

Age-related references in national public health, technology appraisal and clinical guidelines and guidance: documentary analysis

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Abstract

Background

Older people may be less likely to receive potentially beneficial interventions than those who are younger. Implicit or explicit age bias in national guidance may influence entire public health and health care systems. We examined how National Institute for Health & Care Excellence (NICE) guidance and guidelines consider age.

Methods

We undertook a documentary analysis of NICE public health (n=33) and clinical (n=114) guidelines and technology appraisals (n=212). We systematically searched for age-related terms, and conducted thematic analysis of the full paragraphs in which these occurred ('age-extracts'). Quantitative analysis explored frequency of age-extracts between and within document types. Illustrative quotes were used to elaborate and help explain quantitative findings.

Results

A total of 2314 age-extracts were identified within three over-arching themes: age documented as an a-priori consideration at scope-setting; documentation of differential effectiveness, cost-effectives or other outcomes by age; and documentation of age-specific recommendations. Age was not considered in a consistent way across the three document types. In general, public health guidelines appeared to consider age more comprehensively. There were some clear examples of older-age being considered in both searching for evidence and in making specific recommendations, suggesting that this can be achieved within current processes.

Conclusions

We found inconsistencies in how age is considered in NICE public health and clinical guidelines and technology appraisals. More effort may be required to ensure age is consistently considered across all processes. Future NICE guidance should systematically search for and document evidence of age-related differences in receipt of interventions. Where evidence is available relating to effectiveness and cost-effectiveness in older populations, more explicit age-related recommendations should be made. Where there is a lack of evidence, guidance should formally state what new research is needed.

Keywords: older age, NICE guidance, clinical, public health, technology appraisal

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Introduction

There has been substantial research examining inequity of access to and receipt of health care and public health interventions by vulnerable groups,[1-3] including older people.[4-6] Older people may be less likely to receive potentially beneficial interventions than younger people, due to a range of factors at individual, family, community and system level[4, 7-10] and this can translate into worse outcomes.[11] Given current demographic trends towards an ageing population,[12] it is particularly important to understand where and why age-related differences in access to and receipt of effective interventions occur and identify strategies to overcome these.

In the UK, the National Service Framework for Older People (2001) highlighted the need for “rooting out age-discrimination” (p12) in Health and Social Care.[13] The UK Equality Act (2010) came into force on 1st October 2012. This made age discrimination in the provision of services and public functions, including health care and public health, unlawful. Where age is considered a relevant factor in clinical and public health decision-making, the Equality Act (2010) requires “objective justification”(p10) in accordance with evidence-based guidelines.[14] Elsewhere, the World Health Organization is currently consulting on a Global Strategy and Action Plan on Ageing and Health which includes a focus on equitable access to health and health-care interventions.[15]

One important source of information for those planning and delivering public health and health care interventions is national guidance and guidelines. In England, the National Institute for Health & Care Excellence (NICE) produces systematically developed, evidence-based guidance and guidelines and for health, public health and social care planners and practitioners (see **Box 1**). NICE is internationally recognised as a role model in this area.[16] If age, or other, biases are present in such guidance and guidelines, this may influence entire public health and health care systems.

Box 1: National Institute for Health & Clinical Excellence (NICE) guidance and guidelines

NICE guidelines makes recommendations that are determined by independent committees on a wide range of topics, based on the best available evidence of what works, and what it costs. NICE also produces social value judgments relating to equity that the committee must take into account when making recommendations. Guidance are developed using similar processes, but are mandatory. We included two types of guidelines and one type of guidance in this study:

Public health guidelines

These are advisory and make recommendations for populations and individuals in relation to activities, policies and strategies that can help prevent disease or improve health. The guidelines may be topic, population, or setting based.

NICE clinical guidelines

These are recommendations on how healthcare professionals and others should care for people with specific conditions. Healthcare professionals are advised to take the guidelines into account when exercising clinical judgement, whilst making decisions appropriate to the individual circumstances and wishes of patients.

Technology appraisals

These provide statutory guidance on clinical needs and practice when prescribing drugs or technologies to improve health outcomes or prevent disease, and thus are mandatory.

We sought to understand whether and how age is considered in two types of NICE guidelines and one type of NICE guidance and whether some of these are more 'age-sensitive' than others. In this way we aimed to address whether existing guidance and guidelines could have positive, negative or uncertain impacts on any age-related inequities in the design and delivery of public health and health care interventions.

Methods

We systematically searched three types of NICE documents to identify all references to age and categorised these into themes. We then explored the frequency of these references to age overall and within themes, within and across the three types of documents.

Document inclusion criteria

We included three types of documents of most relevance to healthcare and other practitioners, those describing: clinical guidelines, public health guidelines and technology appraisals (see Box 1). NICE guidance and guidelines are produced in multiple formats and each final guideline or guidance is accompanied by a variety of other documents, including evidence syntheses, scope setting etc. We focused on final documents that professionals searching for these would be likely to find and use to guide practice.

Documents available from the list at <http://www.nice.org.uk/guidance> in July 2014 were considered for inclusion in the analysis. This list included full versions of the public health guidelines and technology appraisals, and shortened versions of the clinical guidelines. We did not include background documents or ‘fuller’ versions of clinical guidelines. Guidelines and guidance specific to young people, children, or pregnant women were excluded.

Documents for exclusion were identified by LFF and independently checked by NP. Any disagreements were resolved by discussion.

Document searching and data extraction

A systematic electronic search of included documents was used to locate all references to: ‘age’, ‘old’, and ‘elder’, and other terms for which these were the stem, such as ‘aged’, ‘older’ and ‘elderly’. When such age-related terms were identified, the full paragraph around each was extracted verbatim from the document (referred to as ‘age-extracts’) for thematic analysis. This ensured the context and meaning was retained during analysis, but meant that more than one age-related term could be included within each age-extract. Age-extracts were the primary unit of analysis throughout.

Analysis and Presentation of data

Age-extracts were coded using a framework of themes and sub-themes, which was inductively and iteratively developed by LF and checked by SB. We identified the total number of age-extracts falling within each theme and subtheme, as well as the number specifically referring to older age, rather than age in general. A number of identified themes were excluded from further consideration. These were: use of ‘age’ unrelated to chronological human age (e.g. the age of studies); age included in job titles (e.g. Professor of Old Age Psychiatry); references to other NICE guidance; and references to children only.

Data extraction and thematic coding were conducted by LFF. Five random age-extracts per theme were checked by SB. Any disagreements were resolved by discussion.

We tabulated the total number of age-extracts overall, and within each theme and sub-theme, across document types. We used Poisson regression (after checking that assumptions were met) to compare the total number of age-extracts across document type, using the log number of documents as the offset. We derived the relative rate of age-extracts by exponentiating the coefficients and tested for heterogeneity by using the Wald test for the document type variable.

Although the results focus on quantitative results, example quotes from age-extracts within each theme are used to illustrate and help explain the findings.

Results

A total of 359 documents met the inclusion criteria and were included in the analyses. Within these, 2,314 age-extracts were identified. This equated to a mean of 6.4 age-extracts per document. These fell in to three overarching themes: age documented as an a-priori consideration at scope-setting; documentation of differential effectiveness, cost-effectiveness or other outcomes by age; and documentation of age-specific recommendations.

Table 1 shows the distribution of age-extracts overall and within themes, across document types. Public health (relative rate 2.68, 95% CI 2.41 to 2.99, p<0.001) and clinical guidelines (relative rate 1.14, 95% CI 1.04 to 1.25, p=0.006) contained a greater number of age-extracts than technology appraisals (comparator). There was strong evidence of statistical heterogeneity (p<0.001).

Table 1: distribution of age-extracts overall and within themes across document type

		Public Health guidelines (n=33)	Clinical guidelines (n=114)	Technology appraisals (n=212)	Total (n=359)
All themes	Age-extracts, n	476	699	1139	2314
	Mean age-extracts/document, n	14.4	6.1	5.4	6.4
Theme 1	Age-extracts, n	127	213	178	518
	Mean age-extracts/document, n	3.8	1.9	0.8	1.4
Theme 2	Age-extracts, n	193	47	697	937
	Mean age-extracts/document, n	5.8	0.4	3.3	2.6
Theme 3	Age-extracts, n	156	439	264	859
	Mean age-extracts/document, n	4.7	3.9	1.2	2.4

Table 2 details the framework of included themes and subthemes, with the number of age-extracts in these by guideline type. Below, we discuss key findings within each theme in turn.

Theme 1: age documented as an *a-priori* consideration in guidance scope

Almost half of clinical guidelines (n=49, 43%) were aimed at age-specific groups. This compared to only a quarter of public health guidelines (n=8, 24%) and technology appraisals (n=81, 23%). However, very few of any type of document were aimed at older-age groups specifically (n=15, 4%).

Only public health guidelines documented considering age at scope-setting, although this was done in less than half of cases (n=14, 42%). On 11 occasions, the same question was listed: “Does the effectiveness of the intervention vary with different characteristics within the target population, such as age?”. This question was not documented in any technology appraisals or clinical guidelines.

Public health guidelines were more likely than clinical guidelines or technology appraisals to report statistics describing the problem addressed by age. This was done in three-quarters (n=25, 76%) of public health guidelines, but only one-fifth of technology appraisals (n=22, 19%) and clinical guidelines (n=44, 21%). Similarly, public health guidelines were more likely to describe why age might be an important factor to consider than other documents.

However, this was only done in one third (n=11, 33%) of public health guidelines. Around

one third of all documents identified age as a risk factor for the problem addressed (n=105, 29%), particularly older-age (n=87, 24%).

Box 2 provides illustrative quotations from age-extracts coded within theme 1.

Box 2: illustrative quotations from age-extracts within theme 1

Age in guideline scope

“Are interventions tailored to sub-sets of the smoking population (for example, pregnant women, older smokers) more effective with them than generic interventions?” *PH1 Brief interventions and referral for smoking cessation*

“How does the effectiveness vary with age, gender, class, ethnicity, etc?” *PH2 Four commonly used methods to increase physical activity*

“What are the most effective and cost effective ways for primary and residential care services to promote the mental wellbeing of older people?” *PH16 Occupational therapy and physical activity interventions to promote the mental wellbeing of older people in primary care and residential care*

Statistics describing problem considered by age

“Fifty three per cent of men aged 16–24 achieved the recommended activity levels, compared with 8% of men aged 75 and over. Among women, 29–31% aged 16–54 reached the recommended level. However, the same was only true of 3% of women aged 75 and over.” *PH2 Four commonly used methods to increase physical activity*

Age stated as risk factor for problem considered

“In people between the ages of 45 and 49 years, the incidence is about 20 per 100,000. In those aged 75 and older, the annual incidence is over 300 cases per 100,000 men and over 200 cases per 100,000 women.” *TA105 Laparoscopic surgery for colorectal cancer*

Statements of why age is an important factor to consider

“More than 250,000 older people (aged 66 and older) living in England in private households reported experiencing maltreatment from a family member.” *PH50 Domestic violence and abuse – how services can respond effectively*

Theme 2: documentation of differential effectiveness, cost-effectiveness or other outcomes by age

Detailed considerations of evidence of effectiveness and cost-effectiveness were not included in the clinical guideline documents included. However, effectiveness and cost-effectiveness evidence statements were included in a small number of clinical guidelines (2-4%). Whilst no clinical guidelines described age-related evidence limitations on cost-effectiveness, 17 (15%) described age-related limitations in evidence of effectiveness and these primarily related specifically to older-age (n=12, 11%).

Overall, public health guidelines were at least twice as likely as technology appraisals to report evidence of differential effectiveness and cost-effectiveness by age, as well as age-related evidence gaps in evidence of effectiveness and cost-effectiveness. Whilst the majority of evidence statement of differential effectiveness by age specifically related to older age, this was not the case for cost-effectiveness evidence statements and age-related evidence gaps.

A number of evidence statements in public health guidelines were based on qualitative work relating to understanding of risk, and of the relevance, appropriateness or acceptability of an intervention for older populations. Some public health guidelines also referred to factors that might account for the lower uptake or effectiveness of interventions in older populations, such as: frailty, poorer health, age-related differences in perception of relative risk, use of tools designed for younger people, and scarcity of resources.

A number of technology appraisals (n=33,16%) and public health guidelines (n=1,3%) noted that the age-profile of those included in relevant trials was different (generally younger) to the age-profile of those at risk of the problem studied.

Illustrative quotes from age-extracts in theme 2 are shown in **Box 3**.

Box 3: illustrative quotations from age-extracts within theme 2**Evidence statements of differential effectiveness/cost-effectiveness by age**

"One...study reports a reduction in effectiveness in promoting CVD [cardio-vascular disease] awareness in older participants. Two...studies report no differences in effectiveness according to age." *PH25 Prevention of cardiovascular disease*

"A meta-analysis of exercise capacity with dual-chamber pacing compared with single-chamber ventricular pacing demonstrated no difference...for patients older than 75 years ...but there was...for patients younger than 75." *TA88 Dual-chamber pacemakers for symptomatic bradycardia due to sick sinus syndrome and or atrioventricular block*

Limitations or gaps in evidence of effectiveness/cost-effectiveness by age

"However, there are no good-quality randomised controlled trials comparing the 3 main drug classes (beta-blockers, calcium-channel blockers and digoxin) used for rate control, and no studies specifically addressing people aged 75 and over." *CG180 The management of atrial fibrillation*

"No evidence was found of effective or cost-effective interventions to promote mental wellbeing in older people living in residential care or for those whose physical and mental health needs are complex." *PH16 Mental wellbeing and older people*

Age as a reason why interventions not offered/ineffective in older people

"One qualitative study...found that age was widely perceived to influence access to services...Focus groups revealed that staff appeared to have knowledge of the benefits for older people but that scarcity of resources prevented them offering more accessible and appropriate services." *PH15 Identifying and supporting people most at risk of dying prematurely*

"The PDG [programme development group] considered that people over age 74...might benefit from type 2 diabetes risk assessment and prevention...However, it recognised that many of the risk-assessment tools are not validated for this age group and that comorbidities may make participation in lifestyle programmes more difficult for some." *PH38 Preventing type 2 diabetes – risk identification and interventions for individuals at high risk*

Age of those included in trials different to that those at risk

"The Committee ... noted that the mean age of patients in the trial was 56 years but heard from the Evidence Review Group that the average age of men with gout in UK practice was around 10 years older." *TA291 Gout (tophaceous, severe debilitating, chronic) – pegloticase*

Theme 3: documentation of age-specific recommendations

Two thirds of public health guidelines (n=22, 67%) documented that they took age into account when making recommendations. This compared to no clinical guidelines, and two-fifths of technology appraisals (n=82, 39%). Many of these recommendations focused on ensuring people were not excluded from interventions on the basis of age alone.

Throughout, there were many documented discussions of whether age should be taken into account in recommendations and, in documents published since 2012, whether recommendations should be revised in light of the Equalities Act (2010). No such revisions were recommended and documents often concluded that intervention decisions should be made on an individual basis.

Evidence of effectiveness and cost-effectiveness of new technologies are often supplied by manufacturers to NICE technology appraisal panels. Panels appear to spend substantial time testing and discussing this evidence. Age is regularly examined during this process (n=82, 39%), but mostly in terms of how it is used in cost-effectiveness models.

Only public health guidelines made age-specific practice recommendations, but only in one-fifth of cases (n=7, 21%). Less than half of these recommendations were specific to older-age (n=3, 9%). In contrast, only clinical guidelines prioritised practice recommendations according to age, but these were only present in one-quarter (n=31, 27%). Again, less than half were older-age specific (n=17, 15%).

Age-specific research recommendations were present across guideline types – but were least often found in technology appraisals. Two thirds (n=22, 67%) of public health guidelines included recommendations for further age-specific effectiveness evidence and more than one third (n=13, 39%) for further age-specific cost-effectiveness evidence. Comparable figures for clinical guidelines were 31 (27%) and 6 (5%); and for technology appraisals were 4 (2%) and 0. In most cases, less than half of these were older-age specific.

Box 4 shows illustrative quotations from age-extracts in theme 3.

Box 4: illustrative quotations from age-extracts within theme 3**Age taken into consideration when making recommendations**

"Comments from consultees indicated that a small population of older patients who are not fit enough to receive chemotherapy may not have access to an alternative treatment and so may be disadvantaged. The Committee agreed that this was not an issue of age discrimination because other factors can also affect whether people are fit enough to receive chemotherapy, such as comorbidities." *TA257 Breast cancer (metastatic hormone receptor) – lapatinib and trastuzumab (with aromatase inhibitor)*

"The Committee considered whether NICE's duties under the equalities legislation required it to alter or to add to its recommendations...Because its recommendation applied equally to all people with idiopathic pulmonary fibrosis, regardless of age, the Committee concluded that...there was no need to alter or add to its recommendations." *TA282 Idiopathic pulmonary fibrosis - pirfenidone*

Target population for recommendations age-specific

"All COPD patients still smoking, regardless of age, should be encouraged to stop, and offered help to do so, at every opportunity. [new 2004]" *CG101 Chronic obstructive pulmonary disease*

"Offer people aged 80 years and over the same antihypertensive drug treatment as people aged 55–80 years, taking into account any comorbidities. [new 2011]" *CG127 Hypertension*

"Patient-specific factors (including age, sex, smoking, obesity and comorbidities) should not be barriers to referral for joint surgery. [2008, amended 2014]" *CG177 Osteoarthritis*

Further effectiveness/cost-effectiveness research recommended by age

"How does effectiveness and cost effectiveness vary for...people aged 75 and over?" *PH32 Type 2 diabetes*

"Future studies should be sufficiently powered to detect changes in mental wellbeing ...In addition, the outcome measures used should be appropriate to detect change across different groups of older people." *PH16 Mental wellbeing and older people*

Discussion

Summary of findings

This is the first attempt that we are aware of to analyse how age in general, and older-age in particular, is considered in national health and healthcare guidelines and guidance. Using NICE as a case study, we found 2,314 age-extracts across 359 public health and clinical

guidelines and technology appraisals. These fell into three broad themes: age documented as an a-priori consideration at scope-setting; documentation of differential effectiveness, cost-effectives or other outcomes by age; and documentation of age-specific recommendations.

Age was not considered in a consistent way across the three document types. In general, public health guidelines appeared to consider age more comprehensively, but this was still not consistent within all public health guidelines.

A lack of explicit age-related recommendations within guidelines and guidance could result in uncertainties for practitioners and commissioners. In the absence of evidence, guideline developers might choose to highlight the need for further research. Whilst many public health guidelines did this, few technology appraisals and clinical guidelines did so.

Strengths and weaknesses of methods

NICE produce a range of different guidelines and guidance. We focused on clinical and public health guidelines and technology appraisals as we considered these to be most relevant for practitioners and commissioners. Although multiple documents related to each guideline and piece of guidance are available, we focused on the most front-facing of these that practitioners would be most likely to find. This maximised the relevance of our findings. However, our findings are not necessarily generalizable to other types of NICE document, or to other countries that have different systems for guideline and guidance development.

Documentary analysis is labour intensive and time-consuming.[17] We searched and extracted data from hundreds of large documents. It was not feasible to read all of these in full. Instead we automated searching, but coded automatically identified extracts by hand. Duplicate thematic coding helped increase the validity of this.

There was inconsistency in the information included in the different types of documents included. In particular, the clinical guideline documents included did not incorporate the evidence used to make recommendations (although this is available elsewhere), whilst public health guidelines and technology appraisal documents did. This may explain some of the differences between document types found. However, variations in reporting may also reflect variations in approach.

As we conducted a documentary analysis, we were only able to include what had been documented. Committees developing guidance and guidelines may have considered many issues that were not explicitly recorded in the documents analysed.

We searched specifically for age-related terms. Instances when age was indirectly referred to, for example in terms of life expectancy or frailty, may have been excluded. As such, our results may underestimate frequency of age-extracts. However, there is little reason to believe this underestimation would vary systematically across document types and so constitute bias.

We excluded guidance and guidelines with a specific focus on children, young people and pregnant women. We did not make judgements about which included documents should have considered age. However, it could be argued that all should have done – even if just to state that guidance and guidelines were relevant across the age spectrum.

It is unclear how much impact NICE guidance has on practice or commissioning and thus how much the differences identified here might influence practice.[18] However, it has been suggested that increasing the specificity of guidelines is likely to improve implementation.[19]

Interpretation of results

Since the implementation of the Equality Act (2010) in 2012, NICE is legally obliged to ensure that age-discrimination does not occur. Whilst the Act does appear to have resulted in age being more explicitly considered in technology appraisals, this often appeared to be more a post-hoc check for compliance, than an integration of the Act's principles throughout the development process. Further developments to embed the principles of the Equality Act (2010) in NICE processes may be planned.

Legal obligations are only one aspect of equity. The concept of 'embedded inequity' proposes that consideration should also be made of whether omissions in methodological process, outcome measures, and individual context and circumstances might lead to discrimination.[20] As others have reported,[21] we found that public health guidelines appear to more consistently (but not universally) include consideration of age from the start than technology appraisals and clinical guidelines. This may reflect the use of a conceptual framework to inform public health guidance development and explicitly consider

inequalities since at least 2009. This suggests that whilst some NICE processes help ensure embedded equity, others do not.

Nearly half of public health guidelines and one-fifth of technology appraisals reported evidence of differential effectiveness and cost-effectiveness by age. Interventions may be less cost-effective in older people due to their shorter life expectancy.[22] However, in many instances where prevalence increases with age, numbers needed to treat will be smaller in older people due to higher absolute risk and this may increase the cost-effectiveness of some interventions as age increases. Furthermore, the benefits of interventions to older people, in terms of reduced morbidity, improved quality of life and maintained independence, are likely to be different, but no less valuable, than those to younger people.[23] More consideration of how these age-related differences in benefit can be taken into account in cost-effectiveness calculations is required as well as consideration of alternative methodological approaches that may be more suited for older people.[24]

Comparison with previous findings

As we found, a recent report on the extent to which surgical guidelines support decision making in older people reported a lack of clear age-related recommendations.[25] Others have suggested that NICE make explicit reference to age where there is evidence of age-related inequities in receipt of interventions.[25] However, little is known about whether, and where, age-related inequities in receipt of health care and public health interventions occur. More concerted and systematic action is required to identify age-related differences in receipt interventions to guide development of guidelines and guidance.

Implications for research, policy and practice

When age was considered in the documents we reviewed, a lack of evidence on effectiveness and cost-effectiveness in older populations was often noted. This lack of evidence could influence clinicians and other practitioners in two different ways. Some might argue that it is unwise to provide interventions without evidence of effectiveness or cost-effectiveness. This is likely to result in age-related differences in receipt of interventions. Others may feel that older people should have access to all interventions until such time as evidence emerges of a lack of effectiveness or cost-effectiveness. Whilst the Equality Act (2010) would favour the latter approach, over-provision of ineffective interventions to older people may result in iatrogenesis and waste. Research on the

effectiveness and cost-effectiveness of interventions in older populations is required to overcome any ambiguity in who should be offered interventions. Until this is available, clear and consistent guidance on how practitioners should act in the face of absence of evidence is required.

Many included documents identified that the age profile of those included in trials and evaluations was not representative of the population most at risk. There is little scientific justification for this and future research should focus on providing evidence relevant to those populations most at risk.

In several instances, documents avoided the issue of chronological age by referring to biological age, frailty or ‘fitness’, leaving decisions on assessment of these to practitioners. Given the variability in how practitioners make such judgements, there are concerns that decisions might be influenced by unconscious prejudices.[26] Better understanding is required of how the risks and benefits of interventions are evaluated by practitioners and older people in the absence of explicit guidance, and what contributions these assessments may make to inequalities in receipt of interventions.

Conclusions

We found inconsistencies in how age is considered in NICE public health and clinical guidelines and technology appraisals. There were some clear examples of older-age being considered in both searching for evidence and in making specific recommendations, suggesting that this can be achieved within current processes.

NICE deserves credit for openly discussing equity issues in decision making.[27] More effort may be required to ensure age is consistently considered across all processes. Future NICE guidance should systematically search for and document evidence of age-related differences in receipt of interventions. Where evidence is available relating to effectiveness and cost-effectiveness in older populations, more explicit age-related recommendations should be made. Where there is a lack of evidence, guidance should formally state what new research is needed.

Declarations

Abbreviations

NICE: National Institute of Health & Clinical Excellence

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

All data used in this manuscript are publically available from

<http://www.nice.org.uk/guidance>

Competing interests

None.

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Authors contributions

MW had the initial idea for the study, developed the methods, contributed to data interpretation and provided critical comments on previous drafts. JA and SSo helped develop the initial research idea, developed the methods, contributed to data interpretation and provided critical comments on previous drafts. LFF developed the methods, selected NICE guidance for inclusion, conducted the data extraction and analysis, and drafted and revised the paper. SB checked the themes and coded extracts, contributed to data interpretation and provided critical comments on previous drafts. YBS conducted the statistical analysis, contributed to data interpretation and provided critical comments on previous drafts. NP helped select NICE guidance for inclusion, contributed to data interpretation and provided critical comments on previous drafts. SSa, KW and MR contributed to data interpretation and provided critical comments on previous drafts.

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1 Table 2: age-related themes and subthemes in public health, clinical and technology appraisal guidance

Theme and subtheme	Public health (n=33)		Clinical (n=114)		Technology appraisal (n=212)		Total (n=359)	
	Documents, n (%)	Age-extracts, n	Documents, n (%)	Age-extracts, n	Documents, n (%)	Age-extracts, n	Documents, n (%)	Age-extracts, n
Theme 1: Age documented as an a-priori consideration in guidance scope								
Age of population guidelines aimed at	8 (24)	11	49 (43)	98	24 (11)	34	81 (23)	143
Age of population guidelines aimed at (older-age specific)	1 (3)	3	6 (5)	42	8 (4)	9	15 (4)	54
Age in guideline scope	14 (42)	17	0	0	0	0	14 (4)	17
Age in guideline scope (older-age specific)	2 (6)	3	0	0	0	0	2 (1)	3
Statistics describing problem by age	24 (73)	61	22 (19)	31	44 (21)	54	90 (26)	146
Statistics describing problem by age (older-age specific)	6 (18)	10	14 (12)	15	25 (12)	27	45 (13)	52
Age stated as risk factor for problem	10 (30)	18	39 (34)	64	56 (26)	81	105 (29)	163
Age stated as risk factor for problem (older-age specific)	8 (24)	11	29 (25)	36	50 (24)	64	87 (24)	111
Statement of why age is an important factor to consider	11 (33)	20	18 (16)	20	8 (4)	9	37 (10)	49
Statement of why age is an important factor to consider (older-age specific)	6 (18)	9	8 (7)	9	6 (3)	7	20 (6)	25
Theme 2: Documentation of differential effectiveness, cost-effectiveness or other outcomes by age								
Age as an inclusion criterion in effectiveness studies	13 (39)	42	0	0	74 (35)	151	87 (24)	193
Evidence statements of differential effectiveness by age	16 (49)	66	4 (4)	12	33 (16)	61	53 (15)	139
Evidence statements of differential effectiveness by age (older-age specific)	15 (46)	47	4 (4)	12	14 (7)	27	33 (9)	86
Limitations or gaps in evidence of effectiveness by age	13 (39)	24	17 (15)	21	24 (11)	35	54 (15)	80
Limitations or gaps in evidence of effectiveness by age (older-age specific)	4 (12)	12	12 (11)	15	9 (4)	14	25 (7)	41
Age used in cost-effectiveness models	0	0	0	0	80 (38)	167	80 (22)	167
Evidence statements of differential cost-effectiveness by age	15 (46)	32	2 (2)	2	44 (21)	144	61 (17)	178
Evidence statements of differential cost-effectiveness by age (older-age specific)	6 (18)	11	2 (2)	2	24 (11)	83	32 (9)	96
Limitations or gaps in evidence of cost effectiveness by age	7 (21)	9	0	0	26 (12)	40	33 (9)	49
Limitations or gaps in evidence of cost effectiveness by age (older-age specific)	2 (6)	3	0	0	6 (3)	8	8 (2)	11

Age as a reason why interventions not offered/ineffective in older people	7 (21)	19	5 (4)	5	21 (10)	34	33 (9)	58
Age of those included in trials different to those at risk	1 (3)	1	0	0	33 (16)	49	34 (10)	50
Adverse effects in older people	0	0	6 (5)	7	13 (6)	16	19 (5)	23
Theme 3: Documentation of age-specific recommendations								
Age taken into consideration when making recommendations	22 (67)	39	0	0	82 (39)	220	104 (29)	259
Equality Act taken into consideration when making recommendations	1 (3)	1	0	0	10 (5)	16	11 (3)	17
Target population for recommendations age-specific	7 (21)	15	0	0	0	0	7 (2)	15
Target population for recommendations (older age-specific)	3 (9)	9	0	0	0	0	3 (1)	9
Priority for implementation of recommendations age specific	0	0	31 (27)	47	0	0	31 (9)	47
Priority for implementation of recommendations (older-age specific)	0	0	17 (15)	22	0	0	17 (5)	22
Further effectiveness research recommended by age	22 (67)	34	31 (27)	60	4 (2)	4	57 (16)	98
Further effectiveness research recommended by age (older-age specific)	4 (12)	11	19 (17)	45	2 (1)	2	25 (7)	58
Further cost-effectiveness research recommended by age	13 (39)	21	6 (5)	7	0	0	19 (5)	28
Further cost-effectiveness research recommended by age (older-age specific)	4 (12)	10	3 (3)	4	0	0	7 (2)	14
Other age-related recommendations	18 (55)	47	73 (64)	325	14 (7)	40	105 (29)	412
Other age-related recommendations (older-age specific)	8 (24)	17	48 (42)	149	8 (4)	28	64 (18)	194