PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Changes in older people's care profiles during the last two years of life, 1996-1998 and 2011-2013: a retrospective nationwide study in Finland
AUTHORS	Aaltonen, Mari; Forma, Leena; Pulkki, Jutta; Raitanen, Jani; Rissanen, Pekka; Jylha, Marja

VERSION 1 – REVIEW

REVIEWER	Joanne Lynn Center for Elder Care and Advanced Illness Altarum Institute USA
REVIEW RETURNED	03-Dec-2016

GENERAL COMMENTS	To the Author – substantial comments • Changes over a 15 year period provide a particularly important perspective • Having the entire population represented is a major advantage for this paper • The abstract should include specific key findings about the comparison • The process to identify the four care profiles is substantially different from Lunney et al. and seems to have some other origin. The abstract, for example, says that "Four care profiles were identified," which would imply that they somehow arose from the data; but in the methods, the specification of the profiles seems to have been established prior to examining data. Probably, the authors simply set up this categorization – if so, the might be more clear. If there is some data-driven categorization scheme, then it should be called out. • I understand that it is the jargon of our time to call medical and nursing homes services "care," but we would do well to consider using "services" or something similar, since "care" should (and does) include what families and neighbors do for one another. We have appropriated a tender term to use in a commercial sense. Consider the jarring nature of a phrase like line 36 – "number of days in care (vs at home)" – which seems to say that being home does not involve caring. At the least, it seems that the manuscript might be more clear with saying something like "institutional care." That would make it more readily understandable to say "after which they moved into care." Line 46, page 2 • With sensitivity to the optimists among us, the claim that "the one constant is that physical and cognitive capabilities decline with increasing old age and approaching death" needs to be "on average." Line 21, page 5

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	• The data seems sufficient to have supported a multivariate predictive analysis, yielding insight as to the weightiness of the various correlations. Perhaps this would be another publication. • The authors really should deal with the shortcomings inherent in two elements of their method: counting backwards from death, and assigning cohorts retrospectively. Counting backwards from death implicitly implies that the timing of death is a fixed point, whereas it clearly is affected by treatment, support, and setting. It is possible that the transition patterns identified actually affect the timing of death. For example, not moving dementia patients to the hospital might well accept an earlier death (or, indeed, might let them live longer). Policy and practice have to work prospectively, and retrospective descriptions can help illuminate the possibilities but they may well have serious dysfunctions in being applied prospectively. A simplification of the scheme proposed in this paper would have a category of "younger" elders (say, <85 y.o.) with mainly medical illnesses (cancer, heart disease, and respiratory disease generally) and mostly living with spouses and other family. That category would mostly be expected to have a period of unstable illness with hospital use just prior to death (except for the small number who die more suddenly). If one applied this prospectively, it might work out well. But it might have a great deal of dysfunction for those who survive into older age and end up in profile 3, with dementia and long-term care. In short, we cannot know the rate at which profiles can be identified prospectively. • The connecting of findings with policy (e.g., on page 18, lines 21-28; page 19, lines 34-51) is unusual and welcome. • The rise in service housing (which in the U.S. would be mostly what we call "assisted living" – though it seems that the Finnish model might have more substantial assistance) Minor points • Line 29, page 5 – "decreasing mortality" has to be something like "decreasing age-adjusted mortality rates," since mortality is fixed at one per person, unadjusted for age. • Line 16, page 6 – common usage in the U.S. would have "registries" rather than "registers" – a curious difference. • There are a few grammar errors and missing words. Needs a careful final review.

REVIEWER	Jeffrey Poss School of Public Health and Health Systems University of Waterloo Canada
REVIEW RETURNED	17-Apr-2017

GENERAL COMMENTS	This is an interesting descriptive study of Finland's experience over a fifteen year period of care experiences among those dying aged 70 or greater. The data sources are strong and the analysis appropriate. However, I fail to understand how the findings from this study support some of the conclusions, something I believe can be addressed as a minor revision. Page 18, line 16 states "It is possible then that increasing numbers of very old and frail people are living their last months of life at home." I find this statement only partially supported by the study.

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	Yes, there are a higher number (in absolute counts, the first two groups) of older people living at home, but as a proportion of the 2013 cohort they represent a smaller proportion of individuals. And while there is a significant increase in disease burden, as you state, there is no evidence regarding their functional state or measure of frailty. In the conclusions you comment on the challenges to the system of care for individuals with very high multimorbidity at home at end of life. While this may be true, it doesn't draw on evidence presented here. Again, there are lower proportions in these two primarily home-based groups over time, and trends in transitions and acute hospital use in these strata does not suggest a community system that is observed to be struggling. Instead of an orientation towards living at home, I find the biggest shift over time is the introduction of service housing and its apparent influence on care away from individuals' home settings, and its influence on acute hospital utilization. Please provide more information on what service housing is as a publicly funded care option in Finland, for example: how it compares to nursing home, how many beds there are relative to nursing homes, what the policy goals were in its introduction since 1998. Cancer and dementia rates have increased, unsurprising given their association with older age where the age distribution has shifted significantly over the 15 years. Is there any evidence that dementia or cancer is increasing, after adjusting for age? Would it be possible to present the 2013 rates for diagnoses standardized to 1998 ages to support this comparison? An interesting finding is that stroke is down among all groups, yet it gets no discussion here. If the word count allows, would be interesting to cite relevant literature or other Finnish studies that have found this. Did the authors have information about location of death? Given the paper's focus, it would be interesting as an additional descriptive finding to show the proportion dying at home, in hospital, nursing home, etc. Other Specific Recommendations: • In Table 1 please add tests of significance between 1998 and 2013; it would also be very helpful to include the breakdown of the days in care as you do in Table 2 (primary care hospital, specialized care hospital, nursing home, service housing, home). That way the reader can better judge, overall, the change in locations of care. • In Table 2, line 32 there is an "ns" which appears to be unnecessary

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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Joanne Lynn
Institution and Country: Center for Elder Care and Advanced Illness, Altarum Institute, USA Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below To the Author – substantial comments

Comment:
• Changes over a 15 year period provide a particularly important perspective
• Having the entire population represented is a major advantage for this paper
• The abstract should include specific key findings about the comparison

Response:
Thank you for this observation, we added clearer comparisons between the study years, within the limits of the abstract word count.

Comment:
• The process to identify the four care profiles is substantially different from Lunney et al. and seems to have some other origin. The abstract, for example, says that "Four care profiles were identified," which would imply that they somehow arose from the data; but in the methods, the specification of the profiles seems to have been established prior to examining data. Probably, the authors simply set up this categorization – if so, the might be more clear. If there is some data-driven categorization scheme, then it should be called out.

Response:
We have studied these extensive data for several years, and the categorization was based on what we have learned from our data in our previous studies, and what we have learned from previous literature of end-of-life functional trajectories and care use. We changed the text under Identification of profiles to describe this process clearer (pages 9-10 lines 14-18), and revised the abstract methods.

Comment:
I understand that it is the jargon of our time to call medical and nursing homes services "care," but we would do well to consider using "services" or something similar, since "care" should (and does) include what families and neighbors do for one another. We have appropriated a tender term to use in a commercial sense. Consider the jarring nature of a phrase like line 36 – "number of days in care (vs at home)" – which seems to say that being home does not involve caring. At the least, it seems that the manuscript might be more clear with saying something like "institutional care." That would make it more readily understandable to say "after which they moved into care." Line 46, page 2

Response:
We have acknowledged this question, and have used concepts care services and care facilities. We reread the text from this perspective and changed care to care service /care facility / round-the-clock care, in some parts of the text (marked with yellow). The problem is that we cannot call these services studied here institutional care because service housing is not classified as institutional care. We added sentences under chapter Discussion (p.22 lines 7-12), which emphasize that we do not have the information on informal care or formal home care services thus we don't know if people receive care at home. In all, we have emphasized the fact that we study round-the-clock care services in several paragraphs (Key Concepts p. 9, Care Services pages 7-8)

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Comment:
• With sensitivity to the optimists among us, the claim that “the one constant is that physical and cognitive capabilities decline with increasing old age and approaching death” needs to be “on average.” Line 21, page 5

Response:
“On average” added.

Comment:
• The data seems sufficient to have supported a multivariate predictive analysis, yielding insight as to the weightiness of the various correlations. Perhaps this would be another publication.

Response:
We agree that our results tempt to include further analysis. Yet, those are not possible to conduct in this paper, but hopefully in another paper.

Comment;
• The authors really should deal with the shortcomings inherent in two elements of their method: counting backwards from death, and assigning cohorts retrospectively. Counting backwards from death implicitly implies that the timing of death is a fixed point, whereas it clearly is affected by treatment, support, and setting. It is possible that the transition patterns identified actually affect the timing of death. For example, not moving dementia patients to the hospital might well accept an earlier death (or, indeed, might let them live longer). Policy and practice have to work prospectively, and retrospective descriptions can help illuminate the possibilities but they may well have serious dysfunctions in being applied prospectively. A simplification of the scheme proposed in this paper would have a category of “younger” elders (say, <85 y.o.) with mainly medical illnesses (cancer, heart disease, and respiratory disease generally) and mostly living with spouses and other family. That category would mostly be expected to have a period of unstable illness with hospital use just prior to death (except for the small number who die more suddenly). If one applied this prospectively, it might work out well. But it might have a great deal of dysfunction for those who survive into older age and end up in profile 3, with dementia and long-term care. In short, we cannot know the rate at which profiles can be identified prospectively.

Response:
We agree with this perceptive comment, although we do not consider counting backwards from death and assigning cohorts retrospectively as shortcomings but as a one way to illustrate the care use in last years of life. The aim of this paper is to show what are the care use profiles in last two years of life in this whole older population, without focusing on any particular disease or illness. Our aim is to provide information on the current situation of care use for the national health and social care policymakers, not to predict care trajectories. We added a paragraph to discussion section, page 21-22 lines 4-5, 15-5.

Comment:
• The connecting of findings with policy (e.g., on page 18, lines 21-28; page 19, lines 34-51) is unusual and welcome.
• The rise in service housing (which in the U.S. would be mostly what we call “assisted living” – though it seems that the Finnish model might have more substantial assistance)

Minor points
• Line 29, page 5 – “decreasing mortality” has to be something like “decreasing age-adjusted mortality rates,” since mortality is fixed at one per person, unadjusted for age.

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• Line 16, page 6 – common usage in the U.S. would have “registries” rather than “registers” – a curious difference.
• There are a few grammar errors and missing words. Needs a careful final review.

Response:
Thank you for the minor points, corrections are included. Language check is made by a native English speaker.

Reviewer: 2
Reviewer Name: Jeffrey Poss
Institution and Country: School of Public Health and Health Systems, University of Waterloo, Canada
Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below

Comment:
This is an interesting descriptive study of Finland’s experience over a fifteen year period of care experiences among those dying aged 70 or greater. The data sources are strong and the analysis appropriate. However, I fail to understand how the findings from this study support some of the conclusions, something I believe can be addressed as a minor revision.
Page 18, line 16 states “It is possible then that increasing numbers of very old and frail people are living their last months of life at home.” I find this statement only partially supported by the study. Yes, there are a higher number (in absolute counts, the first two groups) of older people living at home, but as a proportion of the 2013 cohort they represent a smaller proportion of individuals.
And while there is a significant increase in disease burden, as you state, there is no evidence regarding their functional state or measure of frailty.

Response:
Thank you for this comment. We acknowledge that there are many 90-year-olds who are not suffering from poor functioning and are living at home, as they should be. The fact that the proportion, and the number (in absolute counts) of the oldest people has increased in all of the profiles means that there really are a higher number of people aged 90 or older in all of the profiles, also in the first two. From the perspective of health care resources this possibly means that more home care and round-the-clock care is needed due to the fact that the older people are in last years of life, the higher are the care needs. It is true that we do not have information on their functional ability, or frailty, in this study. But in terms of earlier research findings (reference 26) of the oldest people in Finland, their functional ability has not improved. That’s why we speculate that it is possible there are increasing number of old and frail people living at home, although it is possible there are also very old people who are in good health. We do not say that results from this study prove that there are more old and frail people living at home, but state our concern that this might be the case, and it should be taken into account when the future care resources are allocated.

Comment:

In the conclusions you comment on the challenges to the system of care for individuals with very high multimorbidity at home at end of life. While this may be true, it doesn’t draw on evidence presented here. Again, there are lower proportions in these two primarily home-based groups over time, and trends in transitions and acute hospital use in these strata does not suggest a community system that is observed to be struggling.

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Response:
We agree and revised the conclusions to be based more on our current results.

Comment:
Instead of an orientation towards living at home, I find the biggest shift over time is the introduction of service housing and its apparent influence on care away from individuals' home settings, and its influence on acute hospital utilization. Please provide more information on what service housing is as a publicly funded care option in Finland, for example: how it compares to nursing home, how many beds there are relative to nursing homes, what the policy goals were in its introduction since 1998.

Response:
We agree. More information is added to text (page 8 lines 4-18).

Comment:
Cancer and dementia rates have increased, unsurprising given their association with older age where the age distribution has shifted significantly over the 15 years. Is there any evidence that dementia or cancer is increasing, after adjusting for age? Would it be possible to present the 2013 rates for diagnoses standardized to 1998 ages to support this comparison?

Response:
Age standardized rates in different diagnoses would be interesting, but perhaps a topic of another article. In this study, the diagnoses are shown to describe characteristics of individuals in different profiles, and are not studied as such. The purpose of this paper is to show how the care use near the time of death has changed at the population level / national level, and discuss what it means to health and social care policy, and policy initiatives.

Comment:
An interesting finding is that stroke is down among all groups, yet it gets no discussion here. If the word count allows, would be interesting to cite relevant literature or other Finnish studies that have found this.

Response:
We agree that the changes in frequency of diagnoses in last two years are very interesting, and should be studied further. We also believe that this would be the topic of another paper (with the comment above).

Comment:
Did the authors have information about location of death? Given the paper's focus, it would be interesting as an additional descriptive finding to show the proportion dying at home, in hospital, nursing home, etc.

Response:
Yes, we do have the location of death. However, we feel that adding places of death to findings would require a thorough discussion of the places of death. That is impossible to conduct within the word limit. In addition, we have two manuscripts concerning the changes in places of death under progress, hopefully they will be published soon. Yet, a rough estimation of the places of death can been seen from the Figure 2, final month.

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Other Specific Recommendations:
Comment:
In Table 1 please add tests of significance between 1998 and 2013; it would also be very helpful to include the breakdown of the days in care as you do in Table 2 (primary care hospital, specialized care hospital, nursing home, service housing, home). That way the reader can better judge, overall, the change in locations of care.

Response:
We added tests of significance to Table 1. We also added days in different care sites to Table 1 as shown in Table 2.

Comment:
In Table 2, line 32 there is an "ns" which appears to be unnecessary

Response:
Ns removed from Table 2.

VERSION 2 – REVIEW

REVIEWER	Joanne Lynn Center for Elder Care and Advanced Illness Altarum Institute USA No particular competing interests - just have worked with the same concepts.
REVIEW RETURNED	21-Jun-2017

GENERAL COMMENTS	Review: Aaltonen M. et al, Changes in the older people's care profiles during the last two years of life… Submitted June 21, 2017, Joanne Lynn, MD, Director, Center for Elder Care and Advanced Illness, Altarum Institute, Washington, DC, USA This is a strikingly comprehensive look at population trends in a geographic area, showing trends in service needs of the elderly population over time. The report is descriptive and the analyses are appropriate and presented well. The connections to policy are well-stated and helpful. A few more improvements are possible: 1. Abstract should give key data- not just generalities. 2. The abuse of the word "care" (in the medical literature generally) has become more annoying – consider in Abstract "after which they moved into care" and "high use of care" – surely these persons would be receiving care at home, too. Why not use "services" or, as appropriate, "institutional services?" The authors' explanation makes clear that service homes are not counted as institutional in Finland. But still, we could use a longer phrase and thereby not denigrate the work of informal caregivers as somehow not being "care." 3. In Abstract – what does "care at the end of life" mean – 6 months or 2 years? (page 2-3) 4. This sentence is hard to understand and could be recast – p 8, line 15+ - "In addition to paying rent for housing, medication and most services are paid out of pocket, although they are party reimbursed by the Social Insurance." 5. There is an odd sequence of analyses – p 10, lines 17 – 22. This could be the way to present the data, but the analyses probably

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	had to do the descriptions in each time frame first, and then the comparisons. 6. I still find it odd to call the work to split the four profiles as "identified" – these are arbitrary splits that did not arise from the data but from understandings of the authors as to what is important to patients. The manuscript certainly characterizes the four profiles, but the profiles could just as well have been cut at 1 care transition, rather than 0. And the split on time out of facility could have been 180+ days. This is not a criticism of the categories chosen, just a call for their origin being clear throughout. 7. The role of the service homes is an important element –it is not clear whether these should count with facility care or with home settings. While services are available 24-hours-a-day, is most of that time "on call" – and people are expected to need only scheduled services for a relatively small part of the day? This has been a perpetual dispute in the US – should assisted living centers count as apartments with services or as institutions? Since they are new in Finland and filling a gap, their ambiguous status deserves attention. It is not obvious that they should count as facility-based care, though the prose now adds that they take care of persons similar to nursing homes but they are more home-like. 8. Page 19, lines 3+ It seems a bit of an overstatement to equate Profile 1 to sudden death and Profile 2 to cancer, in Lunney's work. Perhaps it would be more accurate to say that Lunney's groupings are probably mostly included in the way designated, but not that the profiles "represent" Lunney's. 9. Page 20, lines 11+ Some people in some conditions that might usually lead to hospitalization should not go to hospital but should have services where they live, either because transfer and hospital-associated risks exceed likely gains, or because the person is coming close to death and prefers to stay home. In Finnish homes, service homes, and nursing homes, is it likely that a person could get medical care at home? The prose as written does not account for that possibility; rather, it assumes that it is appropriate to send these people to the hospital. 10. The report claims high accuracy of the registries. What is known about the accuracy of diagnoses of dementia and frailty? Certainly, those are dramatically under-diagnosed in the U.S. 11. Page 5, line 5 – there is something jarring about saying that mortality is declining – mortality is and always has been 100%. There is a decline in age-adjusted mortality, or a delay in mortality, but not a decline. Possibly best to simply re-word to say "Driven mainly by longer average lifespans,…" 12. Page 23, line 13 – the argument to this point has been about longer disability. This line switches to more "severe" disability. There is no evidence presented for that possibility. Most likely, the authors meant "…characterized by a longer period of serious disability…" 13. Page 23, line 320-21 – It is not clear what is meant by "especially long-term care,…" It seems that living most of the last two years of life in round-the-clock care is already "long term care." Perhaps the authors meant "long term care facilities?" This might also be true of page 24, line 7, the last lines of the paper. 14. Page 6, line 3 – "affected" might be more proper than "impacted" 15. Page 8, line 1 – no apostrophe on "wards" 16. P. 11, line 18 – when saying "total" number of days –probably more clear to say "per capita" or "on average" to make it clear that it is not the population total 17. p. 22, line 5 – add "a" – "over a certain time period."

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REVIEWER	Jeffrey Poss School of Public Health and Health Systems, University of Waterloo, Canada
REVIEW RETURNED	23-Jun-2017

GENERAL COMMENTS	The authors have addressed my comments.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Joanne Lynn
Institution and Country: Center for Elder Care and Advanced Illness, Altarum Institute, USA Please state any competing interests or state 'None declared': No particular competing interests - just have worked with the same concepts.

Please leave your comments for the authors below

Review: Aaltonen M. et al, Changes in the older people's care profiles during the last two years of life… Submitted June 21, 2017, Joanne Lynn, MD, Director, Center for Elder Care and Advanced Illness, Altarum Institute, Washington, DC, USA This is a strikingly comprehensive look at population trends in a geographic area, showing trends in service needs of the elderly population over time. The report is descriptive and the analyses are appropriate and presented well. The connections to policy are well-stated and helpful.
A few more improvements are possible:

Comment 1:
Abstract should give key data- not just generalities.

Response:
Design and results are revised and include more detailed information.

Comment 2:
The abuse of the word "care" (in the medical literature generally) has become more annoying – consider in Abstract "after which they moved into care" and "high use of care" – surely these persons would be receiving care at home, too. Why not use "services" or, as appropriate, "institutional services?" The authors' explanation makes clear that service homes are not counted as institutional in Finland. But still, we could use a longer phrase and thereby not denigrate the work of informal caregivers as somehow not being "care."

Response:
We added "services" to abstract to clarify the nature of care studied here, and also added "after which they moved into hospital or long-term care facilities". Use of term care has been checked throughout the paper.

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Comment 3:
In Abstract – what does “care at the end of life” mean – 6 months or 2 years? (page 2-3)

Response:
The end of life refers to the last six months of life and is now stated for the first time in Abstract Methods.
The end of life is removed from the beginning of the abstract to avoid the confusion which is the end of life, the last 2 years or last 6 months.

Comment 4:
This sentence is hard to understand and could be recast – p 8, line 15+ - “In addition to paying rent for housing, medication and most services are paid out of pocket, although they are party reimbursed by the Social Insurance.”

Response:
The sentence is revised.

Comment 5:
There is an odd sequence of analyses – p 10, lines 17 – 22. This could be the way to present the data, but the analyses probably had to do the descriptions in each time frame first, and then the comparisons.

Response:
The description of analyses is revised.

Comment 6:
I still find it odd to call the work to split the four profiles as “identified” – these are arbitrary splits that did not arise from the data but from understandings of the authors as to what is important to patients. The manuscript certainly characterizes the four profiles, but the profiles could just as well have been cut at 1 care transition, rather than 0. And the split on time out of facility could have been 180+ days. This is not a criticism of the categories chosen, just a call for their origin being clear throughout.

Response:
The word identified is replaced with “constructed”. Also “analyzed” and “categorized” are used to describe the role of authors more adequately.

Comment 7:
The role of the service homes is an important element –it is not clear whether these should count with facility care or with home settings. While services are available 24-hours-a-day, is most of that time “on call” – and people are expected to need only scheduled services for a relatively small part of the day? This has been a perpetual dispute in the US – should assisted living centers count as apartments with services or as institutions? Since they are new in Finland and filling a gap, their ambiguous status deserves attention. It is not obvious that they should count as facility-based care, though the prose now adds that they take care of persons similar to nursing homes but they are more home-like.

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Response:
Service housing with 24-hour assistance are categorized as care facilities and round-the-clock care, but not as institutional care. They are considered more homelike and allowing more self-determination for older people, but in fact, rather than filling the cap they are responding to the same needs as institutional nursing homes. The shift from institutional long-term care to service housing is mainly motivated by financial factors; in service housing a greater share of costs than in traditional nursing homes is covered by residents themselves and by the state through our national social insurance. Hence there has been a financial incentive for municipalities to shift from nursing homes to service housing 24-h. The fact that the use of service housing with 24-hour assistance is monitored daily and included in the Care Register for Social Welfare as the use of institutional care, verifies the idea that service housing is a care facility like nursing homes. Another important issue is what is considered as home and what people experience as home. However, these latter questions would deserve another article.

Comment 8:
Page 19, lines 3+ It seems a bit of an overstatement to equate Profile 1 to sudden death and Profile 2 to cancer, in Lunney's work. Perhaps it would be more accurate to say that Lunney's groupings are probably mostly included in the way designated, but not that the profiles "represent" Lunney's.

Response:
The "profiles represent" is removed and replaced with "likely include".

Comment 9:
Page 20, lines 11+ Some people in some conditions that might usually lead to hospitalization should not go to hospital but should have services where they live, either because transfer and hospital-associated risks exceed likely gains, or because the person is coming close to death and prefers to stay home. In Finnish homes, service homes, and nursing homes, is it likely that a person could get medical care at home? The prose as written does not account for that possibility; rather, it assumes that it is appropriate to send these people to the hospital.

Response:
In Finland people can get care provided by home care nurses, but it is relatively rare (in most municipalities not possible) that for example a medical doctor or a geriatrician would visit home. Thus medical care provided at private home is not a real option for hospitalizations especially in conditions like hip fracture or severe falls which we mention in text. In service housing with 24-h assistance people are entitled for basic medical care and palliative care, the same as in nursing homes.

Comment 10:
The report claims high accuracy of the registries. What is known about the accuracy of diagnoses of dementia and frailty? Certainly, those are dramatically under-diagnosed in the U.S.

Response:
Registers are considered reliable what comes to the conditions diagnosed. In our study, the information on dementia diagnosis is gathered from three registers, including four registered causes of death, which increases the reliability of diagnoses detection. Another thing is that the diagnostics of dementing diseases has improved during the past 20 years and it cannot be excluded that the registers therefore are more accurate in reporting these diseases at the end of our study period than in the beginning. There is no evidence that dementia would be dramatically under-diagnosed in Finland. A sentence is added to p.23, lines 19-22, in paragraph where diagnostic practices were already mentioned.

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Comment 11:
Page 5, line 5 – there is something jarring about saying that mortality is declining – mortality is and always has been 100%. There is a decline in age-adjusted mortality, or a delay in mortality, but not a decline. Possibly best to simply re-word to say “Driven mainly by longer average lifespans,…”

Comment 12:
Page 23, line 13 – the argument to this point has been about longer disability. This line switches to more “severe” disability. There is no evidence presented for that possibility. Most likely, the authors meant “…characterized by a longer period of serious disability…”

Response:
11-12: The sentences are revised.

Comment 13:
Page 23, line 320-21 – It is not clear what is meant by “especially long-term care,…” It seems that living most of the last two years of life in round-the-clock care is already “long term care.” Perhaps the authors meant “long term care facilities?” This might also be true of page 24, line 7, the last lines of the paper.

Response:
The first sentence is revised. The last lines are left as they are, because there long-term care can be understood in its broadest meaning (including all possible long-term care providers).

Comment:
14. Page 6, line 3 – “affected” might be more proper than “impacted”
15. Page 8, line 1 – no apostrophe on “wards”
16. P. 11, line 18 – when saying “total” number of days –probably more clear to say “per capita” or “on average” to make it clear that it is not the population total
17. p. 22, line 5 – add “a” – “over a certain time period.”

Response:
14-17 revised.

VERSION 3 – REVIEW

REVIEWER	Joanne Lynn, MD Center for Elder Care and Advanced Illness Altarum Institute USA
REVIEW RETURNED	18-Aug-2017

GENERAL COMMENTS	Profile 2 probably includes a substantial number of Lunney's frail elder group as well as Profiles 3 and 4.

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VERSION 3 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Joanne Lynn, MD
Institution and Country: Center for Elder Care and Advanced Illness, Altarum Institute, USA
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

Comment:
Profile 2 probably includes a substantial number of Lunney's frail elder group as well as Profiles 3 and 4.

Response: True, especially in later years when the number (and proportion) of very old people with dementia belonged to profile 2. We refer to this issue on page 22, rows 9-16.

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