Assessing Understanding of the DOHaD Hypothesis in Target **Communities to Inform Translational Intervention Design** Masahito Oyamada^{*1}, Sarah Morgan^{2,3}, Robyn Dixon⁴, Clare Wall⁴ and Jacquie Bay^{2,3}

- 1. Fuji Women's University, Japan;
- 2. Liggins Institute, University of Auckland, New Zealand;
- 3. Gravida: National Centre for Growth and Development, New Zealand;
- 4. University of Auckland, New Zealand.
- *Presenting Author

With the accumulation of compelling evidence, the Developmental Origins of Health and Disease (DOHaD) hypothesis has reached the stage of translational research. Such research supports the development and testing of interventions to support primary prevention of noncommunicable diseases (NCDs) via application of DOHaD principles. However, very little evidence exists regarding baseline public understanding of DOHaD concepts and even less around the impact of public understanding interventions in this field. Existing evidence demonstrates relatively low levels of understanding of DOHaD in first-time mothers, 11-14 year old school students and their parents, and 18-22 year old female university students.

Knowledge translation interventions should engage target groups in processes that allow access to and discussion about scientific evidence within the socio-ecological context of the group. Knowledge of baseline understanding of DOHaD concepts, as well as NCD risk awareness and prevention understanding is required to inform the development of transactional interventions. To address the lack of research surrounding public awareness and understanding of the concepts of early life origins of adult disease we have initiated The Public Understanding of DOHaD Project (http://www.lenscience.auckland.ac.nz/en/about/our-research/Public-understanding-DOHaD.html).

This collaboration between researchers in New Zealand and Japan is establishing baseline knowledge of DOHaD hypothesis understanding in groups identified as key targets for intervention. This evidence will be used to inform the development of knowledge translation interventions. The project has developed a validated questionnaire with context-appropriate versions that enables data collection from the general public, adolescents in schools, health-sector professionals, and tertiary students studying to be health professionals.

The aim is to identify cohorts and pathways through which improved DOHaD theory education of future health professionals might lead to improved communication of the knowledge to the general public and those who are at most risk of NCDs, and charged with growing our next generation.

t takend	
LENSCIENCE Bringing Schools and Scientists Together	
LIGGINS INSTITUTE THE UNIVERSITY OF AUCKLAND NEW YEALAND THE WINE WARE TO BUILT HEARTH THE OF AUCKland THE WINE WARE TO BUILT HEARTH THE OF AUCKLAND THE WINE THE THE OF AUCKLAND THE THE THE THE OF AUCKLAND THE THE THE THE THE THE THE THE THE THE	PUD Project – Print Questionnair
The Liggins Institute, University of Auckland The Liggins Institute, University of Auckland 1142 The Liggins Institute, University of Auckland 1142	L tion
The Liggins Institute, University West, Auckland 1140	Date of completion
Drivate Dea	Time of completion Location of completion Location of completion
summation Sheet	Location of completion Please use a clear 'x' m
Participant Information	1. Have you heard of non-comm
tanding of DOHaD In New the University of Auckania	1. Have you need No
Participant Information Sheet Participant Information Sheet Understanding of DOHaD in New Zealand Communities Understanding of DOHaD in New Zealand Communities The Liggins Institute at the University of Auckland. The Liggins Institute at the University of Auckland. Dr Sarah Morgan, LENScience Research Fellow Dr Sarah Morgan, LENScience, School of Nursing	Yes
Research conducted by: Principal Investigator: Dr Sarah Morgan, LENScience, Jacquie Bay, Director LENScience, Jacquie Bay, Director Robyn Dixon, School of Nursing	
principal Investigation Jacquie Bay, Director Robyn Dixon, School Charles	2. What is a non-communicable
co-Investigators: Associate Professional of Nursing	2
Dr Anecita Lini, entireld	
Professor Wayne -	
Liggins Institute Director.	
Liggins Institute Director: Professor Wayne Cutiend The Liggins Institute is interested in finding out what New Zealanders know about the Developmental Original of Health and Disease (DOHaD) hypothesis. We are doing this by asking New Zealand adults to complete short questionnaire, about what DOHaD is. The questionnaire can be completed on line or by hard copy. If use this information to help design education programmes to increase awareness and understanding will use this information to help design education programmes to increase (NCDs) can be reduced.	males
The Liggins Institute is (DOHaD) hypothesis. The questionnaire can be contracted awareness and undered	 Can you give some examples
of Health and about what Done theotion programmed and teopses (NCDS) can	3. Canyou p
short question to rielp use of noncommunation in the draw	
We will use the physical state and the state of the state	
of What the study, Participation is your paper bland, usidentify	
- Hightight to take party hrowser window of the apply information the	for the second s
short questionnaire, about to help design education P to communicable diseases (We will use this information to help design education P to communicable diseases (We will use this information to help design education P to communicable diseases (of what the DOHaD hypothesis is and how the risk of noncommunicable diseases (Me will use this information to take part in the study. Participation is entirely voluntary. You can withdraw of what the DOHaD hypothesis is and how the risk of noncommunicable diseases (Not are under no obligation to take part in the study. Participation is entirely voluntary. You can withdraw You are under no obligation to take part in the study. Participation is entirely voluntary paper blank/incomplete. All You are under no obligation to take part in the study. Participation are or any information that could identify we will not record your name or any information that could identify we will not record your name or any information the participation as we	What are the risk factors for
your participation give is anonymous anorted. This means withdraw the will be	4.
the months was of the rescure sub- questionnal of the from your question the	
you when the findings of the version of the queed window or returned your paper version of the queed window or returned your paper version of the queed window or returned your paper version of the queed window or returned your paper version of the queed window or returned your paper version of the queed window or returned your paper version of the queed with the paper version of the queed with the the the the queed with the the queed with the questionnaire you are giving the University of Auckland consent to use this interview or completing the questionnaire you are giving the University of Auckland consent to use the participation of the test of test of the test of	
window of the able to identify which and a participants to give the University of Auckland come	
would not that from approximately are giving the second se	tions are abo
complete or completing the question	5. The next questions are about a gree or disagr
interview of complete arch. information in the research.	whether you apres
Information from this	affects health.
interview of complete each. information in the research. The questionnaire should not take you longer than 5-10 minutes to complete. To take part you will need to be at least 16 years old and be able to speak English. Information from this rot take part you will need to be at least 16 years old and be able to speak English. Information from this research will be stored on a secure computer system for up to 6 years before being erased. Individual forms research will be stored on a secure computer system for up to 6 years post-collection. The research when destroyed by shredding after the responses are analysed or at 6 years post-collection. The sites. You when destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collection. The destroyed by shredding after the responses are analysed or at 6 years post-collect	
The years before being an and to be at least 16 years of and to 6 years before being an and to be at least 16 years of years before being an and to be at least 16 years of years before being an and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being and to be at least 16 years of years before being an	
To take part you will need to a secure computer system for a 6 years poor	staats their risk
research will be stored on de stored ding after the responses and the LENScience and LENScience@auckland.ac.ne	a An individual's diet affects their risk
The questionnaire should not be at least 16 years old and be able to speak Engine To take part you will need to be at least 16 years old and be able to speak Engine research will be stored on a secure computer system for up to 6 years before being erased. Individual Torrito will be destroyed by shredding after the responses are analysed or at 6 years post-collection. The research information will be released in a newsletter format on the LENScience and Liggins Institute web sites. You may also email LENScience to request a copy of the report when it is published <u>LENScience@auckland.ac.nz</u> in d and operated by The Liggins Institute at The University of Auckland.	i maman's health prior to
information will be recease to request a copy of the top	A woman's health price of the fetus during pregnancy. the fetus during pregnancy. A father's health prior to conception A father's near during pregnancy.
may also email LENSCENSE	A father's fleater P
will be destroyed or released in a newstetter information will be released in a newstetter may also email LENScience to request a copy of the report when it is performed The research is funded and operated by The Liggins Institute at The University of Auckland. Human Participants Ethics The research is funded and operated by The Liggins Institute at The University of Auckland Human Participants Ethics For any ethical concerns contact: The Chair, The University of Auckland Human Participants For any ethical concerns contact: The Chair, The University of Auckland Human Participants Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland For Committee, The University of Auckland For 3 years Reference Number 013093	A woman's little and
The research and the chair, The Chair, The Chair, The Symonds Street, Private Second Human Participants	a the fetus units the ing pregnal
For any ethical concerns of Auckland, Level 5, 70 by The University of Auckland, Level 5, 70 by The University of Auckland	A woman's flut to a vears of II
Committee, The University research has been approved Number 013093	A woman's have heldbood
The research is funded and operated by the University of Auckland To g 92019, Auckland, Teacher and the University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland, Human Participants Committee, The University of Auckland, Level 3, 76 Symonds Street, Private Bag 92019, Auckland Human Participants 3737599 extn. 83711. This research has been approved by The University of Auckland Human Participants 3737599 extn. 83711. This research has been approved by The University of Auckland Human Participants 4.155 Committee on 21/11/2014 for 3 years Reference Number 013093	t the child through during pregnal
Ethics Comme	A woman's fut the dulthood.
Dr Sarah Morgan http://www.lenscience.auckland.ac.inj.edu	g the child through the tirst 2
	h A child's nutrition during the the child h health of the child throughout child
What is DOHaD?	



Total number of responding students	69	
	09	
You have heard of DOHaD, yes	0	
You have heard of DOHaD, yes (%)	0	
A woman's nutrition during pregnancy affects the health of the child thoughout adulthood		%
strongly agree	6	8.7
somewhat agree	14	20.3
I don't know	36	52.2
disagree	11	15.9
strongly disagree	2	2.9
A child's nutrition during the first 2 years of life affects the health of the child throughout adulthood.		
strongly agree	11	15.9
somewhat agree	20	29
I don't know	30	43.5
disagree	7	
strongly disagree	7 1	10.1
strongly disagree		10.1
strongly disagree	1	10.1
strongly disagree . Nutrition Year 3 - New Zealand Total number of responding students	26	10.1
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes	1 26 1	10.1
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much	1 26 1	10.1
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately	1 26 1 3.8	10.1 1.4 % 11.5 46.2
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly	1 26 1 3.8 3 12 7	10.1 1.4 % 11.5 46.2 26.9
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly disagree	1 26 1 3.8 3 12 7 1	10.1 1.4
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly	1 26 1 3.8 3 12 7	10.1 1.4 % 11.5 46.2 26.9 3.8
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly disagree	1 26 1 3.8 3 12 7 1	10.1 1.4 % 11.5 46.2 26.9 3.8
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly disagree I don't know A child's nutrition during the first 2 years of life affects the health of the child throughout	1 26 1 3.8 3 12 7 1	10.1 1.4 % 11.5 46.2 26.9 3.8 11.5
strongly disagree 5. Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree moderately agree slightly disagree I don't know A child's nutrition during the first 2 years of life affects the health of the child throughout adulthood.	1 26 1 3.8 3 12 7 1 3 3	10.1 1.4
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree slightly disagree I don't know A child's nutrition during the first 2 years of life affects the health of the child throughout adulthood. agree very much	1 26 1 3.8 3 12 7 1 3 3 12 7 1 3	10.1 1.4
strongly disagree Nutrition Year 3 - New Zealand Total number of responding students You have heard of DOHaD, yes You have heard of DOHaD, yes (%) A woman's nutrition during pregnancy affects the health of the child thoughout adulthood agree very much agree slightly disagree I don't know A child's nutrition during the first 2 years of life affects the health of the child throughout adulthood. agree very much agree very much	1 26 1 3.8 3 12 7 1 3 3 12 7 1 3 3 12 7 1 1 3 8	10.1

Table 2. Nutrition Year 4 - Japan

Total number of responding stu	udents 76
You have heard of DOHaD, yes	55
You have heard of DOHaD, yes	(%) 72.4
A woman's nutrition durning pregnan affects the health of the child through adulthood	•
strongly	vagree 11
somewhat	t agree 30
l don'	t know 27
di	sagree 8
strongly di	sagree 0
A child's nutrition during the first 2 ye life affects the health of the child thro adulthood.	
strongly	vagree 28
somewhat	t agree 25

Table 1. Selected question responses of fi Japanese nutrition students

I don't know

strongly disagree

disagree

Table 2. Selected question responses of for Japanese nutrition students

Table 2. Selected question responses of third year New Zealand nutrition students

This questionnaire enables us to make comparison among various countries and populations, and revealed that there is apparent difference in understanding of DOHaD (both the term and the concept) between future dieticians in New Zealand and Japan.

While not alarming in itself, it highlights a potential avenue for education of the population about NCD risk avoidance. In New Zealand, premature mortality between the ages of 30 and 70 due to the top 4 NCDs (Cancers, Diabetes, Cardiovascular Diseases, and Chronic Respiratory Diseases) is 11%, in Japan it is 9% (WHO NCD diseases country profiles 2014). In comparison, the USA is 14%, China is 19% and India is 26%. Knowing the baseline understanding of DOHaD theory in the general population of a country could effectively highlight an avenue for intervention.

The questionnaire is designed in two formats to be easily understood by highly educated health professional trainees, and the general public - and is very easily translated. The collaboration has recently been extended to a group in China and we look forward to adding another country into the comparison.

Should you wish to use the questionnaire within your own research setting, please don't hesitate to initiate a conversation with Professor Oyamada or email him at oyamada@fujijoshi.ac.jp



	February 2015	
% 14.5 39.5	EDUBLY PERIOD Public Print Questionnaire: Professional # Achild's nutrition during the first 2 years of life affects the Achild's nutrition during the first 2 years of life affects the Agree Disagree Moderately Moderately Signitudity Image: Disagree in the child throughout adulthood. Image: Disagree in the physical activity levels of a mother and father before Image: Disagree in the child throughout adulthood. Image: Disagree in th	PUD Project – Print Questionnaire: Professional 10. What is your highest completed educational No education qualification NCEA Level 1 / School Certificate / or equivalent (e.g. NCEA Level 2 / Sixth form Certificate / or equivalent NCEA Level 3 / University Bursary or equivalent (e.g. Diploma) Trade certificate / apprenticeship Diploma below bachelors (e.g. older qualifications for primary teaching / ECE teaching etc Bachelor's Degree
35.5	Yes	Post Graduate Diplom
10.5 0	If YES, where?	Masters PhD Other notes:
36.8 32.9 26.3 3.9 0	J. To what extent does the diet of the mother during pregnancy affect lifelong risk of:	11. Which ethnicities do you identify with? Tick as many as needed Māori NZ European / Pakeha Pacific Island (Tongan, Samoan, Fijian, Cook Island / R Asian (Japanese, Chinese, Korean, Singaporean, Thai, I Asian (Japanese, Chinese, Korean, Singaporean, Thai, I Indian, Pakistan, Sri Lankan European / Caucasian (Australian, UK, USA, Other European Middle eastern Latin American / Hispanic African
irst year	9. What are you studying? Stage (year) & topic: Stage (3 and 1 and	Thank you for taking part in this survey. hypothesis on our websites if you are interest the front page of this survey (entitled Particip When we have finished the research we w academic journals and to the public on our w educational strategies, thank you!
ourth year		

Ea	bruary 2015	
, re		
l qualification?		
14-		
. GCSE)		
Higher School Certificate / A Level / IB		
r Pharmacy, Physiotherapy / Nursing /		
(File		
Rarotongan, Nuean)		
Malay)		
Wald		
ropean)		
	, the DOHaD	
. We have information about NCDs	and the Second	
We have mjort more; please carefu	ny course	
We have information about NCDs and the be- sted in finding out more; please carefully tear off & keep pant Information Sheet).		
pant Information Sheet). pant Information Sheet). will report the results via peer-review publication in web site. Your help is essential for developing policy and web site. Your help is essential for developing policy and		
will report the will report the sessential for dev	CIOP	
WED SILE.		

4