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RESEARCH ARTICLE

Explaining science-led policy-making: pandemic deaths, epistemic deliberation and ideational trajectories

Erik Baekkeskov[1]

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Abstract What logics steer policy-making when science really leads? Answering this question is a core question for contemporary policy improvement doctrines such as innovative governance, evidence-based policy and experimental governance. In particular, the paper reviews two ideal-type logics of the impact of new information on policy, based on epistemic community, policy learning, neoinstitutional and philosophy of science literature. One logic emphasizes shared epistemic community where uncertainty creates differences in expert judgments, but accruing information pushes toward consensus. The alternative logic emphasizes nationally established ideas that place policies on trajectories, where countervailing new information is ignored until overwhelming, and polities stay different. It then assesses these logics for their ability to explain an empirical puzzle from real-world science-led policy-making: the actual impact of developing pandemic influenza mortality information on 2009 H1N1 flu vaccination policies in three most-similar polities—the Netherlands, Sweden and Denmark. The comparative case studies employ in-depth interviews with each country's leading government-appointed experts and archival evidence, in addition to national statistics. The evidence best supports the second, ideational trajectories logic. In face of the same growing certainty about low 2009 H1N1 mortality, Dutch policy shifted from general mass to targeted vaccination, Swedish policy remained general mass vaccination, and Danish policy remained targeted vaccination. In addition, looking closely at the Dutch policy shift reveals it to have been a switch from national pandemic to seasonal flu response trajectories, rather than a skip from 'Swedish' to 'Danish' style policy.

Keywords Epistemic policy learning · Knowledge utilization · Evidence-based policy-making · Certified experts · Ideational trajectory · Pandemic influenza preparedness and response

✉ Erik Baekkeskov
erik.baekkeskov@unimelb.edu.au

[1] School of Social and Political Sciences, Faculty of Arts, The University of Melbourne, 420 John Medley Building, Parkville, VIC 3010, Australia

Introduction

Experts, science, evidence, knowledge and policy-making have long been linked (e.g., Weber 1946; Weiss 1982). In the past two decades, 'what works' in policy has been the focus of prescribed public policy improvement approaches like 'innovation,' 'evidence-based policy' and 'experimental governance' (Considine and Lewis 2007; Head 2008; Osborne and Brown 2011; Sabel and Zeitlin 2012). Such calls for apparent practicality echo policy evaluation approaches of an earlier generation (Pawson and Tilley 1997). In each approach, scientific knowledge and new evidence point the way to effective policy.

However, these contemporary doctrines may oversimplify the policy-making problem when science is at the forefront. Policy analyses from area experts or scholars of public management and related disciplines often seek to develop practical answers by reducing the task to one of scientific methodology and analysis, or by actually recommending 'depoliticization' (e.g., Banks 2009). But scholarship on the science–policy nexus has long cast doubt on prospects for friction-free conversion into policy of scientifically validated information (Bennett and Howlett 1992; Jasanoff 1987; Keller 2009; Radaelli 1995; Weick 2006; Weiss 1983). So contextual frictions affect public policy-making, also when scientific knowledge is important to achieving efficacy. But *which* factors shape policy-making is not always known.

This paper investigates factors shaping policy-making when evidence actually rules. It first reviews factors that can shape 'real' science-led policy-making (SLP). SLP is policy-making actually led by scientists, scientific knowledge and information developed through scientific methods. That is, SLP situations minimize 'frictions' from non-scientific factors, giving prescriptive 'what works' doctrines most-likely conditions for effectuation. The review focuses on two core but alternative ideal-type SLP logics: epistemic deliberation and ideational trajectories. The paper contrasts how these logics answer a theoretical question: When 'the' experts have real autonomy to steer policy, how is policy-making sensitive to new evidence?

The two alternative logics of SLP are then compared for their respective ability to solve an empirical policy puzzle. The same piece of developing evidence, the mortality rate of pandemic influenza, made all the difference in 2009 H1N1 'swine' flu pandemic vaccination policy-making in one small European polity (the Netherlands), while it made no difference in two other, but otherwise similar, polities (Sweden and Denmark). The Dutch 'switched' from mass to targeted vaccination, while the Swedes continued with mass and the Danes continued with targeted vaccination. That is, only one of the three states changed policy when they learned about actual deaths from 2009 H1N1. Moreover, as shown elsewhere, government-appointed epidemiologists and biomedical professionals ('certified experts') steered policy-making in all three cases (Baekkeskov 2016; Baekkeskov and Öberg 2016). Hence, the paper applies the plausible theories of SLP to an empirical question, stated somewhat pointedly: Why were deaths pivotal to Dutch 2009 H1N1 vaccination policy and not to Swedish or Danish?

Showing these apparently different reactions to the same information, and why they existed, elucidates how SLP actually occurs. By uncovering *sources of sensitivity* to new evidence in government expert deliberations, policy-makers and advisors may advance their abilities to apply evidence-based policy-making, experimental governance and other science-informed policy improvement methodologies. In turn, the analysis contributes to the literature on these topics and on public health policy challenges such as vaccination and epidemic (and pandemic) preparedness and response. The paper thus responds to the

repeated calls for empirical studies of policy learning within government (Bennett and Howlett 1992; Dunlop and Radaelli 2013: 601) and focuses particularly on the 'epistemic learning' variety (Dunlop 2014; Dunlop and Radaelli 2015; Baekkeskov and Öberg 2016).

Real science-led policy-making (SLP)

A powerful idea undergirds contemporary policy improvement approaches that apply scientific methods: That the 'best' technical solution to a problem can become policy. Through instruments such as randomized controlled trials and systematic reviews of research, specialized and highly trained professionals can identify effective solutions to real public problems. In turn, such experts can show and tell public policy-makers (politicians, generalist civil servants) and stakeholders what the best 'solution' is to a given public 'problem.' Finally, the formal policy-makers and other powerful actors will turn such advice into policy, in the interest of good governance.

The science-led process outlined above assumes 'friction-less' research utilization in policy-making (Boswell 2009; Weiss 1979). That is, though scientific advice to become policy actually needs translation by civil servants (and perhaps mass media) and authorization by politicians (and perhaps stakeholders), the idealized process of science-led policy-making assumes that such rival forces of policy-making do not exert influence in the sense of interfering with policy contents.

Enter politics as friction

In particular, friction-less use of knowledge assumes that technical analysis is compartmentalized and separated from politics. In much policy-making, separations of technical (or administrative) and political rationalities are unlikely. Compartmentalization has obviously long been debated in political science, public administration and public management studies. From Max Weber and onward, the possibilities for simultaneously achieving technically and politically rational policy have been repeatedly disputed (e.g., Howlett and Ramesh 2003; Weber 1946; Weiss 1983). That is, a long scholarly record demonstrates that polities are unlikely to adopt solutions that are best in technical *and* political senses. In this light, recent policy improvement approaches are just further iterations of normative policy-making doctrines that privilege technical above political rationality (alternative normative scholarship such as that on 'deliberative democracy' argues why political should trump technical rationalities, with references to democratic legitimacy or citizen participation; cf. Baekkeskov and Öberg 2016).

In addition, explanation-seeking political science and related social sciences show that separations of technical and political concerns are hard in public policy-making. Indeed, studies of (rather than for) policy-making find that politics and technical logics are blended. This can be true in, for instance, specific medical and health interventions, where experts or expert-led government agencies may have to enroll stakeholders to have their preferred policies enacted (Baekkeskov 2014; Carpenter 2010; Van Damme et al. 2008). Often, politics is critical to explanations of policy-making; but technical logics can also explain policy contents (Baekkeskov 2016; Dunlop 2014). These patterns mean difficulty in discerning forces that may shape policy when knowledge use in government *is* as 'frictionless' as it is ever likely to become. Fortunately for observers, some polities have made practical enhancements of science's role in policy-making. These include delegation,

or at least deference, to experts in some policy-making instances (i.e., venue shifting and deliberative 'freezing').

Venue shifting to scientific forums

Carol Weiss and her collaborators have emphasized the importance of venue shifting reforms 'ringed with optimistic assumptions about the transformative power' of transferring 'consequential decisions' from one set of actors to another (Weiss 1995). Extending Weiss' perspective, prescriptions like 'evidence-based policy' are effectively calls for venue change, from politicians, bureaucrats and interest groups, to scientific experts. Weiss has studied venue changes between levels of governance (in US educational policy-making). A logical extension is transfers of responsibility along lines of policy area specialization, that is, from non-experts to specialists (Dunlop 2014; Dunlop and Radaelli 2013). Yet the optimistic assumptions are similar: Venue shifting is done to make policy-making rely more on information that will yield better policy.

Following Dunlop and Radaelli (2013, 2015), science-led policy-making (or 'epistemic policy learning') is predicated on asymmetry between scientific experts and other potential policy-makers ('certification'). Hence, government-appointed experts are certified by virtue of their training and professional credentials coupled with their positions as officials (Dunlop 2014; Stallings 1995). In addition, through processes documented by Daniel Carpenter and others, such 'real autonomy' includes ability to 'induce politicians to defer to the wishes of the (expert) agency even when they prefer otherwise' (Carpenter 2001: 4).

A key strength of science is unpacking information into more and less valid types. Scientific experts become crucial actors because they can sort good information from bad, signal from noise, real findings from spurious associations. The promise of more expertise is to improve the quality of information amidst rival forces affecting policy and, hence, to make policy more effective and more defensible. That is, shifting from other venues to expert advisory processes makes policy-making as free of 'frictions' created by politics and other social forces as any policy-making is likely to become through re-organization. However, friction from public discourse then remains (in democracies, at least).

Freezing alternative deliberations

A second set of strategies for moving policy-making toward SLP has been seen in contexts like pandemic flu response and, more generally, autonomous agency construction. While venue shifting creates capacity for real autonomy, securing asymmetries between government-appointed scientific experts and others in policy-making requires work. Hence, high-status (really autonomous) government agencies build up their reputations and, in tandem, coalitions that support them (Baekkeskov 2014; Carpenter 2001; Maor 2011). Moreover, in the public deliberative space, rather than requiring true consensus, asymmetries in favor of certified experts are sometimes maintained by freezing deliberation through unified expert fronts (Baekkeskov and Öberg 2016). To create and maintain SLP, venue shifting interacts with deliberative freezing to create and maintain asymmetries between 'the' experts and rival authorities.

If policy is made in expert venues due to deference from formal policy-makers and practical absence of alternative deliberations, then government-appointed specialists in the relevant science (i.e., the certified experts) steer policy-making. That is, while politicians with generalist civil service support (political parties and departments) and perhaps stakeholders (businesses, associations, or advocacy groups) formally make policy, none are

pivotal actors. Hence, experts' advice *structures* policy (policy is generally congruent with the advice), and specific recommendations *become* policy (government acts to implement experts' recommendations). What then explains policy? In particular, what accounts for policy variations and change?

Sensitivity to new information and changing ideas among scientific expert advisors

Beyond uncertainty and urgency

A key set of explanations for differences between experts' responses is rooted in crisis management and psychological decision-making studies (Gigerenzer and Gaissmaier 2011; Leonard and Howitt 2007; Tversky and Kahneman 1974). While policy-making probably always includes uncertainty because policy-making and research follow different cycles, the severe uncertainties and urgency of crises (Boin et al. 2010; 't Hart et al. 1993) can create specific conditions that force specialists to act on 'instinct' or 'heuristics' (fast decision-making), rather than taking time to collect and analyze data, deliberate and reason (slow decision-making). Hence, actors ranging from physicians to fire fighters make quick decisions that can actually 'solve' the urgent and uncertain 'problem,' but that may vary depending on the heuristics they have inculcated. But what if decisions are not urgent, and if new evidence reduces uncertainty?

'Epistemic' deliberation and reasoning or 'Ideational' path dependency?

In the aforementioned normative policy approaches, policy-making is assumed to occur without the friction of politics and other non-scientific influences. However, even under frictionless conditions (i.e., SLP), there is a relationship between the kind of logic that drives SLP and the *sensitivity* of a policy-making process to new information. Sensitivity to particular new information means that policy develops or changes as a result of that information.

New information has the capacity to overturn or entrench beliefs. Indeed, following Popper (1959; see also next subsection), science is largely about discovering credible information that challenges beliefs. Hence, SLP *will* be sensitive to new information. Such policy *will* change when beliefs are overturned by new information. But this mechanism of scientific updating can imply two ideal-type SLP logics. In one kind of SLP logic, sensitivities are *similar* across polities. This implies that new information will have similar impacts on policy in different polities. In the second SLP logic, sensitivities may be *different* across polities. This implies that new information can have dissimilar impacts on policy in different polities.

Similar sensitivities and policies across polities with SLP can be rooted in drives toward common knowledge or revelation of 'the' truth. Policy-relevant experts can start from the same values and causal understandings (Haas 1992). But given uncertainty, opinions may differ even if 'the' experts all belong to the same epistemic community (Adler and Haas 1992). When asked for advice, the experts are left to sensemake about, estimate and outright guess what is true (Weick 2006). But even experts' guesstimates are prone to error. Hence, expert opinions may differ stochastically. But given time, research and information sharing between expert groups working on the same problem, uncertainty is

replaced by knowledge, or at least, intersubjective agreement. Hence, experts advising governments 'update their beliefs,' that is, they learn (Bennett and Howlett 1992; Dunlop and Radaelli 2013: 600) as new information reduces uncertainty. In addition, their beliefs coalesce as some are proven valid and others invalid.

In such epistemic 'deliberations,' new information enables new agreement among experts because they have *similar sensitivities* to new information. Experts share basic premises and are looking to prove or disprove the same basic alternative ideas about the state of the world. Experts are also quick to realize errors in their opinions and align with an emerging consensus. As uncertainty is replaced by knowledge, one universal understanding emerges.

By implication, the epistemic deliberation logic means that certified experts' advice to their various governments should increasingly agree as information accumulates. Indeed, consensus permits experts to 'instruct' state and society about the best policy rather than to merely opine (Dunlop 2014; Dunlop and Radaelli 2015). Given SLP, polities formerly in error will change policies to align them with the expert consensus. Hence, policies should converge between different polities when new information emerges. In summary, SLP following the epistemic deliberation logic means that:

I. Polities are similarly sensitive to new information about a policy issue. Hence, when new information emerges, science-led policies are updated or stay constant such that they tend to *converge* between polities.

Dissimilar sensitivities and policies across polities with SLP can be rooted in nationally institutionalized ideas. Institutional theories of policy-making emphasize how past decisions lead to persistent differences in policy between polities (Hall and Taylor 1996; Schmidt 2008). Rather than converging on any one approach, national policies follow historically rooted 'trajectories' (Zysman 1994). In institutional logics, policies change by modifying past rather than by importing new approaches wholesale.

Path dependency is well understood as a mechanism that keeps policies in place. In turn, the policy 'trajectories' concept builds on Max Weber's famous notion of the 'switchman' to clarify that path-dependent policy may change by moving along 'tracks' (incrementally or through accretion) or by switching from one track to another (more radical change, yet still path dependent).

In particular, scientific experts advising governments in a policy domain may well share general values and causal frameworks. But they may have different specific beliefs that determine their policy advice. One expert's or expert group's thinking about a policy problem and solution can differ from another's if they start from different paradigms or theories, or even just different single assumptions about specific parameters that are critical to policy (e.g., Baldwin 2005; Vallgårda 2007). In addition, deliberations about specific pieces of policy advice tend to be national or even more local; and each national set of experts needs to offer its own explicit advice.

The experts' beliefs are updated because they are scientists. But any piece of new information can pose a challenge to one assumption and have no implications for another. Hence, even if all policy-relevant experts generate and share compatible data or information with each other, different experts can have *different sensitivities* toward the same stream of information. Within a national policy-making process, the group of experts called upon to give advice may thus be sensitive to new information that similar groups abroad are insensitive to. If policy is made through SLP, then policy itself will accordingly shift in one place and remain in the other.

In addition, scientific experts update their beliefs slowly. As the next subsections will review in detail, commonplace scientific approaches can make hypotheses, theories and frameworks persistent. During uncertainty, the ideas that determine sensitivities to new information are precepts rather than empirically vetted understanding. For policy-making during uncertainty, specific precepts constitute the accepted understanding of the policy problems and solutions among the nationally certified experts. Though these precepts remain beliefs with little factual support from the situation at hand, they *act* as knowledge: They lend contents to policy advice that nationally certified experts develop. As new information arrives, the experts need to decide whether to retain or abandon their precepts. By commonplace scientific convention, hypotheses, theories and even entire frameworks are preserved until information contradicting them is overwhelming. Hence, the policy is likely to stay on its trajectory so long as 'the' experts remain uncertain and despite contradicting evidence.

These considerations mean that new pieces of information can act like Weberian switchmen. When national beliefs are sustained through the encounter with new information, then SLP-based policy keeps 'rolling' along its present ideational trajectory. That is, policy continues to be made based on those beliefs. If new information overturns beliefs, then SLP-based policy changes direction. At this juncture, another set of beliefs is needed. Policy is not made by copying the neighbor. Rather, as before, the national experts are likely to follow their own established ideas. Hence, changed SLP-based policy is likely to 'switch onto' another nationally and historically rooted ideational trajectory. In sum, policy expectations when SLP follows the ideational trajectories logic are:

II. Polities starting from different beliefs will be sensitive to different new information. In addition, polities will be slow to abandon policy based on their established beliefs in the face of information contradicting them. Finally, polities will tend to switch to another national ideational trajectory when beliefs sustaining the original trajectory are overturned. Hence, when new information emerges, science-led policies develop or stay constant such that they tend to *remain different* between polities.

As previously suggested, updating (or 'learning') means that information created with scientific methodologies can sustain or overturn experts' beliefs. But then, how can different beliefs exist and be sustained in light of new information? As previously mentioned, the remainder of this section reviews three mechanisms that can account for the differences between and persistence of ideational trajectories.

Conservative hypothesis invalidation standards

A simple explanation of sustained differences in experts' beliefs is standard hypothesis testing. Following Popper (1959), scientific researchers look for evidence that contradicts their hypotheses. Even if equally vigilant and methodologically rigorous, however, researchers operate with a significant bias: Hypotheses are only rejected if there is high confidence in the signals that contradict them. So long as signals are too uncertain to contradict favored hypotheses, the beliefs from which these hypotheses are deduced stay valid (e.g., H-null cannot be rejected).

By implication, processes of theory validation depend on the sequence of hypotheses tested. If initial hypotheses differ between processes, then the same new information may pose no challenge to the hypothesis in one investigative process and simultaneously invalidate the hypothesis in a different process. That is, the sequence creates different sensitivities to new information in different processes.

Conservatism and sequencing of hypothesis testing can explain why, as previously described, the starting precepts of national expert policy advisors can result in policy differences. In policy-making, formal policy-makers may demand advice before experts have completed entire validation processes. The experts then have to use what they believe at that moment, regardless of what their equally expert colleagues across the border may believe. In some notional long term, all experts may agree. In the meantime, nationally certified experts' different ideational precepts and common hypothesis testing standards can add up to different science-led policies.

Cognitive bias favoring theory over evidence

Scientific experts advising governments may be more likely to ignore the facts than to abandon their theory (Lomas 2000: 144). If no challenge emerges from equally informed peers, then idiosyncratically favored theories can steer policy in different directions in different polities, and in spite of contradicting evidence. Such cognitive bias is only enforced by the standard scientific approach, that is, to preserve hypotheses until the experts judge the invalidating evidence overwhelming.

Such bias may be particularly pertinent when scientific policy advice is actually developed by small groups or very hierarchically oriented experts. Greater resources are required of individuals who persistently challenge the prevailing wisdom of the group or its senior-most experts than from those who acquiesce or keep their objections weak (i.e., groupthink; however, cf. Mintz and Wayne 2016, which argues that small advisory groups can also be divided by cacophonous 'polythink'). In hierarchical settings, the leading experts' favored theory may trump lesser experts' objections. Small group leadership is common in crisis management ('t Hart et al. 1993). Strong hierarchies are common in medical decision-making (e.g., Holm 1995). Hence, cognitive bias in favor of nationally prevailing theory may be particularly plausible in SLP related to public health crisis management (such as pandemic flu response).

Paradigm and superstructure preservation

Building from Kuhn's insights about sluggish scientific paradigm shifts (Kuhn 1962), slow-to-come policy changes have been linked to full theoretical frameworks or 'paradigms' with policy implications (Bennett and Howlett 1992; Janos 1986; Hall 1989). Hence, paradigmatic conservatism offers a third way to explain why experts' specific beliefs may be different, and sustained in the face of mounting contradictory evidence.

The notion that more than theory is at stake in adopting new ideas is an important additional insight from this literature. For instance, as Peter Hall has argued, a particular paradigm can be the foundation for a considerable governance superstructure (Hall 1989; 1993). Whole systems of policies and government organization may have to be changed if the paradigm goes, with all that this implies in terms of resistance to change from vested interests supporting the certified experts.

The utility of the two SLP logics now described turns on how well they can account for actual science-led policy-making. The next section presents the methods used to illustrate this utility.

Methods

Most-similar case selection

To illustrate and further explore the paper's theoretical question, three cases are analyzed comparatively and in-depth. The empirical relevance of the two SLP logics can turn on their respective capacities to explain how the same evidence is used in different jurisdictions facing the same policy issue. As previously discussed, under SLP conditions, pertinent new evidence leads to updating of beliefs and policies. Yet sensitivities (what information is pertinent) may be similar or dissimilar across polities depending on the SLP logic.

Opportunities for analytically applying the alternative logics exist among the many simultaneous policy processes that ran their courses as states across the world formulated and implemented responses to the 2009 H1N1 influenza pandemic (Baekkeskov 2015; 2016). Principal among many countries' responses was vaccination (Mereckiene et al. 2012; World Health Organization 2005). Vaccination is eminently political: It distributes health risks in populations (risks of disease and of side effects); it requires public funding and regulation; it mobilizes social and industrial actors including physicians and nurses, pharmaceutical producers and patient advocates.

Though many polities faced the same biological threat from 2009 H1N1 and used vaccination in response, even very similar polities pursued different vaccination policies. Hence, careful selection among most-similar systems cases of 2009 H1N1 vaccination policy offers quasi-experimental conditions for investigating how policy can be affected by new information (Przeworski and Teune 1970). In particular, Dutch, Danish and Swedish 2009 H1N1 responses show different policy developments (Table 1). During 2009, Dutch policy changed from general mass to targeted vaccination. In contrast, Danish and Swedish policy maintained continuity. Denmark throughout ran a policy of targeted vaccination of the kind that the Netherlands changed to. Sweden continued in the track that the Dutch left, and implemented general mass vaccination.

As mentioned, the case selection offers quasi-experimental conditions for the comparative and within-case analyses. The influenza pandemic in 2009 was a quintessential 'transboundary' crisis (Ansell et al. 2010). The same disease (2009 H1N1 flu) had been detected in many countries within few weeks of coming to international attention through the World Health Organization's (WHO's) alert on April 25, 2009. Within Europe in particular, outbreaks and epidemiological characteristics of 2009 H1N1 were highly similar (Amato-Gauci et al. 2011). Hence, disease characteristics were constant across polities. Simultaneously, countries' responses were interdependent since what one did could affect spread to another, and through trade and travel restrictions. Again, this was particularly pronounced in close-knit regions like those of the European Union (EU).

Despite states' similar circumstances and pressures, policies enacted in response to 2009 H1N1 varied considerably even within the EU (Mereckiene et al. 2012). Swedish, Dutch and Danish vaccination policies varied across two pivotal decisions. First, during June 2009, the three states decided how many they would be able to vaccinate by ordering vaccine quantities from suppliers (Table 1). Sweden ordered 18 million doses of the *Pandemrix* vaccine from pharmaceutical provider GSK on 21 June, sufficient to cover all residents (MSB 2011: 10). The Netherlands ordered 34 million doses on 18 June, split between the *Focetria* vaccine from pharmaceutical provider Novartis and GSK's *Pandemrix* (RIVM 2011: 75). There too, all residents could be vaccinated. Denmark ordered

Table 1 2009 H1N1 vaccination policy developments in Sweden, the Netherlands and Denmark

	June 2009 policy decision: vaccine availability	Fall 2009 policy decision: vaccination offers
Sweden (maximalist continuity)	100 % (18.0 million doses)	100 % (all residents)
The Netherlands (*change*)	100 % (34.0 million doses)	37 % (risk groups only)
Denmark (minimalist continuity)	28 % (3.1 million doses)	20 % (risk groups only)

3.1 million doses of GSK's *Pandemrix* on 25 June, sufficient to cover 28 percent of Danish residents (Folketinget 2009).

Second, policy divergence was repeated when the three countries chose whom to vaccinate (Table 1). Swedish authorities (specifically, county public health officers acting on advice from the national board of health) chose to offer vaccination to all residents, in line with the previous decision to order vaccines for all. Dutch authorities (specifically, the health ministry acting on advice from the national board of health) chose only to offer vaccination to specified risk groups, despite the contracted availability of vaccines for all (RIVM 2011: 115). Danish authorities (specifically, the health ministry acting on advice from the national board of health) chose only to offer vaccination to specified risk groups, in line with the previous decision to order vaccines for some.

These three different policy developments show that universal policy convergence was missing. Yet the Netherlands did change course, from being close to Swedish policy to adopting something more like Danish. This can indicate partial convergence, and some influence of trajectories. Hence, the cases warrant closer comparison and within-case analyses to assess the empirical relevance of the two SLP logics.

As described elsewhere in detail, the three states are otherwise highly similar (Baekkeskov 2016; Baekkeskov and Öberg 2016). The countries share fundamental conditions for flu, ruling out environment, epidemiology or disease characteristics as causes of the described variations in response policy development. The political systems are also highly similar, as are the three states' levels wealth and healthcare availability. As noted, the governments and health authorities are highly interconnected through international organizations and, indeed, through personal networks among the health experts advising governments. They even share similar traditions of seasonal flu vaccination, targeting risk groups rather than offering such vaccinations to the general population. The three states thus lend themselves well to case studies of 2009 H1N1 vaccination policies by boosting the credibility of the internal validity of theory supported by such analyses.

Finally on this set of cases, Baekkeskov, Rubin and Öberg show through detailed analyses that in all three states, 2009 H1N1 vaccination policies were steered by certified experts rather than governed by logics rooted in politicians' or stakeholders' interests (Baekkeskov 2016; Baekkeskov and Rubin 2014; Baekkeskov and Öberg 2016). In summary, pandemic response was delegated to small groups of biomedical professionals and epidemiologists appointed by government and centered on the boards of health in each country advised policy on 2009 H1N1 vaccination. In turn, this advice relied heavily on pandemic flu preparation made nationally between 2004 and 2006. Formal policy-makers passed these experts' advice through into policy without alterations. Finally, the leading national experts dominated each national public discourse on the issue. Hence, the nationally certified experts effectively made the 2009 H1N1 vaccination policies of

Sweden, the Netherlands and Denmark, respectively (in line with the analytical criteria above, the within-case analyses in this paper offer additional substantiation for the friction-less SLP conditions in these cases).

Data and analytical criteria

The empirical analyses seek to answer the empirical question posed in the Introduction: Why were deaths pivotal to Dutch 2009 H1N1 vaccination policy and not to Swedish or Danish?

The case analyses rely on multiple sources, and they use sources of two kinds. One kind is elite interviews. The key experts and formal policy-making participants in processes leading to the 2009 H1N1 vaccination policy choices in each country were identified through policy documents, by media mentions and by referral. They were invited to share their recollections with the study. In all, five such centrally placed individuals in Sweden offered their recollections through oral interviews or written communications with the study. Six such individuals participated in the Netherlands. Seven such individuals participated in Denmark.[1]

Archival records are equally important sources for the case studies. The analyses make use of national statistics as well as policy proposal documents and evaluations related to 2009 H1N1 vaccination policy-making and campaigns in each country. Where internal government documents have been available, these have also been used.[2]

The case analyses assess comparative criteria, based on the expectations in section "Epistemic' deliberation and reasoning or 'Ideational' path dependency?" (I and II). As previously described, similar sensitivities should lead to *international policy convergence* as new information develops. Different sensitivities should lead to *movement along national trajectories* or *switches between national trajectories* as new information develops, and differences in policies then persist. Case comparison reveals which expectation is fulfilled.

Within-case study offers additional evidence on a logic's relevance by showing how well its mechanisms reflect reality (George and Bennett 2005). Hence, the within-case observations should support that nationally certified experts structured and defined policy contents (i.e., policy was made under friction-less SLP conditions). Further, decision process analysis focuses on each case country's *starting assumptions about pandemic flu policy problems and solutions*. It then *traces the impact of new pandemic flu mortality information* on how each country's expert policy advisors understood the 2009 H1N1 problems and solutions. Finally, the paper assesses the congruence between the certified experts' constant or changing understandings and national 2009 H1N1 vaccination policy.

[1] Caveats remain. Among the responsible elected officials, only the former Danish Minister of Health agreed to be interviewed. In addition, Swedish decision participants proved more reluctant to accept interviews than their Danish and Dutch counterparts. This may be associated with acrimonious public debates in Sweden during and after 2011 when more than 120 cases of Narcolepsy in children were traced to the 2009 H1N1 *Pandemrix* vaccinations. Finally, interviews were conducted between October 2013 and December 2014, that is, four to five years after the events in question. Hindsight bias could have entered, and indeed, interviewees did not perfectly recall all dates or sequences of events. Hence, though most identified key individuals have relayed detailed recollections to the study, some important recollections may remain to be recorded.

[2] The study made requests for internal documentation that were only met in some instances. For instance, minutes from internal meetings mostly proved non-existent or were withheld due to confidentiality.

Case comparison: convergence or 'Trajectory Switching'?

The Netherlands, Sweden and Denmark did not converge on one approach to vaccination against 2009 H1N1. Rather, each made its own and in some respects radically different policies. At a high level of abstraction, all three polities *were* similar, in that all of them decided to vaccinate a whole lot of people against 2009 H1N1, and with more or less the same drug. But through the allocative lens, differences were substantial (Table 1). Availability of vaccines and who is offered vaccination shape health consequences: Recipients gain protection from the disease agent and are exposed to risk of adverse effects. Non-recipients have neither. As described, neither convergence nor sustained differences are evident at the surface of these allocations—the Netherlands changed policy, while Sweden and Denmark though dissimilar from one another did not.

The more detailed comparison in this section shows which of the alternative SLP logics' expectations were fulfilled. At the level relayed in Table 1, the Netherlands 'switched' from Swedish to Danish policy on 2009 H1N1 vaccination. This could be indicative of convergence between Dutch and Danish policies. However, Danish and Dutch population shares in risk groups differed substantially (37 % in NL vs. 20 % in DK). Hence, important differences remained between these two countries. Obviously, neither moved closer to the Swedish position.

Looking more closely at Dutch and Danish targeting shows that the countries also differed qualitatively on key groups to whom vaccination would be offered (Table 4: Folketinget 2009; GR 2009; MSB 2011; NRC 2009; RIVM 2011). The Netherlands offered vaccination to two large groups that Denmark did not: children and the elderly. In turn, Denmark targeted a group that the Netherlands did not single out: people critical to business continuity (Table 2).

In turn, Sweden and Denmark mainly implemented vaccination preparations made specifically for pandemic influenza through its national strategy and pre-pandemic contracts with pharmaceutical providers (Table 3: Baekkeskov 2016; RIVM 2006:14; SOS 2006: 20; SST 2006: 40–41). In contrast, the Dutch jettisoned their pandemic plans. This might have led them to look abroad for ideas and then converge on another country's pandemic risk groups. This would be likely if Dutch SLP followed the epistemic deliberation logic.

Instead, the Netherlands switched to its established seasonal flu risk groups (Table 2: Mereckiene et al. 2010; NHG 2008), with some add-ons. Indeed, this switch followed the explicit strategy recommended at the time by the Dutch Health Council (GR 2009: 25–26): 'The experts advise that all groups who are currently eligible for the annual influenza vaccine should be offered vaccination against influenza A/H1N1' because 'the research

Table 2 Seasonal flu risk groups (2008–2009 winter)

Sweden	Netherlands	Denmark
1. Medical risk groups	1. Medical risk groups	1. Medical risk groups
Chronic medical conditions	Chronic medical conditions	Chronic medical conditions
All adults 65+	All adults 60+	All adults 65+
2. Healthcare workers	2. Healthcare workers	2. Healthcare workers

Because H1N1 became a seasonally circulating flu after 2009, seasonal flu risk groups were generally modified to include pregnant women and obese individuals from 2010

Table 3 Planned pandemic flu vaccinations (2006 plans and pre-pandemic contracting)

Sweden	Netherlands	Denmark
All residents	All residents	1. Medical risk groups 2. Healthcare workers 3. People in critical jobs

data currently available do not provide sufficient scientific evidence to support' alternative conceptions. That is, the documentation shows that Dutch public health experts advising government on 2009 H1N1 response did not error correct by moving toward an emerging international consensus. Rather, their thinking *switched* to another, established national idea.

There was also some subsequent development *along* the Dutch 'seasonal' trajectory. On 17 September and 9 November, the GR/RIVM issued additions to the core seasonal vaccination groups: all pregnant women in their second or third trimesters and, most significantly in terms of numbers, all children aged 6 months to 4 years, their households (HH) and close caregivers, and HH and caregivers of all children aged 0 to 6 months (RIVM 2011: 120–121). Similarly, Danish policy developed along its 'pandemic' trajectory to include pregnant women and obese individuals.

The 2009 H1N1 vaccination policy comparison above fulfills the ideational trajectory rather than the epistemic deliberative expectations for SLP. Rather than policy convergence among very similar polities, Sweden and Denmark followed their own and very different approaches. The Netherlands switched from mass to targeted vaccination and from its own pandemic flu plan to a slightly adjusted version of its standard seasonal flu procedure.[3] The comparison thus indicates that the ideational trajectory logic may be able to explain actual SLP. Can the evident path dependencies of Swedish, Dutch and Danish 2009 H1N1 vaccination policies accurately be characterized as ideational trajectories?

Within-case analyses: pandemic problems and solutions meet emerging H1N1 mortality

The comparative expectations for ideational trajectories are fulfilled between the three cases, while those for epistemic deliberation are not. Can the ideational trajectory mechanism account for the Dutch policy switch and the Scandinavian policy continuities? That is, can these three policy development processes be explained by encounters between sensitivity and new evidence?

To preview the subsequent accounts, growing clarity on likely deaths from 2009 H1N1—expressed as the mortality rate among symptomatic individuals—made different impacts in the three polities. In turn, these differences were congruent with differences in precepts about pandemic flu problems and solutions held by each country's leading government-appointed public health experts. That is, the three processes *did have* different sensitivities to the mortality rate. The national experts' ideational precepts made Dutch

[3] The possible importance of different nationally established ideas can lead to further inquiry: Why is one idea established in one place while another is established elsewhere? Answering this is beyond the scope of this paper. Baekkeskov 2016 points to national pandemic planning and other preparations made between 2003 and 2009 as an important locus. But comparative historical accounts remain to be developed.

policy sensitive to the new mortality information and Swedish and Danish policies insensitive.

The section first offers an ordered account based on empirical observations of the three systems' ideational sensitivities to pandemic flu deaths and their respective encounters with the emerging 2009 H1N1 mortality rate. It then summarizes and compares these within-case analyses.

The place of 2009 H1N1 mortality in nationally certified expert deliberations

In all three countries, the leading public health policy advisors learned that 2009 H1N1 was not the deadly plague that some had feared (Keller et al. 2012; Lakoff 2015; MacPhail 2014). Maximalist Sweden's national health agencies analyzed H1N1 mortality but did not connect this to vaccination policy recommendations. As recalled by Sweden's two principal expert policy advisors at the time (Anders Tegnell, Head of the Infectious Diseases Unit at the National Board of Health and Welfare—*Socialstyrelsen*—SOS; and Annika Linde, Sweden's State Epidemiologist, who was placed at the health protection authority—*Smittskyddsinstituttet*), the issue of who should receive vaccination was never raised or debated within the policy-making process after the decision to purchase vaccines had been made in June 2009 (Linde 2014; Tegnell 2014).[4] In Tegnell's words: 'I don't seem to remember ever discussing going anywhere else than to offer anybody who wanted vaccine a dose, a protection by vaccine' (Tegnell 2014). Similarly, Linde recalled no one raising objections to the general mass vaccination policy in private or public (Baekkeskov and Öberg 2016: 16). Indeed, another centrally placed (but anonymized) expert recalled having deliberately withheld objections, even within the confines of expert deliberations (*ibid.*). Rather, once Sweden had decided by June 21, 2009, to make vaccines available for everyone, further analysis focused on the order in which counties would roll out vaccinations to population groups (i.e., priority groups rather than vaccination targets).

Critically, the Swedes had *not* envisioned a deadly disease while preparing for the eventuality of pandemic flu before 2009. Nor had they thought at any time during 2009 that the new H1N1 strain was unusually deadly. Anders Tegnell recalled that: 'we definitely didn't have a sort of Spanish Flu catastrophe scenario in our planning. We had sort of a moderate Asian-like flu [as in the 1957 flu pandemic]' (Tegnell 2014). That is, a flu causing many to fall ill (high morbidity) but relatively few to die (low mortality). In addition, repeatedly and publicly during 2009, Swedish government experts and other authorities stated that H1N1 was *not* highly fatal (Baekkeskov and Öberg 2016).

General mass vaccination in Sweden was a way to 'keep business continuity' (Tegnell 2014) in addition to saving lives. Tegnell added that little was known in late 2009 about who actually *was* most vulnerable to H1N1 (Tegnell 2014). In a written response, Annika Linde stated that Swedish policy had been vindicated during 2010 because fewer Swedes than Danes died from the next winter's H1N1 wave (as described below, Denmark only offered H1N1 vaccination to some groups in 2009) (Linde 2014). Finally, though Sweden's policy-makers reportedly *never* deliberated on restricting recipient groups during 2009 H1N1 policy-making, arguments that sustained and promoted general mass vaccination were publicized continually (Baekkeskov and Öberg 2016).

[4] Linde, Annika, 2014, *former State Epidemiologist for Sweden*. Personal communication 8 December.
Tegnell, Anders, 2014, *former Head of the Infectious Diseases Unit,* Socialstyrelsen (SOS), Sweden. Interview 9 September.

Neighboring Denmark's government experts took critical stock of 2009 H1N1 severity as they developed recommendations about vaccine availability during June 2009. Like their Swedish counterparts, Danish authorities had never assumed that a pandemic flu would be particularly deadly; nor did they at any time believe that 2009 H1N1 would be (Baekkeskov 2016; Nielsen 2014; Smith 2013).[5] Unlike the Swedes, however, the Danes focused on preventing deaths rather than securing business continuity. In the words of Else Smith (Anders Tegnell's Danish counterpart): 'When the pandemic hits it really is not about preventing that people become ill. It is about saving lives' (Smith 2013).

Hence, from early on in the 2009 H1N1 response, Danish experts sought to identify vaccination targets. Nils Strandberg Pedersen, Director of *Statens Seruminstitut* (SSI) and Denmark's longest serving expert policy advisor on pandemic preparedness and vaccination, recalled that the 2009 H1N1 vaccination policy recommendations were:

> based on a risk assessment, where we looked at characteristics we could see that the epidemic had had in countries that had been hit before we were hit… That was New Zealand, for instance. And I think Australia also. And there were data, some data, from the US (Pedersen, 2013).[6]

New information on mortality was in focus. Else Smith, then Head of the Infectious Diseases Unit at the National Board of Health (*Sundhedsstyrelsen*—SST) in 2009 and later Director of SST, recalled that 'already in June [2009]' there were many indications 'of a somewhat milder clinical course [for 2009 H1N1] than you sometimes can see with other [influenzas]' (Smith 2013). Further,

> experiences from not least Australia, which is one of the Western countries that was struck first [by 2009 H1N1] …already [showed] very clearly that the mortality would be very, very, very low. And it then becomes very clear that the H1N1 resembles the one [the flu pandemic] that occurred in the end of the 1950s.

Similarly, in a letter quoted by another study, Pedersen wrote that the Danish decision in June 2009 on vaccine availability was based on assessment of the 'available' Australian and New Zealand data (Baekkeskov 2016: 12). In turn, Denmark's Parliament directly enacted the SST experts' written recommendations when approving the previously described purchase of sufficient vaccines for 28 percent of the population (as previously described; Table 1).

Leading up the fall in 2009, Danish expert deliberations focused on sizing three recipient groups that had been delimited in pandemic plans from 2006 (SST 2006: 40–41) and reaffirmed during the deliberations in June: medically at-risk people, healthcare personnel and individuals whose jobs were critical for 'societal functions' (SST 2011; Troest 2013).[7] When interviewed, Else Smith emphasized that general mass pandemic flu vaccination was never considered seriously in Danish deliberations before or during 2009. From Smith's earliest involvement in pandemic flu planning in 2003, 'at the realistic level, it [general mass vaccination] was never a scenario I saw in my head' (Smith 2013). Indeed, Danish preparations consistently pointed toward the limited pandemic flu vaccination that

[5] Nielsen, Jacob A., 2014, *former Minister of Health for Denmark.* Interview 11 April.
Smith, Else, 2013, *former Head of the Infectious Diseases Unit,* Sundhedsstyrelsen (SST), Denmark. Interview 12 November.

[6] Pedersen, Nils S., 2013, *Director of Statens Seruminstitut* (SSI), Denmark. Interview 20 November.

[7] Troest, Annlize, 2013, *Head of Preparedness,* Sundhedsstyrelsen (SST), Denmark. Interview 18 September.

was actually implemented during 2009 (Baekkeskov 2016). Hence, Sweden and Denmark followed very different policy tracks even as accumulating data on 2009 H1N1 mortality confirmed the two countries' shared expectation that pandemic flu severity would be moderate.

Government experts in the Netherlands also paid particular attention to 2009 H1N1 mortality rates. Unlike Denmark, however, the Netherlands had anticipated a deadly pandemic influenza in the shape of a mutated strain of H5N1 avian influenza or of a new 1918–1920 Spanish Flu (Baekkeskov 2016). This assumption became the working hypothesis about the pandemic flu problem when Dutch experts began to advise their government on 2009 H1N1 response.

As described, the Dutch health ministry decision about vaccine availability was made in June 2009. At that time, the Infectious Diseases Unit (CIb) of the National Institute for Public Health and the Environment (*Rijksinstituut voor Volksgezondheid en Milieu*—RIVM) and the National Health Council (*Gezondheidsraad*—GR) maintained the deadly flu hypothesis (Baekkeskov 2016). As recalled by Roel Coutinho,[8] then Director of the CIb, member of the GR and leading advisor on pandemic response during 2009:

> Up until, let's say, May–June, … the data [on 2009 H1N1] were very limited—not reliable. The stories and articles describing patients in the literature were mostly about severe cases.

Albert Osterhaus,[9] the Netherlands' primary expert on influenza virology, advisor to the Dutch government on pandemic flu planning and response, and member of the GR committee advising the government on 2009 H1N1 vaccination, offered a consistent but more elaborate account of the decisions:

> At that time [of the vaccine availability decision on 18 June 2009] there was very limited information. We informed other countries through the WHO system, which was also limited. So the only thing we knew… of course, what was published by the WHO, but also from our colleagues in the US, where the pandemic started earlier. And in that short period of time there was no change in the picture other than it was less severe than we initially thought from the Mexicans, which were not there.
>
> […] with the flu you have to be careful all the time. Because the worst case scenario is, it starts mild and it blows up in your face because you get mutations that make the virus more severe.
>
> […] Young people were dying actually, here in our hospital. […] we could have prevented those [deaths] if we could have vaccinated them in time.

Osterhaus also recalled how he and his colleagues weighed the mortality risk against the vaccination availability choice at the time:

> If you know that there is a chance that you get a 1918 [Spanish Flu], what difference does it make if you have to spend, what was it, EUR 35 million or 25 million. That's not a difference if you have, let's say, 10,000 more people dying.

[8] Coutinho, Roel, 2014, *former Head of the Infectious Diseases Unit* (CIb), National Institute for Public Health and the Environment (RIVM), the Netherlands. Interview 2 April.

[9] Osterhaus, Albert, 2014, *Professor and Head,* National Influenza Center, the Netherlands. Interview 6 May..

The fear of a deadly pandemic flu was eventually rendered unlikely by the accumulating data. Dutch conclusions about vaccination policy then changed. The Netherlands' official post-pandemic review explained the shift in brief (RIVM 2011: 115):

> On August 17, 2009, the CIb and the Health Council presented the vaccination advice document 'Vaccination against 2009 H1N1 pandemic influenza: target groups and prioritization' to the Minister of VWS [ed: health minister]. […] Vaccination of the entire population in the Netherlands was not recommended because the risk of complications from infection with the 2009 H1N1 pandemic virus seemed to be slender and information on vaccine side effects was not yet widely available. The Ministry of VWS [ed: health ministry] took this advice completely on board.

Coutinho recalled the process in greater detail (emphases added):

> Only, I think, in the summer did it become clear that it [2009 H1N1] was much milder [than feared]. Then for ourselves [at CIb], the discussion was, should we give out more *Tamiflu* [i.e., anti-viral drugs—not vaccines]? Then we had a clinical group of people coming together, saying, 'no, that's not necessary; it's a mild disease in most cases so you only treat severe cases'… [this] must have been in July or August… Then, all of us said, 'well, apparently it [2009 H1N1] is much milder than we thought—so there is no reason to *vaccinate* everyone.'

That is, the CIb's analysis of national *anti-viral* needs led directly to specific expert recommendations on *vaccination*. As previously described, these were issued on 17 August by the GR and RIVM (GR 2009; RIVM 2011: 115–121). The GR/RIVM subsequently updated their recommendations, on 17 September and 9 November. As described, these additions extended coverage to all pregnant women and to children (Table 4). All were approved as policy by the Ministry of Health without alterations (Coutinho 2014; van Dalen 2014; RIVM 2011).[10]

Osterhaus, whose main role was as an advisor to the government by way of the GR, corroborated that the Dutch policy shift was rooted in mortality risk. Analysis 'was all based on data we [the GR and RIVM] got because of risk of dying.' The following exchange with the interviewer shows Osterhaus' recollection of the shift in more detail:

> Interviewer (I): There must have been a point where you say, 'we don't need to vaccinate everybody; we need vaccinate only a smaller portion…?'
>
> Osterhaus (O): Yes… That came on the basis of the profiles we got from the US and then from the Southern Hemisphere.
>
> I: Australia? New Zealand? […]
>
> O: [It] was really on the base of the epidemiological data we got from the field. As I said, it was Southern Hemisphere, it was also Spain, it was England… So that was involving… and I remember it was…it was the same risk groups as for normal vaccination, if I remember well, for seasonal flu vaccination.

The sources thus point in the same direction. CIb's mortality data analysis in early August 2009 of the H1N1 mortality information that had then accumulated was pivotal to Dutch policy. The analysis *rejected* the key Dutch assumption about pandemic flu severity. It left untouched the long-standing Dutch focus on preventing pandemic flu deaths (i.e.,

[10] van Dalen, Paul, 2014, *National 2009 H1N1 Pandemic Response Coordinator,* Ministry for Health, Welfare and Sports, the Netherlands. Interview 24 February.

Table 4 Groups offered 2009 H1N1 vaccination in Sweden, the Netherlands and Denmark (from October/November 2009)

	Sweden	*Netherlands*	*Denmark*
Targeted coverage	All residents	1. Medical risk groups • Chronic medical conditions • Pregnant women • HH of highly at-risk people • All adults aged 60+ • All young children aged 6 months–4 years • HH with children u. 6 months 2. Healthcare workers	1. Medical risk groups • Chronic medical conditions • Pregnant women • HH of highly at-risk people • Obese individuals 2. Healthcare workers 3. People in critical jobs
# People	9.0 million[a]	GR 17 August: 5.0 million[b] GR 17 September: +0.1 million[c] GR 9 November: +1.1 million[d] Total: 6.2 million	1.1 million[e]
Population share	Approximately 100 %	Approximately 37 %	Approximately 20 %

[a] MSB (2011: 10)

[b] GR (2009: 26)

[c] Estimated based on the Netherlands' Central Bureau for Statistics standard demographic data (http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLEN&PA=37943eng&LA=EN). Assumes 15,000 births per month × 6 months

[d] NRC (2009)

[e] Folketinget (2009)

protecting vulnerable groups; GR 2000). This removed the foundation from the original general mass vaccination policy and led to the previously described switch to an enhanced version of the Netherlands' seasonal flu vaccination scheme.

Established 'problem and solution' driving sensitivities and national policy

The three case accounts begin to show why Swedish policy-makers' support of mass vaccination proved insensitive to 2009 H1N1 mortality data, while their Dutch counterparts' support turned on this issue. The cases also suggest how Danish experts could establish in mid-June 2009 that limited vaccination would be sufficient, while Dutch experts could not do so before mid-August.

The contrasts between the Netherlands, and Sweden and Denmark, respectively, were rooted in how the three national public health systems had defined the pandemic flu problem and had envisioned vaccination as a solution. Problems and solutions in the 2009 H1N1 pandemic were legacies of pandemic preparations made prior to 2009 (Baekkeskov 2016). Hence, each country began with its own set of pandemic influenza 'problems' and 'solutions.' In turn, these sets made the countries' policies sensitive to only some and not the same new information.

Recalling the accounts above, the Swedish 'problem' was a pandemic that would make many people sick and, hence, disrupt economic and social mechanisms; that is, pandemic flu was *not* assumed to be a deadly plague (Baekkeskov and Öberg 2016; MSB 2011; SOS 2006; Tegnell 2014). In turn, the Swedish vaccination 'solution' was to cover everyone

Table 5 National ideas about pandemic flu 'problems' and 'solutions' and consequent 2009 H1N1 vaccination policies

Polity (period)	Problem	+Solution	→Policy
Sweden (in pandemic prep and all 2009)	High risk of morbidity and business disruptions	Prevent illness	Mass vaccination
Denmark (in pandemic prep and all 2009)	Limited risk of severe complications and deaths	Prevent deaths	Pandemic risk group vaccination
Netherlands (in pandemic prep and June 2009)	High risk of severe complications and deaths	Prevent deaths	Mass vaccination
Netherlands (from mid-August 2009)	Limited risk of severe complications and deaths	Prevent deaths	Modified seasonal risk group vaccination

who would otherwise be missing from society and the economy. Since very large proportions of the population could fall ill and be absent from obligations and jobs for extended periods, vaccination in Sweden aimed to cover as many citizens as possible. In contrast, the Dutch 'problem' was defined as a killer pandemic (Baekkeskov 2016; RIVM 2006; 2011) and the vaccination 'solution' was to protect the lives of particularly vulnerable groups (GR 2000). Since everyone is vulnerable in a killer pandemic, vaccination in the Netherlands needed to cover everyone. Finally, the Danish 'problem' was a mild pandemic in terms of mortality, balanced against possible adverse effects of vaccination and probable scarcity (Baekkeskov 2016; Smith 2013; SST 2006; 2011). The Danish vaccination 'solution' was similar to the Dutch, that is, to protect particularly vulnerable groups. But since the disease was assumed to be mild, and since vaccines could have adverse effects (and were unlikely to arrive in time to vaccinate everyone in any case), vaccination in Denmark only needed to cover a population fraction.

These variations in pre-established ideas about problems and solutions meant that the 2009 H1N1 mortality rate had different implications in the three polities (Table 5). The actual mildness of 2009 H1N1 *only* negated the Dutch hypothesized 'problem,' that pandemic flu would be highly deadly. Swedish and Danish experts had shared the hypothesis that a pandemic influenza would *not* be unusually deadly; so as uncertainty about the severity of 2009 H1N1 decreased, the Scandinavians saw no signals that they had assumed the wrong problems.

Counterfactually, Danish policy might have proven sensitive to new information about disease mortality if H1N1 had proven deadly. Much as mild disease negated the Dutch 'problem,' deadly flu would have negated the Danish 'problem,' and the Danish 'solution,' protecting the vulnerable, would then have meant protecting many more people than anticipated (matching the Dutch approach). As it was, the Danes had no trouble making a choice about limited vaccination in June because the accumulating data on H1N1, though preliminary, was consistent with the hypothetical problem that had undergirded Danish planning.

In turn, Swedish policy would probably not have changed had H1N1 proved deadly. General mass vaccination would have mitigated an unusually deadly flu. In addition, much as the Swedes had assumed a pandemic would, H1N1 *did* make many people sick when it finally reached epidemic proportions during the fall and winter of 2009–2010 (Amato-Gauci et al. 2011).

Discussion

The previous two sections illustrate the empirical relevance of ideational trajectories as the logic of real science-led policy-making. In all three polities, policy-making depended on preparations made before 2009 H1N1 was known (Baekkeskov 2016). In particular, how each polity deployed vaccination against 2009 H1N1 depended on how its pandemic planners had hypothesized the pandemic flu 'problem' and how they had envisioned vaccination as a 'solution.' In addition, standard (i.e., conservative) methods for rejecting such hypotheses made policy change slow or nonexistent. In the Dutch case, experts took 3.5 months to 'learn' that they had been wrong to assume that pandemic flu was deadly. In Denmark and Sweden, accumulating evidence about 2009 H1N1 severity was *never* taken as a challenge to anticipated problems or solutions (even though the two otherwise very similar countries had entirely different 'solutions,' cf. Baekkeskov and Öberg 2016).

Why was Dutch policy sensitive to new information on the 2009 H1N1 mortality rate? The established Dutch ideas were that pandemic flu was deadly disease (the problem) and that vaccination should only be offered to highly vulnerable groups (the solution). Response to 2009 H1N1 proceeded from these precepts while the severity remained uncertain. Hence, Dutch policy was sensitive to actual mortality because the share of the Dutch population that would need vaccination depended on this rate. Once the 'worst case' became indefensible, that is, once the hypothesis could be confidently rejected, the Netherlands could adopt new policy.

As shown, however, new policy did not mean newly invented. Rather, in rejecting the pandemic flu preparations, the Dutch switched to their customary, annual *seasonal* flu risk groups (with the small addition of pregnant women, admittedly; notably, pregnant women are now permanently among the seasonal flu risk groups in all three countries). That is, the Netherlands switched between ideational trajectories rather than actually converging with Denmark (or splitting from Sweden).

These factors, the prepared problems and solutions, were exactly different in Sweden and Denmark. The Swedes had not based preparations on mortality but had, rather, focused on the high likely *morbidity* of pandemic influenza with consequent absenteeism and threats to social services and obligations. In addition, the Swedish preparations, like the Danish, had assumed that pandemic flu would *not* be particularly deadly. Based on these assumptions, Swedish preparations included general mass vaccination as societal rather than vulnerable group protection. Hence, though Swedish experts advising government were just as aware of the true mortality of 2009 H1N1 as their Dutch counterparts, Swedish vaccination targeting was insensitive to such emerging realization because mass vaccination in that polity was about business continuity.

The Danes were much like the Dutch, with the exception of how they had anticipated pandemic flu mortality. Hence, the Danes also paid close attention to the mortality of 2009 H1N1. But where the Dutch saw accumulating evidence against high severity, the Danes only saw evidence supporting moderate severity. Hence, as was true for Swedish counterparts, the increasing certainty about actual 2009 H1N1 posed no challenge to Danish preparations made in earlier years when the vaccine availability decision was needed in June 2009, nor later on when actual vaccinations had to be decided.

Conclusions

When 'the' experts have real autonomy to steer policy, how is policy-making sensitive to new evidence? The paper has answered this theoretical question by elucidating two ideal-type logics of real science-led policy-making (SLP): 'epistemic deliberation' and 'ideational trajectories.'

The epistemic deliberation logic builds on the notion that new information translates directly into new policy (Banks 2009; Dunlop 2014; Dunlop and Radaelli 2015; Haas 1992). Hence, under SLP conditions, different jurisdictions may pursue separate policies because of uncertainty (enabling intersubjective disagreements among experts) about the 'true' state of the world. New information reduces uncertainty, which in turn brings experts closer to agreement. Sufficient information creates consensus. In consequence, when observing different polities where certified scientific experts actually steer policy, the same information should mean the same thing for the ideas of those experts. That is, experts advising governments have *similar sensitivities* to new evidence in different polities. This means that polities should have policies that converge as evidence develops. However, the extant cases illustrate that this expectation need not be fulfilled in practice.

The alternative ideational trajectory logic builds on the 'institutional' notion that policy is path dependent and that new information creates movement along or switches between trajectories (Baekkeskov 2016; Baldwin 2005; Bennett and Howlett 1992; Hall 1989; Janos 1986; Kuhn 1962; Vallgårda 2007). Hence, different jurisdictions may operate from different beliefs despite internationally shared values, general frameworks and awareness of information.

New information then has different implications in jurisdictions operating from different precepts about the same policy situation, leading some to 'learn' while others find it irrelevant. Given ideational trajectories, policy differences between polities are not just products of uncertainty and random guesses when there is SLP. Policy differences can arise because different established beliefs among scientific experts lead them to have *different sensitivities* to new information. In addition, ideas that are nationally established *act* as knowledge so long as contradictory new information is *not* overwhelming. As the cases demonstrate, even information about actual human deaths from pandemic disease can be unimportant in some but not all polities.

Why were deaths pivotal to Dutch 2009 H1N1 vaccination policy and not to Swedish or Danish? The answer to this empirical conundrum is that ideational trajectories rather than epistemic deliberation governed SLP in the three cases. 2009 H1N1 vaccination policies adhered to or shifted between national trajectories in light of disease mortality information, rather than converging internationally. In addition, the three within-case analyses offered consistent and repeated evidence that policy sensitivities can be explained by established ideas and scientific methods interacting, in the shape of initial national beliefs about pandemic flu problems and solutions interacting with the standard conservatism of scientific inquiry to push national policies along or switch them between particular grooves. Hence, the ideational trajectories logic can render SLP comprehensible in some situations where epistemic deliberation cannot.

The case analyses focused on empirical conditions under which SLP is most likely (i.e., most-likely without frictions created by politicians or stakeholders or their institutions or ideas). Such focus sets the paper apart from many evidence-based policy studies and related (sub)disciplines, which often develop explanatory or interpretive frameworks that theorize science-based policy broadly rather than in most-likely contexts (e.g., Head 2008;

Jasanoff 1987; Sabel and Zeitlin 2008). But broad theorizing may be insufficiently fine-grained to discern logics that operate when various 'usual suspects' of politics (politicians, powerful stakeholders, etc.) exert influence from logics of actual SLP.

In addition, the case findings were made in a policy domain where we could expect the epistemic logic to be strong. Yet rather than being observed in highly insulated policy communities, the described experiences have been observed in processes using highly experimental, data-driven and globally interconnected sciences (biomedicine and epidemiology). By implication, real science-led policy-making may well *tend* to follow the ideational trajectories 'institutional' logic summarized here. Hence, new information may lead to policy changes (i.e., learning). But because different jurisdictions can start from different science-based assumptions about the same issue, new information does not have to mean policy convergence, even if 'the' experts get to decide everywhere.

The cases further suggest that science-led policy path dependency is not confined to crisis conditions of urgency and uncertainty. While 2009 H1N1 vaccine purchases in June were made under considerable uncertainty about the actual severity of the pandemic flu, the decisions starting in August about who to target were made based on great certainty about the severity. In addition, given several months of preparations, on top of years of planning, the choices of recipient groups in 2009 can hardly be said to have been made urgently. In addition, uncertainty and urgency are extreme in crises, particularly in early stages. Yet some degree of these conditions is common in all policy-making. Hence, rather than radical new or inventive policies from evidence-based policy-making, expect inter-jurisdictionally differentiated and conservative policy-making along the aforementioned trajectories. New information can create shifts in policy. But again, information may simply act as Max Weber's famed switchmen, changing policy from one nationally established trajectory to another rather than to anything newly invented.

The political character of vaccination policy (as described previously, vaccination distributes health risks in populations, in addition to costing public funds and efforts) means that the cases analyzed here may lead thought toward the recent literature on policy over-and underreaction (Jones et al. 2014; Maor 2014a; 2014b). Swedish and Danish vaccination policy continuity during 2009 in the face of new H1N1 evidence could be policy 'underreaction' if, for instance, 'policymakers accurately estimate increased risk but are predominantly influenced by internal sources of policy persistence' (Maor 2014b: 433). However, the 2009 H1N1 cases of SLP have shown that different risk understandings *can* translate into congruent policy continuity or change, rather than being muted or amplified by organizational or political forces. But it is fair to look back at the 2009 H1N1 responses to ask, for instance, whether countries like Sweden 'overreacted' by vaccinating 60 percent of its population against a disease that proved quite mild (e.g., as described previously, more than 100 children in Sweden alone have since developed Narcolepsy due to the vaccination). Or whether countries like neighboring Denmark 'underreacted' by vaccinating six percent of its people against a novel disease that, while killing few, infected many in 2009 and subsequent flu seasons. The balance may be unresolvable. In the words of the Dutch flu specialist Albert Osterhaus, pandemic flu vaccination is 'a Catch-22. What you do is always wrong. If you order too little [vaccine] they will crucify you afterward. If you order too much you will also be crucified.'

A final perspective worth highlighting is the prospect for international dispute pre-emption or resolution by way of SLP. Given experiences such as those in the 2009 H1N1 pandemic, handing issues over to scientists does not mean that conflicts between jurisdictions will disappear. Yet other hopes for 'depoliticization' from shifts toward evidence-based policy-making look better served. Though likely to be path dependent, scientific

policy advice need not be bound by institutions rooted in non-technical partisan interests. Venue shifting offers the promise of scientific leadership, and hence, technically defensible ('output legitimate') policy, even if that policy differs from what equally scientific neighbors are doing about the same situation. That is, some intra- and inter-state conflicts can be displaced from venues peopled by politicians, generalist bureaucrats and stakeholders to those peopled by government-appointed scientists. Hence, such conflicts may be contained in scientific debates rather than evoking more costly disputes.

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