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Quality and quantity in mobility biographies research: Experiences from a mixed method study of non-cyclists in Germany

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Abstract

Mobility biographies research since the 2000s has generated an impressive range of insights into both structural and individual influences on people’s modal choice, including life events and ‘mobility milestones’ (Rau and Manton 2016) that either reinforce or reconfigure people’s mobility needs and options. In contrast, people’s (in)voluntary non-engagement in specific mobility practices such as cycling and related dynamics across the life course remain seriously under-researched, calling for mixed-methods inquiries that can address ‘what’ and ‘why’ questions.

Drawing on RadAktiv, a mixed methods study of non-cyclists in Germany that investigates the impact of critical and incisive life events on people’s cycling practices, this chapter attends specifically to chances and challenges that arise when combining qualitative and quantitative modes of enquiry in mobility biographies research. Focusing on conceptual and methodological issues surrounding the identification and social-scientific investigation of life events, it advocates for a technical approach to mixing methods. It argues that such an approach, while problematic in some respects, is ideally suited to accommodate the existing diversity of ontological and epistemological viewpoints within the mobility biographies research community. Importantly, it would serve to expand the methodological strengths of this important research field by sparking fruitful epistemological and methodological debates across disciplinary boundaries.

key words: mobility biographies, mixed methods, life events, mobility milestones, cycling, non-cyclists, Germany

Quality and quantity in mobility biographies research: Experiences from a mixed method study of non-cyclists in Germany

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3.1 Introduction

Modal choice is contingent upon a wide range of structural and individual factors, including life events and 'mobility milestones' (Rau and Manton 2016) that either reinforce or reconfigure what transport modes people can avail of. The influence of significant life events on the mobility practices of individuals and households has thus been subject to increasing attention, especially among those researching mobility biographies (Lanzendorf 2003, Müggenburg et al. 2015, Scheiner & Holz-Rau 2013). However, debates continue concerning suitable methodological approaches and their practical implementation (Axhausen 2008, Schoenduwe et al. 2015, Rau & Manton 2016, Sattlegger & Rau 2016). At least three issues are relevant in this context. First, questions concerning 'what' people do, and 'why' they do it, require different methodological approaches. The former requires quantitative forms of enquiry that can capture broader trends while the latter calls for qualitative work that reveals reasons for people's actions, including motivations and meanings. Second, the issue of time looms large in mobility biographies, accompanied by regular calls for more longitudinal surveys (to complement and potentially validate results from retrospective biographical work that relies heavily on people's ability to remember mobility-related events). Here the question also arises how much time before and after a critical life event does the empirical work need to cover to capture changes in mobility practices.

Third, the use of mixed methods approaches to data collection and analysis in the context of mobility biographies research deserves much more attention than has hitherto been the case. Here, a discussion urgently needs to be had within the mobility biographies research community about how different quantitative and qualitative approaches could be meaningfully integrated without compromising on the strengths of each approach in answering 'what' and 'why' questions respectively. For example, there is an observable trend in social-scientific research more generally towards the pseudo-quantification of qualitative data through premature coding and categorization and an overemphasis of detectable words and phrases (as opposed to more hidden meanings, metaphors etc.), partly aided by the growing use of software for qualitative data analysis. This points towards the potential pitfalls of unidirectional integration where qualitative evidence is subsumed under the 'quantitative logic' of a project and, at the same time, highlights the merits of alternative approaches to data integration that ascribe equal relevance to all parts.

People who do not cycle make up a large part of the population in Germany (and elsewhere). For example, recent representative statistics for Germany show that 50% of adults cycle less than once a month (infas 2019), essentially making them non-cyclists. They thus represent an interesting target group for pro-cycling campaigners and decision-makers who wish to promote sustainable alternatives to the current car-centric mobility system. However, very little is known

about who these non-cyclists are, and what motivates them to refrain from cycling. In particular, people's mobility biographies in relation to non-cycling, including the impact of specific life events such as accidents, ill health or sudden changes in family circumstances on people's willingness and ability to cycle, remain seriously under-researched.

This chapter critically examines the advantages and drawbacks of mixed methods approaches to researching the influence of incisive life events on cycling, focusing on accounts provided by non-cyclists in Germany. Drawing on Alan Bryman's influential work on quantity and quality in social research (Bryman 1988/2003, 2006; Bryman et al. 2008), it demonstrates the benefits and limitations of adopting a technical view of mixed methods work that facilitates the more or less unlimited combination of different tools for data collection and analysis. As opposed to an epistemological view that cautions against mixing methods that derive from largely incompatible epistemological traditions. Building on this, the chapter outlines a number of key steps that can assist researchers in their multi-methodical investigations of changes in mobility practices before, during and after major life events such as a traffic accident or the birth of a child.

3.2 Mixing methods: Theoretical considerations

Debates concerning the merits and pitfalls of qualitative, quantitative and mixed methods studies have been central to the development of many modern social science disciplines since their inception in the 19th century. For example, prominent classical thinkers in sociology such as Max Weber and Emile Durkheim have presented detailed works on the methodological foundations of social research that treat theoretical standpoints and methods of data collection and analysis as intertwined.

A vibrant and lively debate about the merits and limitations of qualitative and quantitative approaches to social research ensued during the 1980s and 1990s, with significant contributions from social scientists interested in research methodology. Many of these remain as relevant today as they were more than four decades ago. For example, Alan Bryman's seminal text entitled 'Quantity and quality in social research' (1988/2003) details different ways of combining qualitative and quantitative methods. Perhaps more importantly, it juxtaposes key arguments put forward by those who support mixed methods research in the social sciences, and those who oppose it. Members of the first group tend to advocate for a pragmatic approach to mixing methods that adopts an 'anything goes' (more or less) stance. Alan Bryman (1988/2003) labels this the technical view. Advocates of this view argue that methods can be combined, including across the qualitative-quantitative divide, because they are not necessarily linked to particular epistemological standpoints.

In contrast, those opposed to mixing methods frequently endorse what Bryman (1988/2003) calls an 'epistemological view' that emphasizes the incommensurability of key methods in social research, especially whenever they fall into qualitative and quantitative categories respectively.

Quantitative and qualitative methods are more than just differences between research strategies and data collection procedures. These approaches represent fundamentally different epistemological

frameworks for conceptualizing the nature of knowing, social reality, and procedures for comprehending these phenomena (Filstead, 1979:45).

This implies that to be able to engage in mixed methods work, researchers are required to leave aside their epistemological convictions to make room for a kind of empirical pragmatism that prioritises the collection of good-quality data from different sources. This, in turn, raises interesting questions about the merits and pitfalls of a type of ‘naked empiricism’ that is largely blind to epistemological (in)compatibilities and that appears to be disconnected from the researcher’s own views and convictions concerning how to study everyday practices (e.g. how and why people cycle in everyday life).

3.2.1 Typifying mixed methods approaches

Existing typologies of mixed methods approaches reveal much about the state of the field and its key practices at particular points in time (e.g. Bryman 1988/2003, Mason 2006, Johnson and Onwuegbuzie 2004, Leech and Onwuegbuzie 2009, Brannen 2017). While a detailed review of these typologies is beyond the scope of this chapter, it is nevertheless interesting to see how particular issues have dominated the debate since the 1980s. These include the persistence of gradients between methods regarding their status and desirability and questions surrounding the order of application within the same research project (i.e. simultaneous or serial; see also Chatterjee and Clark, this volume). For example, many qualitative methods continue to receive less-than-adequate recognition for their ability to reveal hidden reasons and motivations behind people’s observable actions. At the same time, the lure of quantification continues to be significant, with both positive and negative consequences for the investigation of social and environmental phenomena. Regarding the order of application, social researchers engaged in mixed methods work often prefer serial designs where one methods precedes the next (as opposed to parallel applications of different methods). Table 3.1 captures central aspects of these debates. As is shown in this chapter, methodological developments in the field of mobility biographies mirror many of these trends.

Table 3.1: Typology of mixed methods approaches

		ORDER OF APPLICATION	
		Concurrent	Sequential
STATUS OF METHODS	Equal	QUAL + QUANT	QUAL → QUANT QUANT → QUAL

	Unequal*	QUAL + quant QUANT + qual	qual → QUANT QUAL → quant quant → QUAL QUANT → qual
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Source: Authors' adaptation of Johnson and Onwuegbuzie (2004: 22)

* Method in capital letters is prioritised in methodological design

Concerning the actual practice of mixing methods, certain trends are clearly discernible that correspond to the four types of mixed methods approaches that combine an unequal status with a sequential application process (bottom right cell in Table 3.1). In fact, the relationship between qualitative and quantitative strands of work is often uneven, with quantitative work dominating many areas of social research, including transport- and mobility-related empirical investigations. According to Bryman (2006), mixed methods studies rarely accord equal weight to qualitative approaches. Instead, different types of qualitative enquiry such as unstructured interviews, focus groups or field-based observations are often treated as largely exploratory empirical elements whose main purpose is to deliver some ideas for developing the 'core' method of data collection and analysis (e.g. a questionnaire survey and subsequent statistical analysis). This view of qualitative approaches as ancillary to quantitative work also dominates much of the field of mobility biographies, with few projects ascribing equal importance to these two modes of enquiry. In fact, few studies in the field of mobility biographies combine qualitative and quantitative methods, a fact that suggests the persistence of a major methodological gap (but see Clark et al. 2016, Clark and Chatterjee, this volume, Marincek, Ravalet and Rérat, this volume, Priya Uteng and Farstad, this volume, for recent exceptions). The decision to use a mixed method design that combines qualitative and quantitative work can be made for different epistemological, methodological and practical reasons (see for example Giele and Elder, 1998, for a wide range of reflections on mixing methods in life course research). Adopting a technical view of mixed methods research, Greene et al. (1989: 259) identify five key reasons for mixing methods. First, seeking corroboration between qualitative and quantitative data through triangulation. Second, a quest for complementarity whereby results from one method elaborate or clarify those from another. Third, wishing to develop a method based on results from another method present. For example, prior qualitative work may directly inform measurement decisions taken in relation to the design of a survey. Fourth, mixing methods brings about new perspectives, especially in the face of tensions and contradictions discovered during the research process. Finally, the desire to extend the breadth and range of enquiry through the application of different methods.

Complementing Greene et al.'s (1989) list, further reasons include the ability to accommodate different angles and viewpoints, especially in the context of collaborations between researchers from different disciplinary backgrounds as well as the ability to facilitate different groups of participants in the research process (cf. Bryman 1988/2003, 2006). Here, a mixed methods approach can assist researchers in conducting work across disciplinary boundaries. This is particularly relevant in cases where disciplines come together that diverge greatly in their methodological focus. This said, methodological triangulation, that is, the application of

two or more methods to capture the same phenomenon, is not without its problems. For example, the application of different methods may produce incompatible or even conflicting results that are difficult (if not impossible) to integrate. While efforts to explain and potentially resolve such conflicts can foster methodological and conceptual advancement, few researchers are keen for their empirical study to yield results that are essentially incompatible. On a practical level, efforts towards methodological integration and triangulation of results across large multidisciplinary teams often requires a high level of coordination.

Outlining her positive, yet critical view of mixed methods research, Mason (2006) argues for combining methods in a qualitatively driven way. She believes that '[m]ixing methods helps us to think creatively and 'outside the box', to theorize beyond the micro-macro divide, and to enhance and extend the logic of qualitative explanation' (ibid, p. 9). At the same time, she recognizes that the methodological or theoretical underpinnings and implications of integrative research strategies are varied and not yet adequately understood and that 'mixing methods can be a very good thing indeed, but is not inevitably or by definition so' (Mason 2006: 10).

Regarding the inclusion of different groups of research participants, significant methodological issues arise when involving children and young people, people with cognitive or physical disabilities or participants from different cultural backgrounds who may be unfamiliar with key methods used in 'Western' research. A mixed methods approach can help to accommodate the needs of different groups while ensuring a scientifically rigorous study. For example, the use of visual methods such as photo or video elicitation can be a useful addition to standard methods such as surveys or interviews that require respondents to verbalise their thoughts and considerations. In the context of mobility biographies, visual assistance can be particularly useful when collecting retrospective data. For example, Rau and Manton (2016) demonstrate how easily recognizable graphics can assist respondents of all ages, computer literacy and abilities in completing a rather complex online survey of life events and mobility milestones and their impact on mobility practices.

3.2.2 Mixing methods: State of the art in mobility biographies research

In what ways are these more general methodological reflections concerning mixed methods research relevant for mobility biographies research, especially given the prominent role of longitudinal and retrospective designs in this rapidly evolving field?

Interestingly, methodological debates such as those outlined above have been relatively sparse in mobility biographies research. This might be at least partially related to the multidisciplinary nature of mobility research more generally, and work on mobility biographies in particular. Different disciplines tend to have different traditions regarding methodological debates. For example, in some social science disciplines researchers have been known to initiate and sustain detailed epistemological and methodological debates (sometimes over decades). Extensive and controversial debates concerning the issue of quality and quantity in social research at least since the 19th century and current debates among environmental social scientists about the merits and pitfalls of transdisciplinary research exemplify this. However, this preoccupation with methodological options and challenges is by no means common across all disciplines.

This said, the current sparsity of methodological debate in life course-oriented mobility research might be the proverbial 'calm before the storm'. In fact, it seems plausible to expect future debates concerning key methodological issues in mobility biographies research such as the mitigation of limitations surrounding retrospective surveys, or issues regarding the integration of quality and quantity into investigations of mobility biographies. Concerning the former, much empirical work continues to focus on discrete events and once-off changes that researchers and respondents can easily identify and recall, which tends to eclipse less conspicuous life events as well as more gradual shifts in mobility practices across the life course (cf. Müggenburg 2015, Rau and Manton 2016, Oakil et al. 2016, Scheiner and Holz-Rau, this volume, for reflections on these and related issues). For example, societal norms tend to exert a significant influence on mobility practices. However, efforts to capture empirically moments of exposure to particular norms (e.g. during more formal mobility socialization initiatives such as driving instruction) are very challenging. Future advancements in retrospective methodologies are expected to tackle this important issue.

Integration of quality and quantity in mobility biographies research also remains a work in progress. First, even just a cursory glance at the field reveals the continued dominance of quantitative methods of data collection and analysis, with qualitative and mixed methods work commanding much less space and attention in the field (cf. Miles et al. 2013, Chatterjee et al. 2013, Müggenburg et al. 2015, Sattlegger and Rau 2016, Janke and Handy 2019, Clark and Chatterjee, this volume, Driller, Thigpen and Handy, this volume, Marincek, Ravalet and Rérat, this volume, Priya Uteng and Farstad, this volume). The latter seems particularly surprising given that qualitative mobility biographies studies, especially those that adopt a non-linear view of the life course, excel in capturing different qualities of change around life events and related shifts in understandings and meanings. For example, Sattlegger and Rau (2016) outline the benefits of a reconstructive approach to qualitative mobility biographies research, focusing on the topic of voluntary carlessness. Similarly, qualitative work by Janke and Handy (2019) shows the advantages of using semi-structured, retrospective interviews to analyse non-linear change in cycling behaviour across the life course more generally, and directions of change regarding life events and shifts in attitudes and behaviour in particular. Importantly, these two authors provide convincing arguments that insights from their qualitative study could 'inform retrospective questions in quantitative surveys and improve the quality of the questions to assess behavioural change' (Janke & Handy 2019: 38, Driller, Thigpen and Handy, this volume). Combining quality and quantity in mobility biographies research in constructive and fruitful ways thus seems to present exciting opportunities for conceptual and methodological advancement. However, barriers to mixed methods work remain. These include practical constraints (e.g. time, money), a lack of adequate training in qualitative and mixed methods in some disciplines that contribute to the mobility biographies field and difficulties securing funding for qualitative or mixed methods research. Academic reward structures that encourage more narrow disciplinary work, a quick turnaround of results, and high publication volumes also prevent interdisciplinary, mixed methods studies that may be more difficult to publish.

Concerning mixed methods approaches to mobility biographies research that feature both qualitative and quantitative methods, it is possible to find some examples of sequential designs (e.g. Chatterjee et al. 2013, Rau and Manton 2016, Chatterjee and Clark, this volume). In some

cases, a frontloaded qualitative part (e.g. semi-structured expert interviews, qualitative interviews, focus groups) supports the subsequent design, implementation and interpretation of large-scale quantitative work such as surveys. For example, Rau and Manton (2016) used a qualitative pilot phase, including expert interviews, to design their online survey. As outlined in the previous subsection, this type of research design mirrors trends in mixed methods research more generally. In other cases, quantitative survey work is succeeded by in-depth qualitative interviews to fill obvious knowledge gaps concerning reasons *why* people take up or abandon certain kinds of mobility practices. For example, Chatterjee et al. (2013) analyse face-to-face biographical interviews with 144 urban dwellers in the UK whose city/town received funding under the Cycling City and Towns (CCT) programme. CCT ran for three years and provided a suite of infrastructural and educational measures to encourage citizens to take up cycling (again). Here, qualitative interviews complemented the initial longitudinal quantitative panel study carried out at the start of CCT in 2009, and again towards the end of the programme in 2012. The main aim of the qualitative work was to ‘understand why changes in cycling behaviour had taken place’ (Chatterjee et al. 2013: 185).

3.3 RadAktiv: Forging a dialogue between qualitative and quantitative methods to investigate non-cyclists

To provide some examples of key points made above, this section focuses on RadAktiv, a three-year project (2018-2020) funded by the Federal Department of Transport in Germany that investigates the dynamics of mobility practices of cyclists and non-cyclists across the life course. Cycling counts as one of the most promising means of transport to solve urban traffic problems, including congestion, air pollution and growing competition between different transport modes for public space. Cycling is also frequently presented as a healthy alternative to more sedentary forms of mobility such as driving. However, half of the German population do not cycle (i.e. only once a month or less) (infas, 2019) and 20% do not own a bicycle. To increase the modal share of cycling from 11% to 15% within three years, which is the focus of the German Government’s recent pro-cycling efforts, non-cyclists are a primary target group for change initiatives in this important transport policy area (infas, 2019).

RadAktiv aims to identify different types of non-cyclists (people who cycle less than once a month/never) and their specific characteristics, with a view to recommending targeted measures to encourage members of this group to take up cycling (again). Located at the intersection of applied mobility research and mobility biographies, RadAktiv focuses on life events (e.g. birth of first/subsequent child or grandchild) and ‘mobility milestones’ (Rau and Manton 2016), that is, explicitly mobility-related life events (e.g. buying a bike, being involved in a traffic accident), that can be directly linked to people increasing, decreasing, or maintaining their level of cycling. This focus on changes in cycling practices across the life course is reflected in the study’s retrospective research design that blends qualitative and quantitative tools for data collection and analysis and that reflects a technical view of mixed methods research.

RadAktiv combined an initial phase of qualitative work, including expert interviews and 15 exploratory event-focused interviews with non-cyclists, with a second phase that revolved around the design, rollout and analysis of a nationwide representative survey of cyclists and

non-cyclists (n = 5,002). Survey questions derived from a range of primary and secondary sources, including existing publications and publicly available survey tools, methodological reflections and insights from previous mobility biographies work carried out by the main author of this chapter during CONSENSUS II (e.g. Rau and Manton 2015, 2016; <http://www.consensus.ie/wp/transport/>) as well as interview material with non-cyclists and cycling experts collected during Phase I. Particular efforts were made to develop lists of relevant life events and mobility milestones that include previously neglected events (e.g. birth of the first grandchild, near misses/accidents), with a view to providing additional answer options that reflect insights from previously published research.

An initial explorative analysis of RadAktiv survey data revealed discernible divergences between cyclists and non-cyclists regarding a) perceptions of the utility of bicycles for different types of journeys and b) the role of cycling in respondents' social environment. Regarding utility, non-cyclists tended to view cycling as a suitable transport mode for leisure pursuits (closely mirroring views among cyclists) – but not for everyday commuting or utility trips. However, only 26% of non-cyclists considered the bike to be a suitable mode of transport for work trips, compared to 50% of cyclists. Similarly, only 36% of non-cyclists stated that the bike is suitable for utility trips, compared to 63% of cyclists. Clear divergences also exist between non-cyclists and cyclists regarding the presence (or otherwise) of pro-cycling attitudes in their social environment. Only 16% of non-cyclists stated that their social environment motivates them to cycle, contrasting with 45% of cyclists. Similarly, less than 40% of non-cyclists reported that their family cycles a lot, compared to 65% of cyclists who said so.

The impact of life events and mobility milestones on respondents' propensity towards cycling also showed interesting patterns and contradictions. All life events led to both reductions and increases in cycling. Comparing increases and decreases, ill health/disability produced an overall drop in cycling while birth of a first grandchild or retirement increased cycling. Mixed effects also occurred for all mobility milestones, apart from near misses/accidents and losing access to a bicycle where no increase was observable. Gaining access to a car, acquisition to a public transport pass or losing access to an e-bike decreased cycling overall. In contrast, cycling increased overall whenever respondents took part in cycling training, gained access to a bike or e-bike, experienced changes in infrastructure, got a public transport season ticket and lost access to a car. To sum up, almost all life events and mobility milestones have divergent effects (i.e. increasing cycling for some and curbing it for others).

Finally, it was possible to identify four types of non-cyclists who differed significantly in their reasons for not cycling (and consequently in their motivation to consider taking up cycling). Those classified as very difficult/difficult to motivate reported a range of barriers including lack of safety, poor image of cycling, lack of fitness, low speed, poor environmental and infrastructural conditions and a social environment that discourages cycling. Those who could potentially be motivated or who appeared to be easy to motivate viewed cycling as a useful, fast and cheap transport option that could also help to improve fitness. This said, the latter two groups also cited poor infrastructure, theft, safety concerns, poor image of cycling and a social environment that does not encourage cycling as barriers to cycling.

Initiating RadAktiv with a qualitative enquiry brought about many benefits. First, the questionnaire survey deployed in Phase 2 incorporated key insights generated during Phase 1, which greatly enhanced its relevance to the target group of non-cyclists. In fact, without the team's prior qualitative work and thorough screening of existing studies on the subject, some critical life events such as the birth of the first grandchild would not have featured as prominently in the list of survey questions. However, some grandparents who participated in the qualitative interviews considered the ability to cycle to be an essential life skill that they would like to pass on to their grandchildren. As a result, they increased their cycling following the arrival of their grandchild. Including this life event in the subsequent quantitative survey also confirmed its significance across a much larger sample.

Qualitative work in RadAktiv also led to the re-evaluation of another critical life event - one's own ill health, or the ill health of a partner or spouse - , which is often seen to be a reason for discontinuing to cycle. However, interview data showed that some participants used a diagnosis of ill health (e.g. cardio-vascular problems) to take up cycling again, partly because they treated cycling as a new form of exercise that fitted reasonably well into their daily schedules and routines.

Safety concerns are often seen as a major barrier to a growth in cycling (cf. Manton et al. 2016). As a result, RadAktiv focused explicitly on safety-related views and events. Interestingly, non-cyclists who participated in the qualitative interviews repeatedly mentioned safety concerns as a key issue, thereby mirroring public debates in Germany and elsewhere. However, the subsequent survey revealed that there is no difference between cyclists and non-cyclists regarding the issue of safety. Stand-alone qualitative data would have led to an overestimation of the role of safety concerns in preventing people from cycling, a potential bias that was balanced out by the survey. The same can be said about traffic accidents and near misses, Here, anticipation of a strong effect on (giving up) cycling voiced during interviews, in public debates and also in the literature could not be confirmed by survey data. Many survey respondents who reported a traffic accident or near miss as a significant life event did not report a subsequent decrease in cycling. This is not to suggest that safety concerns, including those following accidents and near misses, do not matter. Instead, the decision to mix methods meant that the relevance of these concerns to both cyclists and non-cyclists was adequately addressed in the research.

The centrality of people's social environment in shaping aspects of their mobility biography (in this case whether or not to cycle) emerged as a major area of corroboration between the qualitative and the quantitative strands of research. The significance of people's immediate social environment (e.g. family, other household members) as well as their peers (e.g. school friends, colleagues in work) was repeatedly emphasized in the interviews, a fact that was mirrored in the survey data.

Findings from the qualitative interviews were also instrumental in shaping the quantitative data analysis, including the interpretation of effects (or lack thereof) of key life events on cycling as well as the development of a typology of non-cyclists. For example, residential relocation has been identified in the mobility biographies literature as a major life event that reshapes people's mobility practices both in the short term and over long periods of time (Scheiner &

Holz-Rau 2013). However, RadAktiv survey results proved inconclusive regarding the direction of change in cycling following residential relocation. In fact, it was not possible within the boundaries of the study to provide conclusive answer concerning the reasons why people (do not) change their cycling habits following relocation. This mirrors insights from previous research on the complex and multidirectional effects of residential relocation on mobility practices (Schäfer et al. 2012, Jaeger-Erben 2013). Further qualitative and mixed methods work is thus urgently needed to reveal the conditions (apart from distance) under which people increase or decrease their cycling post-relocation.

To sum up this section, ample evidence exists that the collection of qualitative data during the initial phase of RadAktiv project was essential to the successful progression of the project. At the same time, the integration of a quantitative element based on a representative sample of the German population proved to be highly significant because its emphasis on capturing large-scale trends helped to challenge taken-for-granted assumptions about the infrastructural and safety needs of those who do not yet cycle. In fact, it is likely that RadAktiv would have struggled to avoid the reproduction of many of these taken-for-granted assumptions without its mixed methods design. For example, insights generated in Phase 1 guided segmentation efforts in Phase 2, including the identification of three key factors: 1) perceived utility of bicycle for meeting everyday mobility needs, 2) aspects of mobility socialization and the role of the immediate social environment (e.g. parents, grandparents), and 3) the influence of peer groups on modal choice. Moreover, initial qualitative insights helped the researchers to make sense of surprising quantitative results such as similarities between cyclists and non-cyclists regarding perceptions of safety and accident risks. In other words, mixing methods offered chances to make sense of a surprising 'what' (survey results) by considering insights into the 'why' (evidence from qualitative interviews).

3.4 Mixing methods in mobility biographies research: Benefits, limits and new avenues

It is evident from the methodological reflections presented herein that initiating the RadAktiv research process by means of a qualitative phase has helped to keep open different angles or viewpoints that would otherwise have been closed already near the start of the project. For example, a number of initial interviews with non-cyclists revealed the significance of family and peers who also do not cycle and who do not consider a bicycle to be a viable and practical means of transport that can meet everyday mobility needs (as opposed to those associated with occasional leisure trips). Moreover, insights from the interviews with experts and non-cyclists translated into a focus during the subsequent statistical analysis of survey data.

Qualitative and quantitative data generated in RadAktiv showed few incompatibilities, with many results from the quantitative phase corroborating initial qualitative insights. Both the segmentation of non-cyclists and the comparative analysis of key characteristics of cyclists and non-cyclists were greatly enriched by previous qualitative work during Phase 1 of the project. Moreover, the qualitative element of the research process, with its emphasis on why people do not cycle, proved to be a suitable tool for developing more structured survey questions that were capable of capturing wider trends regarding non-cycling. These included people's motivations, cycling-related aspects of the social and physical environment and actual and

perceived barriers to cycling. This said, it was also possible to discover some interesting incongruencies between what people report they do, and how they explain or justify their actions, which opened up new analytical avenues. The aforementioned emphasis on safety that emerged as a major issue during the qualitative interviews with non-cyclists later reappeared in the survey results for both groups (cyclists and non-cyclists), suggesting that similar concerns regarding safety do not necessarily translate into similar action. Moreover, the segmentation of non-cyclists revealed that the issue of safety emerged as a central barrier to cycling across three groups of non-cyclists, namely those that were (very) difficult to motivate (Group 1 and 2) and those that could be motivated (Group 3). This suggests that interactions between different motivating and hindering factors need to be better understood in future studies of (non-)cyclists, for example by linking qualitative and quantitative data.

RadAktiv's mixed methods approach also revealed interesting variations concerning the suitability of different methods for investigating things that people *do not do*. A commitment to researching non-cyclists meant that established facts concerning factors that either encourage or hinder cyclists had to be either revisited or extended upon. In this context, qualitative and quantitative tools presented different opportunities and limitations. For example, a combination of insights from previous qualitative research on cycling and cycling culture (e.g. Aldred 2013, Aldred and Jungnickel 2014) and statements collected during the qualitative phase alerted the researchers to possible differences between non-cyclists and cyclists concerning a) reported barriers to cycling (e.g. perceptions of the utility of bicycles as a suitable transport mode for daily commuting trips), and b) variations in the interpretation of particular risks and barriers (e.g. safety concerns in relation to cycling infrastructure). Importantly, the mix of methods used alerted the team to the strength and weaknesses of different tools regarding their capacity to elicit information about actions that people do not engage in and that are often neither reflected upon nor verbalized. Concerning qualitative interviews, this presents challenges for the interviewer that could be at least mitigated through the use of complementary methods (e.g. photo elicitation or the use of infographics and charts generated by analyzing quantitative data collected within the same project and potentially involving the same sample of people, event-centred focus group discussions etc).

3.5 Conclusions

Mixing methods to investigate the dynamics of mobility practices across the life course brings many benefits that can help to address limitations associated with single-method studies, including their exclusive focus on certain aspects of the phenomenon under study that can eclipse a more nuanced and comprehensive view. The methodological richness of mixed methods work that fuses quality and quantity is also very suitable for concurrent and sequential inquiries into 'what' and 'why' questions. At the same time, the limitations of mixed methods work can be substantial, especially with regard to practical issues such as additional time costs and coordination efforts. Moreover, mixing methodological tools associated with divergent ontological and epistemological traditions can throw up considerable challenges concerning the subsequent integration of results. Corroboration can never be guaranteed when combining different methods. Instead, tensions or even contradictions between different sets of data

collected by means of different methods appear to be very common. This said, the production of seemingly incompatible or conflicting research results can actually present opportunities for scientific advancement arising from the problematisation of taken-for-granted research findings or well established methodologies.

Interestingly, the mobility biographies research community has not yet embraced the benefits of mixing methods. This seems puzzling given the multi- and interdisciplinary nature of many studies in this growing field as well as its general openness to methodological innovation and experimentation (cf. Busch-Geertsema et al. 2019 for an assessment of the transport and mobility research community in Germany, including many of those engaged in mobility biographies research). Recent studies that have tackled pressing methodological issues in the context of intra- and inter-generational mobility-biographical research exemplify this. For example, recent groundbreaking work by Döring et al. (2014), Döring (2018) and Müggenburg (2015) on mobility socialization effects across three generations has generated very important insights into inter-generational variations in how people view and interpret particular life events, and what kinds of mobility-related reactions they invoke. Their findings also call for more qualitative work that helps to better understand these variations (e.g. Müggenburg 2015: 160-1). Moreover, these contributions to intergenerational mobility biography research encourage a more critical engagement with the concept of 'life events' as discrete events that can be clearly demarcated from one another, with obvious methodological implications. Here, Müggenburg (2015) suggests that changes in mobility practices may occur before, during and after a life event. Mixed methods approaches could assist in future investigations of these 'auras of change' around major life events that may last (much) longer than the event itself.

To conclude, strong arguments exist for adopting mixed methods approaches to researching mobility biographies, including people's (lack of) engagement in particular mobility practices across the life course and in response to certain life events and mobility milestones. In particular, a mix of qualitative and quantitative methods can shed new light on the dynamics of people's choice of transport mode across the life course. These include the potential of life events and 'mobility milestones' to radically reshape modal choice as well as concurrent, more gradual shifts in mobility practices that may or may not coincide with a particular life event. By focusing on the views and practices of non-cyclists and by adopting a mixed methods approach that fused an initial in-depth qualitative phase with a subsequent large-scale quantitative survey, RadAktiv generated new insights into people's reasons for *not* choosing a particular mobility practice.

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