

One Health from the perspective of human medicine

GUNNAR SKOV SIMONSEN, MD PHD
UNIVERSITY HOSPITAL OF NORTH NORWAY
UIT –THE ARCTIC UNIVERSITY OF NORWAY



Norwegian Organisation for Surveillance
of Antimicrobial Resistance
(NORM)



AMR is a wicked problem

A wicked problem is a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. It refers to an idea or problem that can not be fixed, where there is no single solution to the problem. The use of the term "wicked" here has come to denote resistance to resolution, rather than evil.

*Rittel, Horst W. J.; Webber, Melvin M. (1973). ["Dilemmas in a General Theory of Planning"](#) (PDF). *Policy Sciences*. **4** (2): 155–169.*



AMR is not ONE problem

- Numerous microbes with different epidemiological characteristics
- Variable resistance determinants (mutations, acquisition)
- Often located on mobile genetic elements (plasmids, transposons)
- Similar or identical resistance determinants and mobile genetic elements in clinical and animal/environmental isolates
- *vanA*, CTX-M, DHA, *mcr*, *sul* etc
- Proof-of-principle does not quantitate link between reservoirs!



One size does not fit all

<p>Animal/environmental reservoirs relevant in most cases</p> <ul style="list-style-type: none">• <i>Campylobacter</i>• <i>Salmonella</i>• LA-MRSA	<p>Animal/environmental reservoirs of uncertain relevance in most cases</p> <ul style="list-style-type: none">• <i>E. coli</i>• <i>Klebsiella</i>• <i>Enterococcus</i>	<p>Animal/environmental reservoirs not relevant in most cases</p> <ul style="list-style-type: none">• <i>N. gonorrhoeae</i>• <i>S. pneumoniae</i>• <i>M. tuberculosis</i>
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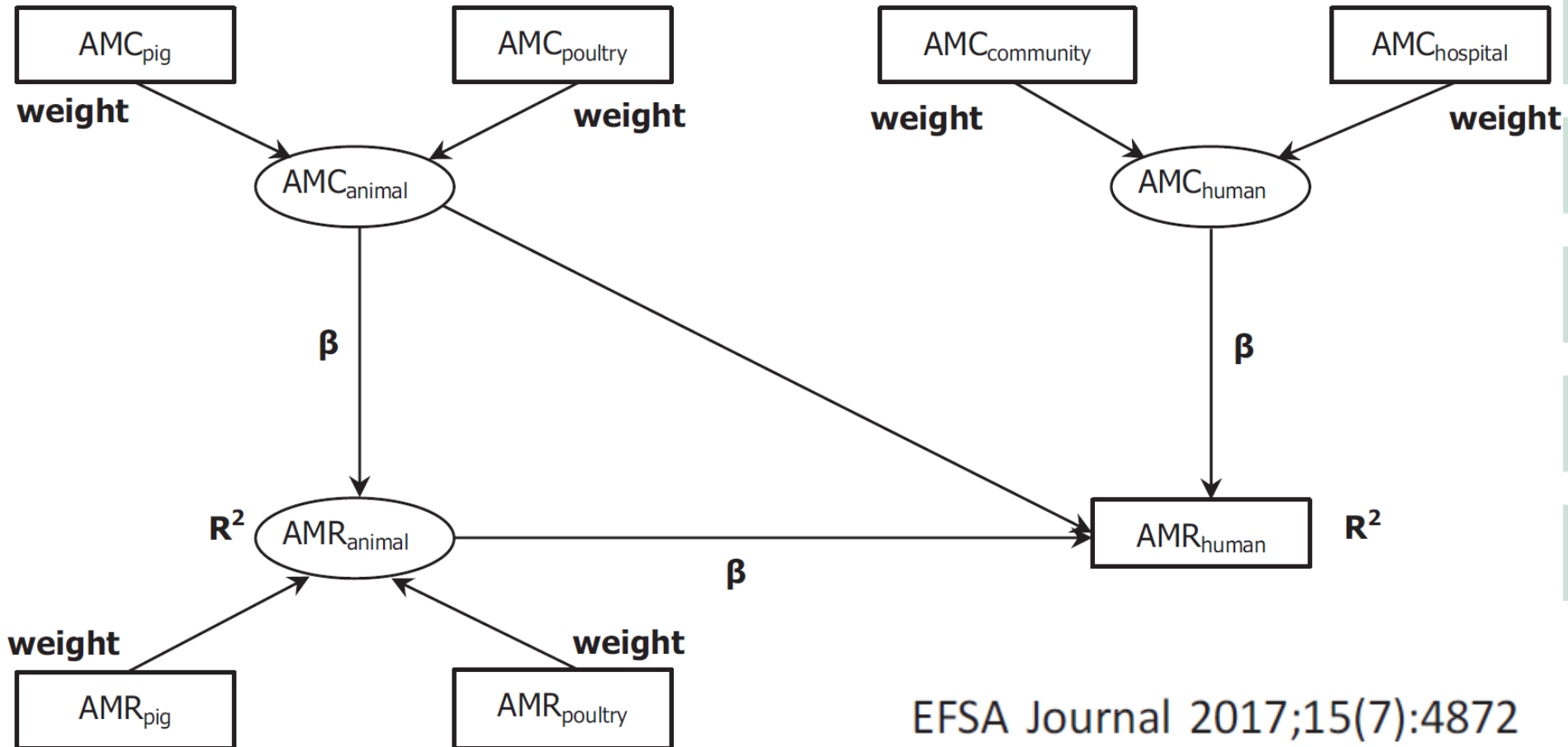
ECDC/EFSA/EMA second joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals

Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA) Report

European Centre for Disease Prevention and Control (ECDC),
European Food Safety Authority (EFSA) and
European Medicines Agency (EMA)

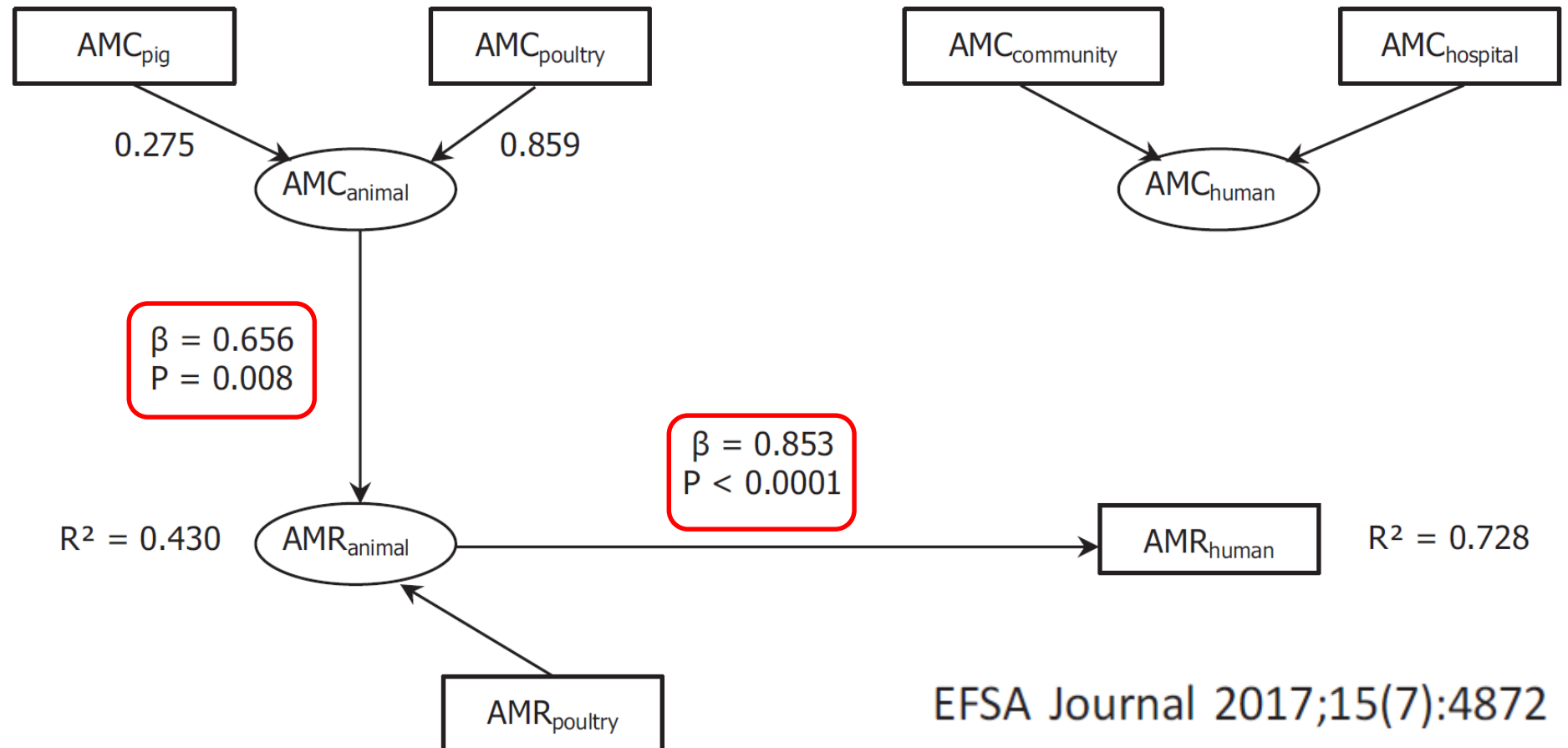


Partial Least Square Path Models for AMC and AMR



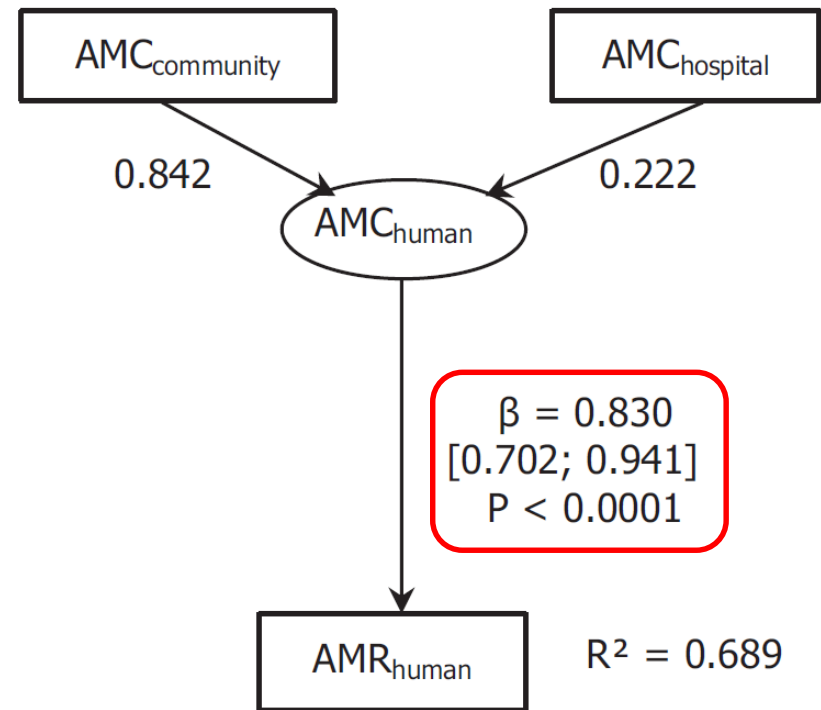
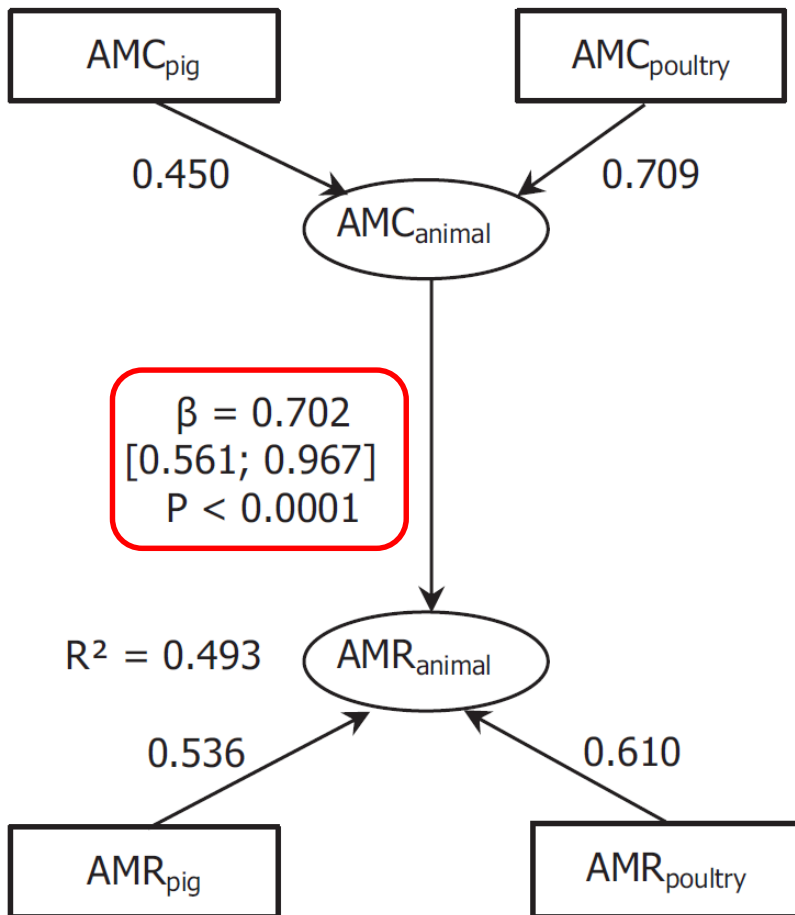


Fluoroquinolones and *Campylobacter jejuni*



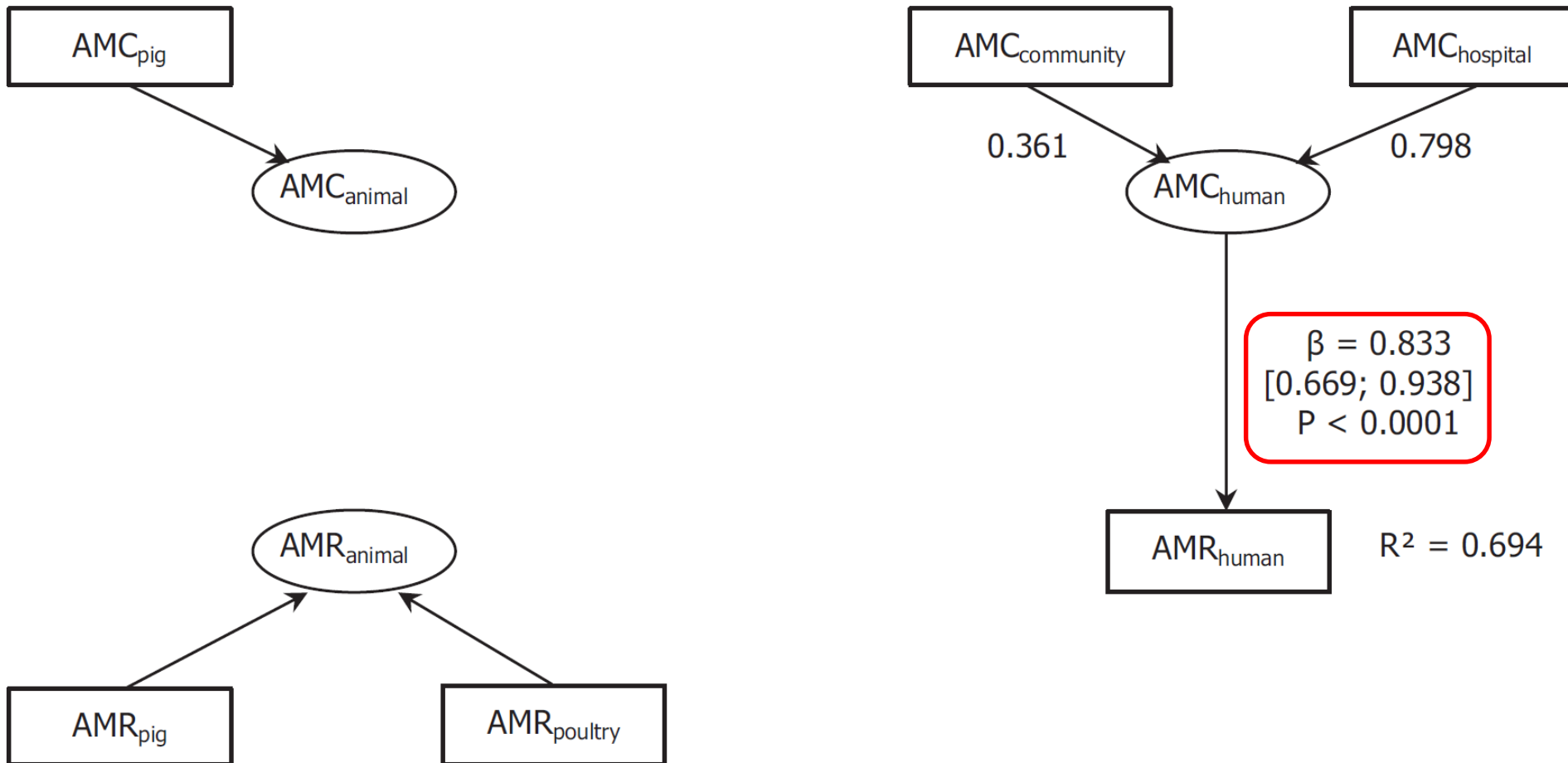


Fluoroquinolones and *E. coli*





3rd generation cephalosporins and *E. coli*





Where do we go from here?

- The links between agriculture, environment and human medicine are essential in development and spread of certain forms of AMR
- Transmission within and between human reservoirs more relevant i other settings
- For important forms of AMR, the quantitative role of non-human reservoirs for human health is poorly understood and most likely context-specific