

How to Investigate the Temporalities of Health

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Abstract: This paper examines the way in which different temporalities interact in the production of health risks and the "risk identities" that they entail. My point of departure is contemporary health research, practice and policy and its focus on categories based on the calculation of a probability of developing a given condition—risk conditions—rather than on the clinical detection of existing signs of such conditions. The emergence of this new form of medicine means that "illness [...] comes to inhabit a temporal space" (ARMSTRONG, 1995), in which potential events in the future are identified, managed and experienced in the present. The paper explores the complex processes that structure this "temporal space" through an analysis of two case studies: the technical controversies around hypertension and prodromal or preclinical dementia. It does so by analysing the dynamics of these controversies and suggesting that they are underpinned by a diversity of contrasting, yet interrelated calculations of the temporal.

I start by considering how, in the health care domain, the emergence of what has been called the neoliberal form of governmentality (LEMKE, 2001) is predicated upon calculative practices that are themselves sustained by an intensification of epidemiological surveillance, screening and routine measurement of health indicators. In this section, I argue that the comparison between the two cases included in the paper is essential to understand how two categories which seem to belong to the same late modern, neoliberal form of organising embodiment and political subjectivity differently deploy the temporalities that govern "risk identities". In the main sections, I describe three different ways in which hypertension and prodromal dementia are understood: as a population problem, as an economic problem, and as a problem of professional labour. In the conclusion, I examine how the different temporalities deployed by these knowledge practices are mutually dependent, and draft some possible implications of this conclusion for further research on health risk and identity.

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1. Health, Risk and Society

In contemporary western societies, social processes are increasingly mediated by distributed networks of technical expertise (BECK, GIDDENS & LASH, 1994). Recent research has suggested that in the field of medicine, this has been reflected in an increasing dependence on technoscientific innovation (CLARKE, MAMO, FISHMAN, SHIM & FOSKET, 2003) and on a shift from the problem of "disease" to the problem of "health". While the emergence of "health" implies significant investments in the understanding of the biomolecular, individual and social dynamics that lead to pathological states, the focus of practice and policy is transferred to preventative therapeutic strategies, health maintenance, health promotion programmes and chronic illness management. This also entails enhanced epidemiological surveillance and a regulation of policies, access to therapies and programmes through the identification of risk factors or states. [1]

The dominance of risk in health discourse and policy has led some authors to suggest that it is correlated with key transformations in the social and political order of contemporary societies. CONRAD, for example, has argued that the practices and policies that are associated with health correspond to a new form of social control that works in parallel with medicalisation processes. While the latter offers medical interpretations and solutions to problems that were previously deemed to belong to the realm of the social, "healthicisation" turns health into the moral (CONRAD, 1992). The main consequence of this is that behaviour formerly seen as individual choices, such as smoking or drinking, are invested with a moral significance because they demonstrate a lack of care for the self, significant others and, increasingly, the community as a whole. [2]

ARMSTRONG, on the other hand, saw the emergence of health as linked to the consolidation of a new form of medicine that he called "surveillance medicine" (ARMSTRONG, 1995). Health risk management practices address future uncertainties through action based on calculations of the probability of developing disease. Surveillance medicine thus entails a problematisation of the "normal" in that it contains the potential ingredients for the development of the pathological. It is here that ARMSTRONG detects a shift from "clinical medicine" and its emphasis on the spatialisation of disease to a form of knowledge that unfolds a temporal domain for the pathological. This shift also has consequences at the subject level, requiring a reconfiguration of the temporal horizon of experience by dragging future possible events to present everyday life practices. Individuals are expected to draw on this temporal horizon in the organisation of their present conduct, self-surveillance becoming a key mechanism in the production and maintenance of "health". [3]

In the past decade, research on a variety of topics such as public health (FLYNN, 2002; PETERSEN & LUPTON, 1997), genetic medicine (HALLOWELL & LAWTON, 2002; NOVAS & ROSE, 2000; WOOD, PRIOR & GRAY, 2003), or medical informatics has characterised how the emergence of the "risky self" is associated with neoliberal modes of governance. Drawing on FOUCAULT's concept of governmentality (FOUCAULT, 1986) sociological studies of risk in

biomedicine have suggested that the intensification of epidemiological surveillance, screening and routine measurement of health indicators is intimately linked with a shift in the responsibility of care from professionals to collaborations across expertise lines and an emphasis on individual monitoring of lifestyle choices. The prominence given in contemporary health practice and policy on "evidence" and "choice" is underpinned by a particular conceptualisation of individuals as natural calculative subjects. In this, the "risky self" appears to solve a central problem of modern societies, by articulating what FOUCAULT termed anatomopolitics—knowledge about the individual body and the institutions where this body could be studied / disciplined—with biopolitics—the knowledge-power composite addressing the problems of the government of populations. The calculative subject, by linking epidemiological data with assessments of his/her individual case and balancing costs and benefits of particular paths of action, becomes a pillar of contemporary political order that is normatively implemented through the ideals of "wellness" (CONRAD, 1994; GRECO, 1993) and the pursuit of health. [4]

While most sociological research on risk has focussed on how this calculative subject is discursively produced and maintained in various domains of health care, it has until recently largely neglected the infrastructural aspects of these processes. However, governmentality processes are reliant on "technologies of governance" (MAY, RAPLEY, MOREIRA, FINCH & HEAVEN, 2005; ROSE & MILLER, 1992) that structure individuals' fields of action and operationalise governance systems. For this reason, MILLER has recently called our attention to how "calculative practices alter the capacities of agents, organising the connections among them" and how they "enable new ways of acting upon and influencing the actions of individuals" (MILLER, 2001, p.379). In this, I suggest, sociology can be assisted by the increasing interest in the social aspects of scientific practices in general, the history of the institutions of objectivity in public life (PORTER, 1995) and, more specifically, the anthropology of calculation (CALLON, 1998). [5]

In this paper, I focus on the calculative practices that generate such tools and technologies, particularly on how these practices are understood and their meaning is negotiated in public debates about health and health care. Governmentality models tend to emphasise the productive aspects of public discourse in effecting the kind of subjectivity that governance systems require, and assume a more or less direct link between these domains. However, the equivalence of temporality between epidemiological calculations and management of the self that underpins governmentality research ignores key processes of collective mediation and negotiation. The paper focuses thus on the public negotiations, translations and mediations between the poles that are central to governmentality—*anatomopolitics* and *biopolitics*. But it does so by arguing that public controversies, rather than the "risky self", are the key mechanism of reflexivity in the articulation between these two poles (CALLON, LASCOUMES & BARTHE, 2001). [6]

My interest in the diversity of knowledge practices that organise these debates leads me to broaden the focus of my enquiry to include both the practices of arithmetic calculation and the practices of qualifying objects or subjects that either support or refer to them. With this aim, I draw on the concept of "qualculation" formulated by Franck COCHOY (2002) to describe how calculative practices depend on operations of qualification of objects and their manipulation within a bounded space-time frame. The concept of qualculation directs the analysis of knowledge practices towards the mundane procedures that underpin them as well as towards the heterogeneous effects they produce. These are particularly significant in relation to the temporal space in which calculative practices operate because of the way in which these spaces are generated and maintained by the practices that operate within them. [7]

Data analysis suggests that the production of the temporal space of health is organised by five different forms of qualculation. In these, risk is framed as:

- a. a problem of management of populations: knowledge focuses on accurately describing the statistical chances of "survival" within a limited temporal horizon for individuals inserted in cohorts;
- b. a problem of management of scarce resources: knowledge focuses on calculating the generational "survival gain" that is associated with lowering the prevalence of particular conditions;
- c. a problem of professional labour: knowledge is concerned with calculating the "workability" of the risk threshold or category in the clinical encounter;
- d. a label: calculations or estimations of the "effects" of the medical label on individuals' productivity, citizenship, or social integration;
- e. an "experience": qualitative explorations of the "inner world" of persons diagnosed with a risk condition and its consequence for personal identity and sense of self. [8]

In my argument attention to the empirical detail of the cases under analysis is critical. The choice of the two case studies is purposive. Hypertension is a risk condition associated with cardiovascular disease that has been part of health discourses at least since the second half of the 20th century. Prodromal dementia categories such as Mild Cognitive Impairment (MCI) have only surfaced recently, backed by hopes that the early diagnosis of dementia will facilitate the prevention of dementing processes and lower the prevalence of the condition in the general population. While the public debate about hypertension revolves around the threshold of arterial blood pressure above which individuals should be classified as hypertensives, the controversy around MCI focuses on the value and usefulness of the category itself. By describing how in each case the "actors themselves" negotiate risk thresholds and categories with reference to different forms of qualculation, I am able to suggest that the "temporal space of health" is specifically organised according to the dynamics of each singular debate. For reasons of space, however, in this paper, I will only explore the first three of these forms of qualculation. [9]

I draw on a variety of empirical material collected through a diverse set of methods: a) documentary and archival research, b) interviews with experts involved in the debates and c) ethnographic enquiries conducted in clinical and research settings. The heterogeneity of these empirical materials supports comparisons across data sets that aim not only for consistency and validation but most importantly at building a theory that is sensitive to historical contexts. The analysis of the data followed conventional procedures of textual and discourse analysis (TITSCHER, MEYER & VETTER, 2000), although guided by an appreciation of the infrastructural, material elements that deploy qualitative practices as follows from the argument presented above. [10]

2. Survival Qualifications

In the 2004 *National Institute of Clinical Excellence Guideline on Essential Hypertension*, hypertension is defined thus:

"Hypertension occurs when the heart has to use more energy to pump against the greater resistance of the vascular system. If the heart is unable to meet this demand then over time the heart may thicken and stiffen and angina pectoris or myocardial infarction may develop" (National Guideline Research and Development Unit, 2004, p.8). [11]

Because this is a document intended to be read by both expert and lay audiences, the definition that is given is brief and relies on an agreed knowledge base. This is also the reason why it fits the purposes of this paper. In this basic definition, the increased resistance of arterial walls is associated with the progressive wearing out of the heart in trying to respond to this change. Over time, this may lead to a heart attack or other cardiac diseases. In its simplicity, this definition also qualifies the association between these physiological processes by stating that the development of cardiovascular disease constitutes a possibility rather than a necessary effect of the stiffening of arterial walls. Hypertension is not a disease itself, it is rather a probability of developing angina pectoris or having heart attack. [12]

This qualification is directly connected to the description of risk conditions that was suggested in the previous section: the very definition of hypertension is reliant upon expert epidemiological calculations of risk over time rather than just involving clinical or pathological representations. As was also suggested, hypertension is an interesting case to study in this group of conditions because it has become one of the central, epistemically stable risk factors for the type of mortality patterns that emerged in western societies after the Second World War. To be able to understand how and why hypertension came to occupy this position it is useful to focus our attention on one of the key historical moments in the development of this mode of qualification. [13]

In 1948, amidst the confident reformism that characterised US public policy after the end of the war, a coalition of the National Health Institute of the U.S. Public Health Services, the Massachusetts Department of Public Health, the local Health

Department, launched a longitudinal study of "factors influencing the development of vascular disease". The Framingham Heart Study, as it became known, involved 6,000 persons between the ages of 30 and 62 years of age from the same town. Recruited to participate in the study over a 20-year period, the study eventually spanned 30 years, during which medical tests were conducted with the participants. Framingham, Massachusetts was chosen as the site of the study because it was deemed to be a cross-section of Americana, although almost all inhabitants were of European ancestry. Framingham also had a fairly stable population, with only one major hospital being used by almost all in the community, good archival records and practices and previous experience of community involvement with a tuberculosis study. [14]

Methodologically, Framingham is normally seen as a key moment in the history of epidemiology because it firmly established the usefulness of the concept of risk factor (ROTHSTEIN, 2003). One of the important innovations was that Framingham, like other studies on cardiovascular disease conducted around the same time, drew on study designs used by life insurance companies. In these studies, a sample of persons were medically examined and followed for a number of years to determine personal characteristics that were associated with higher rates of disease. Upon this basis, the Framingham investigators were able to develop new techniques of cohort tracking, population selection and sampling that partly account for the success of the study. [15]

Another important element borrowed from insurance companies, according to George MANN, one of the original investigators (ROTHSTEIN, 2003, p.283), was the concept of risk factor itself. For insurance companies, risk factors were important decision making tools because they modelled the link between clients' contribution and likelihood of events. They were most importantly a technique of regulating and reducing to a calculable figure the economic and financial risks taken by the company itself. For these purposes, risk factors were most useful as gradients or continuous variables as these matched with monetary units of measurement. The Framingham investigators, however, chose not to use such gradients and attempted to determine a risk threshold for healthy and non-healthy individuals. [16]

The reasons behind such choices are manifold (TIMMERMAN, 2005), only two of them being important for our purposes. About the same time the Framingham study was launched, on the other side of the Atlantic, a controversy broke about whether blood pressure constituted a continuous variable or a graded one in which hypertension could be distinctly identified as a qualitative difference. This debate, rehearsed in the exchange between Sir Roger PLATT and Sir George PICKERING (SWALES, 1985), was relevant for the investigators in the Framingham Study because the different viewpoints embodied divergent forms of organising public health systems. Whereas a continuous variable would entail progressive, almost individualised forms of intervention, a graded, preferably dichotomous variable would identify a discrete population onto which attention should be focused. In the decision to dichotomise blood pressure as a variable, Framingham adhered to an ideal of "hypertension" as a discrete nosological

entity mainly for political reasons, given that the debate cannot be said to be closed to this day. [17]

In qualifying the decision for dichotomising measurements of blood pressure as political, no critical denouncement is intended. The investigators' own understanding of the study support the view that Framingham was more than just "a scientific study" (ROTHSTEIN, 2003). Their intention to establish the risk factor as a currency in public health and clinical practice is also supported by the exclusion, as compared to the original study design, of any social or cultural factors that could be associated with disease, which reinforced an impression of homogeneity concerning the mostly white population under scrutiny. The persuasive strength of their results relied on the almost "laboratorial" conditions that the choice of site and the methodological techniques delivered. In this process, the Framingham Study established a model for longitudinal studies beyond its own influence in determining how factors such hypertension are linked to cardiac disease. [18]

The influence of the Framingham model and form of calculation is visible in the strategies used to establish MCI as a "risk condition" for dementia in the past decade. In its original definition, MCI was used to characterise individuals that have a clinical presentation of a memory complaint, accompanied by an objective memory impairment (assessed by clinical interviews and psychological as well as brain imaging tests), but nonetheless display no other cognitive impairments, have essentially preserved activities of daily living and are not demented (PETERSEN et al., 1999). This has subsequently been used to describe individuals in the most common subset of the MCI syndromes, amnesic MCI, which is associated with dementia of the Alzheimer's type and which has been the object of most research and debate. [19]

The original characterisation of this syndrome was based upon longitudinally controlled studies of clinical populations (PETERSEN et al., 2001). In these studies, individuals who had presented memory complaints were tested, and then followed yearly through repeated standardised assessment of cognitive functions. This group was compared through the same assessments with a sample of individuals with "no memory complaint" (often the spouses of the individuals in the first group). Through these comparisons, it was possible to differentiate rates of incidence of dementia between the two groups and to claim that MCI constitutes a "risk factor" for dementia. [20]

While the decision to dichotomise between the two populations at baseline is strongly evocative of the Framingham design, MCI proponents were not blessed with the same controlled conditions that underpinned the success of Framingham. In fact, one of the most controversial issues about MCI, within this form of calculation, remains its validity as a concept. This is linked with the difference between the rates of conversion to dementia observed in "clinical" studies compared with those conducted in communities, which are more akin to Framingham. Epidemiological studies of MCI have consistently found an inherent "instability" in the category of MCI, with some individuals diagnosed with MCI at

baseline converting back to "normality" in following assessments (ARTERO, TIERNEY, TOUCHON & RITCHIE, 2003; RITCHIE, ARTERO & TOUCHON, 2001). This has led the proponents of MCI to suggest that these studies might be characterising two different populations: those who present memory problems and those who are identified through community involvement in research (GAUTHIER et al., 2006). [21]

The strategy to focus on this specific population rather than the population in general cannot be explained without reference to the changes in the organisation of medical care and the role of public health since the time of the Framingham study. While at the time of Framingham the identification of modifiable factors that would increase the survival of the entire population was a shared goal between the various constituencies involved in public health—from government agencies, to the medical establishment, to patient groups, to pharmaceutical companies—, changes in relations between these constituencies during the 1970's were complemented by changes in the structure of medical knowledge (CLARKE, SHIM, MAMO, FOSKET & FISHMAN, 2003). In this, pathologies have become increasingly partitioned into sub-types with different genetic, molecular and lifestyle pathways; therapeutic solutions are discursively attached to a basic understanding of disease processes; and therapeutic innovation has been mostly reliant on university-industry collaborations. This innovation is attuned, particularly in the US, to a health care system dominated by managed care organisations and to a high degree of health consumerism. [22]

Thus, in our interviews with dementia experts, the identification of a "risk subgroup" rather than a risk population has been consistently identified as one of the main reasons why the concept of MCI might better satisfy the interests of pharmaceutical companies than those of the wider "public". An extract from an interview with a Patient Association director in the area of dementia concisely identifies this problem:

"[MCI research] seems to be growing enormously into a big area that you know lots of people are devoting a lot of attention to, and my cynical view is that that's just driven by the industry em because the more people that get this diagnosis, you know potentially they'd like everybody to be on their drugs. [...] I would say it's just wanting to widen the basket, that if they were to be able to get approval for these drugs for people with mild cognitive impairment that then opens, probably doubles or trebles the number of drugs they can sell that's how I should have seen it that they want to increase the marketing base" [BARRY_2: 4-5]. [23]

This and other similar views link the emergence of MCI with a strategy to expand the therapeutic use and market share of current anti-dementia drugs—known as cholinesterase inhibitors—while preparing the market for the next, expected generation of drugs, a strategy known as disease modifying (MOREIRA, 2006a). This historical divergence from the conditions that gave Framingham's results and ideas their political and social robustness, underpins the reason why this particular form of calculation has been seen to be increasingly weak in the public arena. [24]

In this process, calculations of "survival" became progressively detached from the practices of the management of populations in a particular territory. For the establishment of a rationale for government, epidemiological calculations were still necessary but not sufficient because they did not guarantee the creation of a "public good". Other modes of calculation would have to be developed to further equip political argumentation in controversies about health, risk and society. [25]

3. Benefit Calculations

One of the key processes behind the changes in the configurations of health care constituencies, described in the last section, was the emergence of rising health care costs as a public problem in the turn of the 1970's, particularly in the United States, but also in Europe (ABEL-SMITH, 1996). This served as a background for various reforms concerning health care funding. Thus, in the 1980's, health care delivery became increasingly buyer-driven—either by insurance companies, trusts or patients themselves—and deployment of health care was progressively shifted away from direct providers and "rationalised" (LIGHT, 2000). As ASHMORE and colleagues have suggested, the combination of this trend with a strong political commitment to the National Health Service (NHS) in Britain created opportunities for social scientists to generate new forms of knowledge (ASHMORE, MULKAY & PINCH, 1989). [26]

In what they called "the health economics' dual programme", economists tried to combine ideals of rationality with the development of pragmatic techniques and tools aimed at calculating the relationship between the costs and benefits of health care. Perhaps the most successful of these tools has been the Quality Adjusted Life Year or QALY. A QALY is a technique for measuring the benefit obtained from medical interventions by giving a different "weight" on time in different health states. In this, a year of life expectancy in perfect health is worth 1, whereas a year of less than perfect health is worth less than 1. It is argued that QALYs provide a form of currency to assess the extent of the benefits gained from health care interventions, not only in terms of survival but more importantly in terms of the "quality" of the time survived. QALYs only fully become useful when combined with the costs of providing the interventions, from which cost-utility ratios result. Comparisons can then be made between interventions, and ideally priorities can be established based on which interventions are relatively cost-effective and those that are relatively expensive. [27]

While before 1997, QALYs were used inconsistently in the NHS, it has been one of the objectives of the Labour government since that year to explicitly base health decisions on figures, and one of the roles of the National Institute of Clinical Excellence is to advise the NHS both on effectiveness of treatments and their cost-effectiveness. In this, the QALY plays a central role. For example, in the *National Institute of Clinical Excellence Guideline on Essential Hypertension* already mentioned in the previous section, recommendations on which treatments to provide on the NHS were based on an economic model "constructed to provide a simplified representation of the long term consequences of hypertension". The authors continue:

"In the model patients begin in the 'healthy state', as each year passes they can remain healthy, suffer a myocardial infarction, stroke or die of other cause. [...] The model allows a cohort of people to grow old and die recording the time spent in each state. [...] The consequences of drug treatment is to change the likelihood of disease and thus change the time spent on each state. If weights are applied, then the model can predict quality adjusted survival, or a QALY score. [...] The model is run with and without blood pressure lowering drugs to estimate the change in cost and life expectancy attributable to drug therapy" (National Guideline Research and Development Unit, 2004, p.236). [28]

The mechanics of what is known as the Markov model are simple. In these models, the aim is to calculate the accumulated effects of transition probabilities between different health stages. If the average costs of different types of interventions (such as thiazide diuretics or beta blockers) are known and transition probabilities between health states with or without these drugs are also available, then it is possible to calculate the respective "survival gain" that will be achieved with varying use of resources over a period of time. In this, the QALY aims at standardising the utility—the gain—derived from a scenario of resource utilisation. The outcome of the model only fully makes sense when used to compare and prioritise between two or more options for intervention, or when a decision is made to set a threshold to determine when the cost-utility of an intervention is deemed socially valuable. [29]

For our purposes, however, it is sufficient to note that the logics of political decision-making in health care and the tools of health economics become intertwined in documents such as the guideline cited above. Their specific political strength is derived from the way in which they deploy a re-articulation of the link between hypertension and the production of a "public good", which has been partially lost in the epidemiological mode of calculation. Thus, in order to construct hypertension as a health risk worthy of attention by health policy makers, clinicians and patients, guideline developers could not just point to its association with mortality and cardiovascular events but were required to estimate the cost and change in quality of life associated with lowering hypertension in the general population. [30]

As suggested in the previous section, MCI, as a category, has been the object of critiques because it appears to be linked to the marketing of old and new drugs for dementia. Some of our interviewees saw MCI as directly linked with the need to identify those at risk of dementia in order to enrol them in clinical trials of preventive therapies and to create a future market for those therapies once test results guarantee their approval and market release. Other researchers, perhaps more cynically, saw the emergence of MCI as directly associated with the quest for alternative therapeutic uses of cholinesterase inhibitors once their effect in Alzheimer's disease itself was recognised to be minimal and, in any case, not reversing the disease. Such connections between MCI and the pharmaceutical market are not only the object of denunciations, but have also been effecting formalised practices of calculation such as those described above. However, the effects of using these calculations on MCI are paradoxical. [31]

With the market release of cholinesterase inhibitors drugs in the 1990's, economic evaluation studies of their utility in dementia were put into motion. The results of these studies, the first of which came out in 1999, were positive at first, portraying these drugs as cost-effective. Over the years, however, other studies have shifted the accepted view towards one where these drugs are regarded as cost neutral at best, or, if we accept the results of the only long term clinical trial of Donepezil to evaluate cost effectiveness in Alzheimer's disease—the AD 2000 trial (SCHNEIDER, 2004),—not cost effective at all (LOVEMAN et al., 2005). This evolution is reflected in the advice by the National Institute for Clinical Excellence in relation to this type of drugs. [32]

After authorising the prescription of cholinesterase inhibitors for patients with clinical dementia in 2001, NICE, in its draft revision of the guidance in 2005 (NATIONAL INSTITUTE OF HEALTH AND CLINICAL EXCELLENCE, 2005), has suggested that anti-dementia drugs are not cost effective enough to be available on the NHS. Cholinesterase inhibitors are presently the only therapy available for patients with clinical dementia and the draft guidance provoked a strong media and public reaction with professional and patient/care organisations campaigning against NICE's revised recommendation. More than 100 Members of Parliament supported the campaign, which led to the Secretary of State for Health requesting NICE to reassess its cost-utility analysis. After consultation with "stakeholders" and an appraisal of new evidence supplied by manufacturers, NICE's Appraisal Committee has, in January 2006, recommended cholinesterase inhibitors "as options in the management of people with Alzheimer's disease of moderate severity only" (NATIONAL INSTITUTE OF HEALTH AND CLINICAL EXCELLENCE, 2006, p.2). [33]

This important advisory body's position stands against the backdrop in which the results of the first clinical trial designed to gauge the efficacy and effectiveness of cholinesterase inhibitors against MCI have been emerging. The most publicised and discussed of these was the clinical trial of Donepezil and Vitamin E on MCI led by Ronald PETERSEN and sponsored by the National Institute of Aging and Pfizer/Esai (PETERSEN et al., 2006). Most commentaries on the test results, in the scientific and general press as well as in our sample of experts, emphasised the study's success in designing and conducting a valid MCI trial rather than its negative results on primary outcomes—conversion to dementia—and the relatively small cognitive improvements experienced by those treated with Donepezil in the trial. [34]

This optimism contrasts thus with NICE's view on the economic utility of these drugs and has become the source of uncertainty for experts trying to deploy an evaluative framework in therapies for dementia. One example from our interviews fully illustrates this point:

"[T]here is a real worry about whether its ... you know, how much you're going to be have to be able to do to prove a drug or a technique in this field that it will actually be taken up in the NHS, and the whole point of research is that it should be translational, that's what every charity wants. We want it to change people's lives. And this [NICE's

appraisal] is a real setback for that, and I think it's a real worry that that is how dementia is being regarded, that its not strongly the case that dementia patients can have a enough quality of life to make £2.50 a day worthwhile. I think that's a very disappointing finding, and disappointing not just from the patients but also from clinicians and researchers" [BARRY_29: 23]. [35]

In here, a mode of calculation that focused on "changing people's lives" and enhancing their probabilities for survival is juxtaposed with another in which a price—£ 2.50—is put on a day of people's lives. According to this Research Charity director, the main effect of this mode of calculation is the aggregation of researchers, clinicians and patients against health economists, health policy makers and, presumably, the politicians that support their findings. The disappointment that derives from this confrontation relates to the inability to calculate which research developments will make the threshold of cost-effectiveness. The effects of applying the mode of economic calculation to the calculation of health risks might be, this interviewee seems to be suggesting, that less energy is put into exploring the uncertainties that still proliferate in the understanding of dementia. [36]

It is, paradoxically, these very uncertainties that have underpinned the use of cholinesterase inhibitors in MCI. Because MCI is still not well understood as a prodrome to dementia, and because the knowledge base for the effectiveness of drugs in this risk condition is only beginning to take shape, the deployment of the economic mode of calculation for interventions in MCI generates "ignorance": "Even if it is logical to consider a postponement of the shift from MCI to dementia as cost-effective, this statement must be proven, particularly in light of the insufficient knowledge about the effects of antidementia drugs on survival" (WIMO & WINBLAD, 2003, p.98). [37]

This "ignorance", backed by the assumption that any postponement of the onset of dementia will have important economic effects because it reduces the level of dependence and the use of social and health services, has allowed for cholinesterase inhibitors to be used "off label" for MCI in some specialised clinics on both sides of the Atlantic. It is interesting to note that the usefulness of the concept of MCI in the clinic is, for the clinical constituency, directly linked with the possibility of being able to offer therapeutic solutions to this problem. Thus the establishment of the category MCI relied upon the zone of ignorance that clinical researchers were able to discursively create around the effectiveness of MCI. [38]

In the case of MCI, the attempts to frame its economic utility have failed to align the various groups of actors involved around a consensual view of the "public good". A demarcation has emerged between clinicians, researchers, and patients' associations, on one side, and health economists, health policy makers, and advocates of a more holistic view of dementia on the other. These conflicts derive, according to the first group, from a lack of understanding of the significance of a small therapeutic change in such a devastating disease, while for the latter they derive from the unwillingness to accept equivalence of suffering between dementia and other diseases. The political weakness of economic

qualculations is linked, in this case, to the space of "ignorance," and thus for interpretative manoeuvre, which, paradoxically, was generated by the attempts to create precisely this knowledge base. [39]

4. Qualculations of Labour

The confrontation between the world of economic research and the world of the clinic also became visible in the controversy around the thresholds for hypertension. As I have suggested in the previous two sections, determination of these thresholds is embedded in qualculations of the political effects of "survival" and "survival gain". However, while these two forms of qualculation deploy these effects in relation to standards of decisions concerning the entire collective and the allocation of its shared resources, for the most part they ignore the ways in which these decisions can be implemented by clinicians in their routine practice. This "blind spot" is eloquently identified in this quote from a Scottish general practitioner reacting to the publication of a clinical guideline on hypertension:

"The statement [in the guideline] suggests that that any patient with systolic blood pressure greater than 130 mm/Hg should be kept under annual review. A search on our practice database of 6200 patients revealed that 1700 fell into this category. A check of similar practices suggests that this figure is representative in our area. [...]

Some simple mathematics suggests that as a practice we need to review 34 patients per week. Can I ask the authors what consideration was given to the practical implications of their guidelines?" (GREEN, 2004, p.569) [40]

The contrast between the ideals of guidelines and "life in the real world", as GREEN entitles his letter, reveals that the calculations that have interested guideline developers cannot possibly be implemented in clinical practice. His use of "simple mathematics" to demonstrate this point is particularly significant because it makes reference to the faith decision makers put in numbers (PORTER, 1995) by providing a calculation of the amount of work that would be entailed in following the guideline. In the real world, a threshold such as the one proposed by the guideline, means that patients which otherwise would not be coming to the practice should be reviewed and monitored on a regular basis. This means a considerable increase in work load. [41]

While the interference between these two modes of qualculation is demonstrated here by a mathematical calculation of work load, it points further to how clinical practice, and more specifically primary care, is discursively presented as a particular type of labour. It is well known that, at least in the UK, primary care consultations have increasingly become the object of analyses that configured time as an external constraint organising practice (ARMSTRONG, 1985), so much so that practices nowadays aim at fitting each patient within a 10 minute slot. This process was couched within a rhetoric of "efficiency" that linked the space of consultation with the temporal unfolding of chronic disease. In this, the repetition of medical encounters and their documentation in the patient's record

are crucial to produce a trajectory of illness and to configure primary care work as the ideal form of labour to address this temporal unfolding. [42]

This juncture between a model of illness and a particular type of expertise is, however, particularly sensitive to attempts to standardise patient's care. In the social construction of the role of primary care, general practitioners claimed to represent the "whole patient" because of their privileged access to the individual's trajectory of illness in its complex temporal unfolding. Thus, primary care is said to be ideally suited to manage risk conditions such as hypertension because of the long temporal stretch they take to develop. By introducing them in primary care consultation, these population-derived standards are managed through the tension between a "practice target" imposed by government guidelines and the outcomes negotiated with particular individuals. [43]

As I have argued elsewhere (MOREIRA, 2005), discursive deployments of this tension draw on the idea of "workability" and explore this through narratives or "stories". These narratives typically explore the individual specificities of patient's trajectories and work through elaboration of their differences and similarities (HUNTER, 1991). Furthermore, they speak of how patient and health worker are engaged with each other in a multiplicity of ways and suggest that what they interactively determine as important cannot be fully predicted. Thus, these stories are always incomplete accounts of a process, and derive some of their value from their open-endedness. The value of the narrative is fully realised only with reference to their allegorical character. The narratives perform the qualculative function for the space of consultation in that they demonstrate that representational means of mirroring reality cannot capture this reality *in full*. [44]

In this mode of qualculation, the calculability of time constraints envelops a deeper complexity at the heart of medical practice. Furthermore, the combination of these two operations within the space-time of consultation directs us to the ambiguity upon which the implementation of hypertension thresholds is based. From this perspective, the workability of the category of hypertension depends upon the infrastructure of surveillance that only primary care can implement. However, this infrastructure is itself underpinned by a moral architecture where "expertise" plays an important part. Disentangling one from the other remains a major socio-technical challenge that is far from being resolved (MAY et al., 2005). [45]

Attempts to make MCI a workable category in clinical practice tap into this ambiguity between surveillance infrastructure and the moral architecture of expertise. However, these efforts, rather than focusing on making visible how a combination of factors works to account for the "real" existence of a risk condition, have been developed through a controversy around the clinical value of MCI. One of the key questions in the controversy focuses on whether or not it is possible to extend the MCI diagnosis infrastructure beyond the context of specialised clinics that currently perform it. In attempting to transfer the technical apparatuses that would make such diagnosis possible—cognitive testing, biomarkers, possibly imaging—actors have to take into consideration the type of

expertise available in primary care and, more importantly, the time constraints involved. [46]

A good illustration of this concern comes from a scientific meeting about MCI organised by the Peripheral and Central Nervous System Drug Advisory Committee of the US Food and Drug Administration (FDA) in 2001. This meeting was unusual in that, as one of the employees of the agency, Dr. KATZ, put it, the FDA was asked "to address some fundamental aspects of a particular diagnosis [...], and decide if it exists and how best it ought to be studied" (Administration, 2001, p.6), rather than considering a licensing application for a specific drug. In one of the presentations at this meeting, Dr. SHAH, from the Mercy Mayo Clinic in Iowa, suggested that while sensitive biomarkers for dementia are still being developed, other simple computerised tests could be used. In setting the rationale for his product, he argued that:

"Currently, [in the US] we use about a hundred billion dollars a year to treat out patients with dementia. If we can reduce or postpone or delay the diagnosis or the treatment part of dementia by two years, approximately in 10-15 years—and the numbers are very rough—we will have probably 10 million less people, and financially, if we can delay the admission to nursing homes [...] by six months we can save six billion dollars a year only in the U.S.

So, given the financial aspect, financially it makes a lot of sense to detect dementia early, not only financially but socially, of course, and morally it makes sense to have very early detection and, hopefully, early treatment.

So the next logical question [...] 'is how do we do that'. What is the best way for people in the trenches to diagnose dementia early? This is not a statement, it is a question: are neuropsychological measures significantly sensitive enough and applicable for all primary care physicians [...]? Currently, the way our structure is now, we get about 15 minutes to see our patients. So, on an average [it takes] about 7-10 for primary care physicians to do their Mini-Mental State Examination, which is supposed to take about 5-7 minutes. Even the clock draw, which takes less than 2 minutes, is not done by most of the primary care physicians" (FOOD AND DRUG ADMINISTRATION, 2001, p.192). [47]

This statement is primarily interesting as it shows how Dr. SHAH works through the relationship between the economic mode of calculation and the form of calculation concerned with clinical labour. In this, the scale of the economic problems of an ageing population can only be solved by the infrastructure of primary care. Only primary care can carry out the amount of early detection work that is needed to disentangle the financial predicament of dementia. However, standardised diagnosis tools such as the Mini Mental State Examination (FOLSTEIN, FOLSTEIN & MCHUGH, 1975) are, according to Dr. SHAH, at odds with the time constraints that primary care physicians experience. Furthermore, the use of these standardised tools appears not to be as time efficient "on average" in primary care as it is in other clinical contexts. The disjuncture between the expectations towards the infrastructure of primary care and the expertise available for screening for dementia creates the opportunity for Dr.

SHAH's technical solution, a quick, sensitive and efficient way of screening for dementia that can be applied with no specialist knowledge. [48]

Embodied in Dr. SHAH's technological solution to this disjuncture is a simplified version of clinical practice, employed in primary care. This is because both Dr. SHAH and the rest of the participants in the FDA meeting assume that the full clinical assessment and management of the MCI patient will be carried out in specialist clinics. In this sense, their understanding of pre-clinical dementia is that it requires a specific kind of expertise that is only available at dementia clinics. The link between the characteristics of the disease and the sort of clinical labour that can make it visible and workable implicitly excludes the interactive negotiations that construct primary care as clinical practice. In this division of labour, the function that is ascribed to primary care in dementia practice is thus one of selection of possible patients. [49]

Another issue that is implicitly contained in the solution proposed by the FDA experts is the reliance on primary care knowledge about the patient in order to decide which patients to submit to screening. This knowledge about the patient, as explained with reference to hypertension, derives from repeated encounters and the construction of a representation of the patient—in the patient's record—as a member of a family and a community. The small changes in mood and memory that are said to be the first signs of dementia become visible in the family at first. Privileged access to the patient's evolving social networks thus grounds primary care practitioners' claims to a central role in diagnosing early dementia that goes beyond administering a test. Here, however, the allegorical grasp of complex individual phenomena works to partially exclude dementia from the primary care consultation room. [50]

One of our interviewees, a behavioural scientist working in the US, offers a possible explanation for this:

"If you screen for diabetes and you're able to really maintain that person's health over the long term with the diabetic condition, you know, the downside of not managing diabetes is really devastating, you know people may be losing limbs, eyesight, walking ability etc. [...] Whereas with dementia it's a progressive illness, it's not going to go away and there isn't a lot you can do to ameliorate, you can [only] slow down the symptoms. So if you think of that strictly from the medical perspective in the way you know the policy makers really think about the screening issue and you stack that up against other possible conditions to screen for, it is hard to make a case for that and the problem again is with primary care physicians who have such limited time [...]" [BARRY_28: 2]. [51]

It appears that, in the case of MCI and dementia, the qualculation of time constraints underpins the resistance primary care has to the screening of dementia. As a progressive illness, dementia challenges the structure of work in primary care consultations. It is thus difficult to make MCI a workable category in this setting. This might help explain why in our own interviews with primary care practitioners with a special interest in dementia, the disadvantages of opening the

possibility for dementia diagnosis appear not to be balanced by what can be therapeutically offered at present. This is confirmed by further research on the perspectives of primary care practitioners about early diagnosis of dementia (ILIFFE, MANTHORPE & EDEN, 2003). [52]

The interviewee's comparison with diabetes is of key relevance for our purposes. As with hypertension, diabetes care fits with both the surveillance infrastructure and the moral architecture of expertise in primary care. Standards of care both re-articulate this ambiguity and depend on it for their implementation. The calculation of MCI in the time-space of the consultation room produces a friction between the surveillance infrastructure and the architecture of expertise. While the former underpins the programme of action that can make MCI "real" and its promises possible, as was suggested by Dr. SHAH in the first quote, the model of dementia care embodied by MCI attempts to simplify the expertise help by primary care practitioners. Through this friction, dementia's progressive, insidious, and still fatal character is re-articulated and the negative aspects of MCI or early dementia are emphasised. [53]

5. Conclusion

This paper explored how the "temporal space of health" is negotiated in public debates through an analysis of two case studies: the technical controversies around hypertension and prodromal or preclinical dementia. It suggested that the link between an epidemiological framing of risk and the enactment of a "risky self" is more complex than is normally assumed in governmentality research. It did so by describing the multiple ways in which hypertension and MCI are framed within different practices of calculation (see Table 1 below). [54]

The paper started by examining how the establishment of hypertension as an object in public health was linked to the practices of calculation that were deployed in the Framingham Heart Study. I suggested that the temporality embodied in risk conditions such as hypertension derives from practices of calculation, which were themselves the effect of a contingent arrangement of the political and administrative stability and the ethnic and cultural homogeneity of Framingham, on the one hand, and the drawing together of methodological innovation and a political vision of public health. The comparison with the troubles experienced by MCI proponents to draw public attention to pre-clinical dementia exposed key changes in the social and epistemic organisation of medicine in the past three decades. In this process, epidemiological calculations seem to have lost some of their ability to institute objects as "matters of concern" (LATOURE, 2004) in the public arena and also to deploy calculative subjectivities effectively and extensively. [55]

The analysis of economic calculations of hypertension and MCI described attempts to re-articulate political objects and subjects in a context of managed care and increased reliance on technologies of accountability. I suggested that a central example of these technologies was the QALY, which entailed qualifying time to support resource allocation decisions. However, in the case of

hypertension this form of calculation stabilised the knowledge base and forms of interaction between constituencies. With reference to MCI, economic calculations have produced a "zone of ignorance" that effectively decreased clinical accountability in dementia care. In the case of MCI, action was facilitated not by the deployment of "truth" that underpins the calculative subject but by the creation of obscurities. [56]

In the last form of qualculation analysed in this paper, clinical practice was brought to the forefront as the mechanism through which risk conditions can be made "workable". This entails a further transformation of the meaning of risk through qualculations of primary care practitioners' labour time. I argued that to exist in the "real world", risk conditions have to negotiate the space between the surveillance infrastructure offered by primary care and the moral architecture of expertise (and subjectivity) implied in the idea of chronic illness. This has been, for the most part, a successful process in the case of hypertension. Recent attempts to extend dementia diagnosis or screening to primary care have been resisted by practitioners, however, because they carry with them models of care and of subjectivity that do not fit their expertise.

Mode of Qualculation	Hypertension	MCI
Populations: Survival	Consensual knowledge	Contested meaning
Resources: Benefit	Accountability	Ignorance
Labour: Workability	Mutual reinforcement	Friction

Table 1: Modes of qualculation [57]

In forthcoming publications I hope to explore the two remaining forms of qualculation: "label" and "experience". It is important, however, to mention how, through these forms of qualculation, the temporality of risk is compounded further. In "label" qualculations, knowledge practices focus on the "burden" of medical diagnosis on the person and analyse—quantitatively or qualitatively—the constraints on productivity, agency, or citizenship that it produces. This entails a qualculation of "lost time" in a variety of arenas (labour, political participation, leisure, etc.) as individuals are seen to be withdrawn from those arenas as a consequence of the "label". In the qualculations of "experience", attempts are made to represent the inner world of persons diagnosed with particular risk conditions. These are concerned with the qualculation of suffering and refer to a temporality that is out of measurement and calculation. [58]

This paper was mainly concerned with showing how the temporal space of health is composed by the many different temporalities that are enacted by various forms of qualculation. I wanted to demonstrate that *the equivalence of temporality between epidemiological calculations and management of the self that underpins governmentality research ignores key processes of collective mediation and negotiation*. Moreover, it was my suggestion that in studying these debates, we observe how the link between the management of populations and the conduct

and experience of individuals is problematised, explored, and compounded in different ways by the constituencies involved. Frames of calculation produced different effects on the relationship between the knowledge base and the interaction between constituencies in each of the cases presented in the paper (Table 1). The different ways in which this problematisation is achieved in the case of hypertension and in the case of MCI cast further doubt on the validity of the governmentality model. [59]

Through these debates, epidemiological definitions of risk conditions such as raised blood pressure are challenged by and combined with other forms of knowledge and the subject positions that they entail. In this, they both build upon and contradict the temporality embodied in the models of risk proposed by epidemiology. This conclusion presents us with a new challenge: how are we to think about the relationship between these different forms of calculation? In such an investigation, we might be assisted by conceptual models that do not work through a dichotomy between difference and coordination (MOREIRA, 2006b). These models suggest that in this relationship, calculative practices (of epidemiology, health economics, etc.) are in productive opposition to each other. Also, if these different forms of calculation are taken as whole, it is possible to understand how a dynamic mechanism might be at work in opposing and bringing together calculation and non-calculation (CALLON & LAW, 2005). Further research is needed to understand these dynamic processes. [60]

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