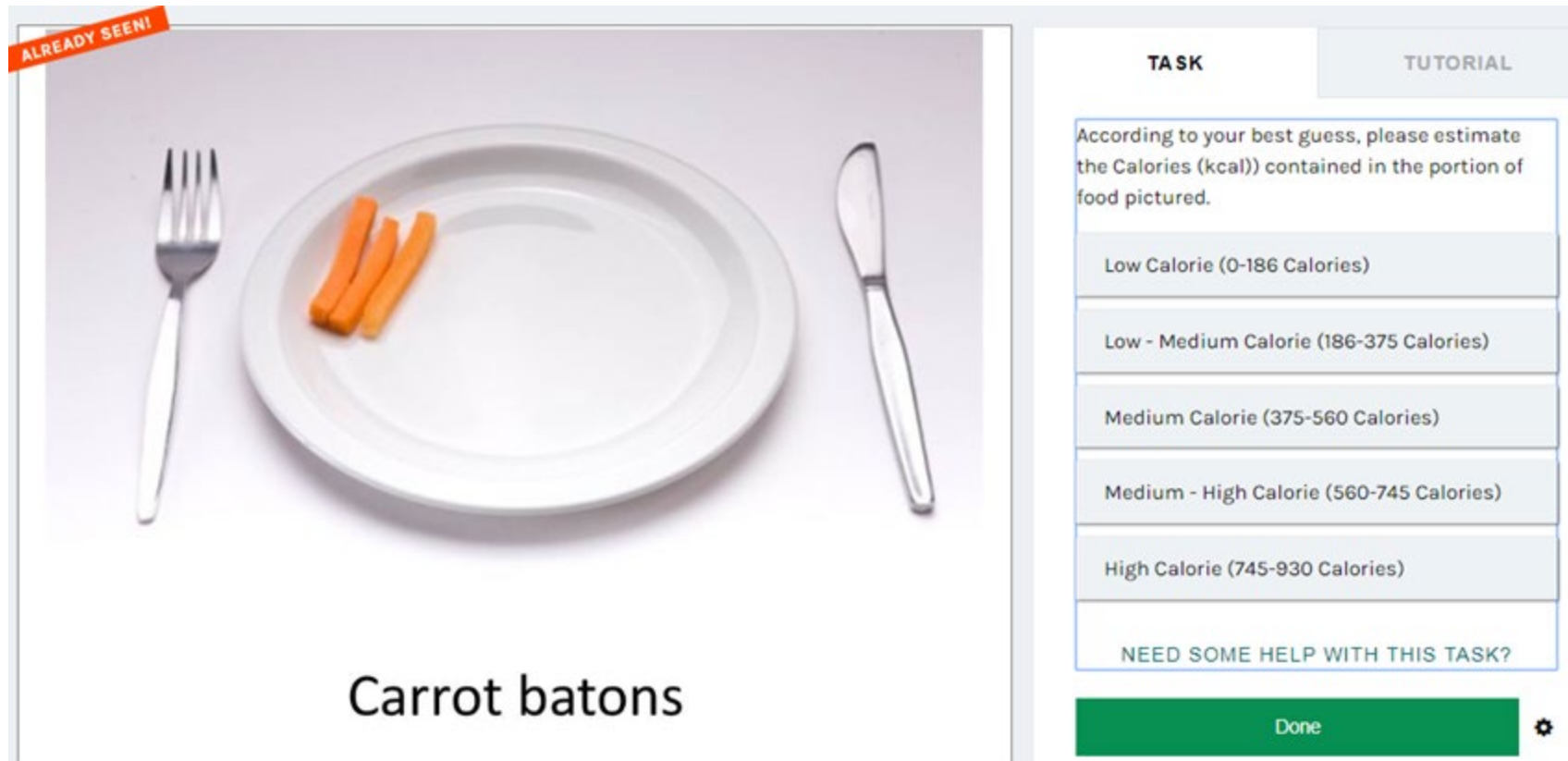
ZOONIVERSE



Online experiments

Zooniverse - You Know Food? (2019)

3 different question systems: Slider, Multiple choice, or text entry



ALREADY SEEN!

TASK **TUTORIAL**

According to your best guess, please estimate the Calories (kcal) contained in the portion of food pictured.

Low Calorie (0-186 Calories)

Low - Medium Calorie (186-375 Calories)

Medium Calorie (375-560 Calories)

Medium - High Calorie (560-745 Calories)

High Calorie (745-930 Calories)

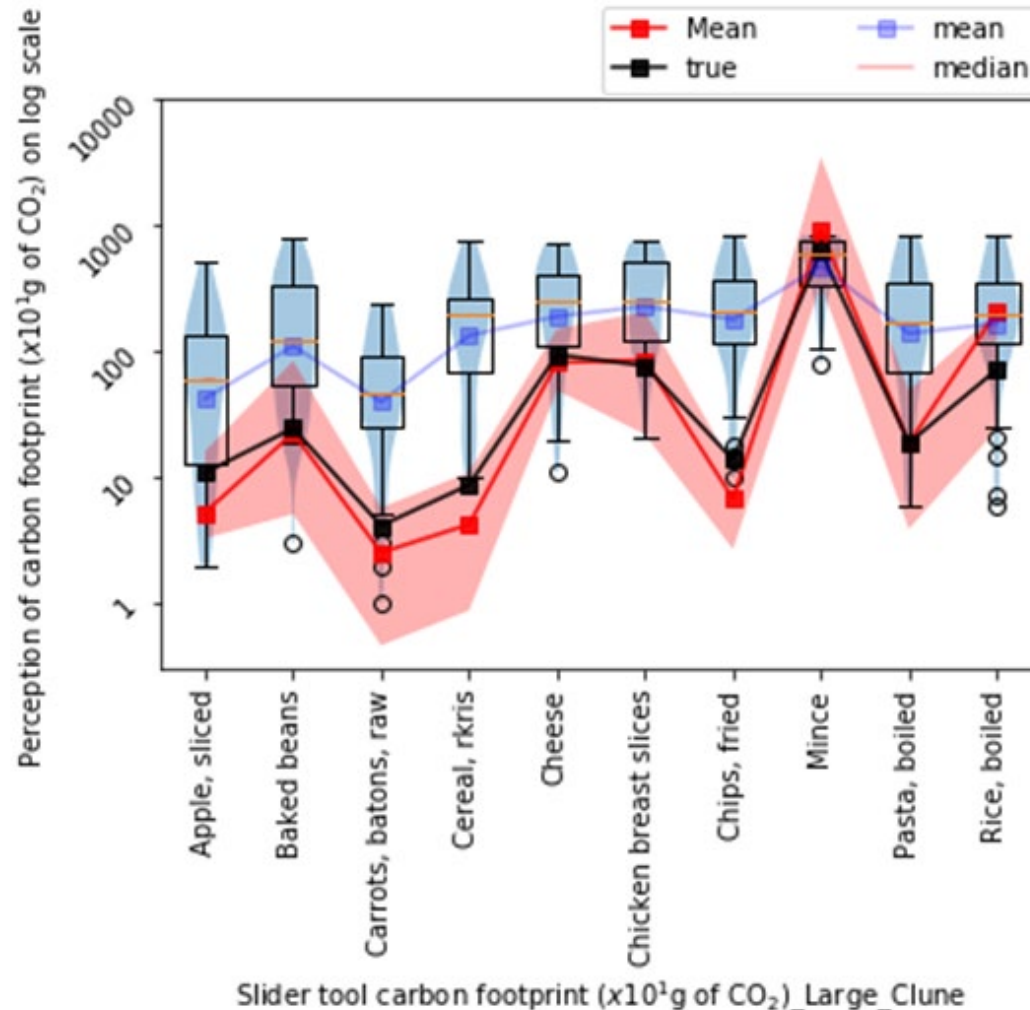
NEED SOME HELP WITH THIS TASK?

Done

Carrot batons

Zooniverse - You Know Food?

<https://doi.org/10.3389/fsufs.2020.00120>



N=~516, 8484 valid image classifications.

10 Foods types 3 portion sizes, with and without weights.

Results: Citizens are unable to accurately estimate carbon footprint and energy content, with the majority of citizens overestimating values. Portion size impacts perceptions, with estimations increasing alongside size. Weight information influences perception, but the direction varies by factor. Input method significantly affects citizen estimations. Citizen feedback confirms the lack of knowledge surrounding carbon footprint values.

Online experiments

Food Safety: Controls

Emerald Open Research Emerald Open Research 2020. 2:35 Last updated: 15 JUL 2020



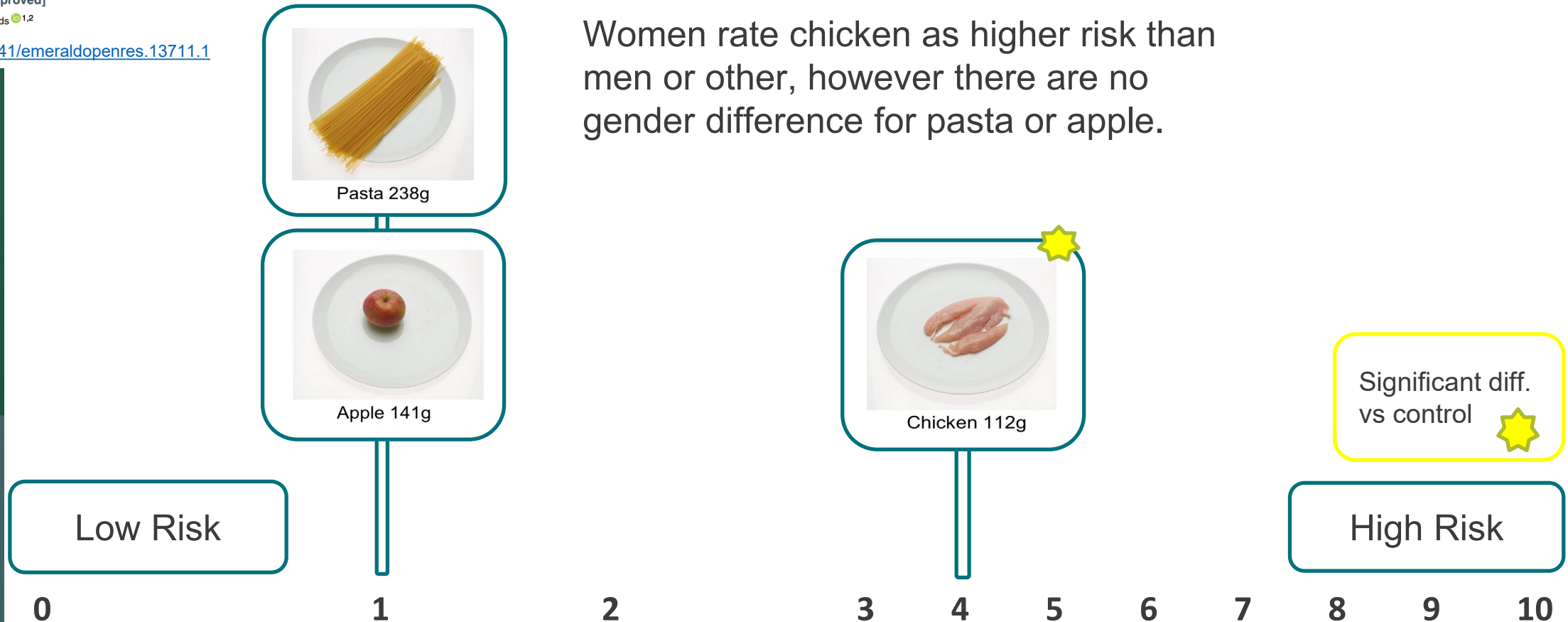
RESEARCH ARTICLE
China and the USA, a higher perceived risk for UK consumers in a post COVID-19 food system: the impact of country of origin and ethical information on consumer perceptions of food
[version 1; peer review: 1 approved]

Beth Armstrong ¹, Christian Reynolds ^{1,2}

<https://doi.org/10.35241/emeraldopenres.13711.1>

Chicken is rated as a higher risk food than pasta and apple.

Women rate chicken as higher risk than men or other, however there are no gender difference for pasta or apple.



Online experiments

Chicken: Safety

Emerald Open Research

Emerald Open Research 2020. 2:35 Last updated: 15 JUL 2020

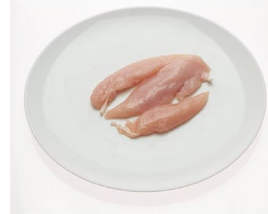


RESEARCH ARTICLE

China and the USA, a higher perceived risk for UK consumers in a post COVID-19 food system: the impact of country of origin and ethical information on consumer perceptions of food [version 1; peer review: 1 approved]

Beth Armstrong ¹, Christian Reynolds ^{1,2}

<https://doi.org/10.35241/emeraldopenres.13711.1>



Chicken 112g



Low Risk

High Risk

0 1 2 3 4 5 6 7 8 9 10

Vegans, vegetarians, pescatarians, those with another dietary preference rate risk as significantly higher than omnivores.

Gamification

<http://climatefoodchallenge.online/>



Figure 1: Screenshot of the climate food challenge game. The player must click the foods in order of lowest carbon footprint to highest. The number under each food represents the portion size in grams. For the example shown the player would click the chocolate bar first, then the bowl of rice, then the steak, to win points. Should the player get it wrong, they will win no points.

<https://drive.google.com/file/d/1FxitzwFFnsloH2kc3LnqIAYfHQmoYyib/view>

Food flashcards
brought to you by GGDOT

GGDOT

CO₂e
minutes driving

Carbon	g CO ₂ e
Protein	g
Calories	kCal
Fiber	g
Water	liters

Sausage
Two small (100g)

CO₂e
minutes driving

16

Carbon	g CO ₂ e	1035
Protein	g	14
Calories	kCal	259
Fiber	g	6
Water	liters	394

Steak
Portion, fried (100g)

CO₂e
minutes driving

30

Carbon	g CO ₂ e	1939
Protein	g	26
Calories	kCal	270
Fiber	g	0
Water	liters	584

Veggie sausage
Two small (100g)

CO₂e
minutes driving

6

Carbon	g CO ₂ e	361
Protein	g	14
Calories	kCal	247
Fiber	g	3
Water	liters	72

Living Labs - University of Sheffield



Actions

- Low impact logo on menu
- Milk guides
- Surveys and Interviews with students
- Student ambassadors
- “Climate Strike” menu changes

Milk Type	Impact Category	2018 Usage (litres)	2019 Usage (litres)	Increase in Usage?
Dairy	Medium	2460	2206	No
Soya	Low	252	240	No
Oat	Low	282	564	Yes

Ingredient	Impact category	Usage in 2018 (kg)	Usage in 2019 (kg)	Increase in usage?
Falafel	Low	105.7	91.8	No
Basil Tofu	Low	28.5	18.7	No
Hummus	Low	73.7	65.1	No
Tuna chunks	Medium	33.3	23.0	No
Roasted Mediterranean Vegetables	Low	27.9	32.4	Yes
Vegan Sausages	Low	374 sausages	723 sausages	Yes
Back Bacon	Medium	6.6	-1.5	No
Piri Piri Chicken	Low	125	86.6	No
Chicken Breast Slices	Low	76.2	58.4	No
Greek Feta	Medium	61.6	55.7	No
Mature Cheddar	Medium	31.3	53.1	Yes
Stilton	Medium	0.07	19.6	Yes
Bacon	Medium	891 portions	492.8 portions	No

Take Away thoughts

- Technology is enabling Citizen Science research in new and exciting ways.
- There are many ways that Citizen Science can help engage, and educate, advance and evaluate existing types of (food) research.
- Let's get to it!

Thanks to my (many) collaborators...

Citizen Science; climate change, cooking and food habits: Carla Adriano Martins; Marcelo Vega; Ian Vázquez Rowe; Gustavo Cediel ; Ximena Schmidt; Angelina Frankowski ; Sarah Bridle ; Carolyn Auma ; Jacqueline Silva ; Gemma Bridge ; Libby Oakden; Hibbah Osei-Kwasi ; Alana Kluczkovski ; Robert Akparibo; Tahir Bockarie; Daniel Mensah; Maria Laura Louzada; Changqiong Wang ; Luca Panzone ; Astrid Kause ; Charles Ffoulkes; Coleman Krawczyk ; Grant Miller; Stephen Serjeant; Fernanda Rauber; Renata Levy, and the catering team and students at University of Sheffield.

... and funders. This work was funded by STFC Food Network+ pilot funding (ST/P003079/1), and STFC 21st Century challenge funding (ST/T001410/1) “Piloting Zooniverse for food, health and sustainability citizen science”. Christian Reynolds was supported from the HEFCE Catalyst-funded N8 AgriFood Resilience Programme and matched funding from the N8 group of Universities. Additional funding was provided by Research England via the project “Food based citizen science in UK as a policy tool”. Thanks to Sheffield Sustainable Food Futures group and the Institute for Sustainable Food, University of Sheffield for providing funding to extend the Living Labs project.



The University
Of Sheffield.
Institute for
Sustainable Food.

Comments?
Questions?

Dr Christian Reynolds

Centre for Food Policy, City, University of London



@sartorialfoodie

christian.reynolds@city.ac.uk

Financial Support: This work was funded by STFC Food Network+ pilot funding (ST/P003079/1), and STFC 21st Century challenge funding (ST/T001410/1) “Piloting Zooniverse for food, health and sustainability citizen science”. Christian Reynolds was supported from the HEFCE Catalyst-funded N8 AgriFood Resilience Programme and matched funding from the N8 group of Universities. Additional funding was provided by Research England via the project “Food based citizen science in UK as a policy tool”. Thanks to Sheffield Sustainable Food Futures group and the Institute for Sustainable Food, University of Sheffield for providing funding to extend the Living Labs project.

**Centre for
Food Policy**

Educating, researching, influencing for
integrated and inclusive food policy

Place-based citizen science

- “Health and Local communities” project in Bornholm, Denmark was community led public health intervention, in a defined geography that aimed to reduce childhood overweight and obesity (Bloch et al., 2014; Toft et al., 2018)
- Sustainable food places?

Food Literacy & Culture

- Canadian healthy eating project (Growing roots): Immigrant communities, to gain familiarity with cooking healthy Canadian meals and to explore positive nutritional elements in their indigenous food cultures. (Henderson and Slater, 2019)