JUST TELLING AND SELLING: CURRENT LIMITATIONS IN THE USE OF DIGITAL MEDIA IN PUBLIC HEALTH

A Scoping Review

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ABSTRACT

Objective: To undertake a scoping review and to map research in the area of digital media use in public health.

Study design: Scoping review.

Methods: PubMed, PsycINFO, Google and major textbooks of public health communication and health psychology were searched for primary studies or systematic reviews examining the use of digital media in a health context. Searches focussed on studies published between the start of 2000 and the end of June 2013. Abstracts of reviews of public health interventions were examined with respect to target groups, health topic, intervention characteristics, media used, study design, issues of quality and ethics, and outcomes. To map this area of work fully, this information was supplemented by adding information from primary studies. Areas were identified where systematic review evidence was scarce or non-existent by comparing the final map with information from the reviews analysed.

Results: 221 systematic reviews related to digital media use in a public health context were included. Most reviews included studies with an experimental design and general 'at risk' target populations. Specific settings were not specified in the majority of reviews. A large variety of health topics were covered. About a quarter of reviews did not specify a health topic but were concerned with broader issues of health promotion, disease prevention, or health education. Over half of the reviews focussed on eHealth and telemedicine, and another third were concerned with mass media – social marketing. Reviews most frequently reported behaviour-related outcomes or conducted some form of content analysis or analysis of the use of particular media. Research gaps were identified relating to community-based research, participation and empowerment, active media use (especially with respect to visual media und use of specific visual methodologies), and the use of salutogenic or assets-based approaches.

Conclusion: The available research relating to digital media use in public health is dominated by studies relating to eHealth, telehealth or social marketing; emphasising the passive reception of messages and a focus on individual behaviour change approaches. Issues of quality and

ethics need to be taken into account more consistently. Further research is needed with respect to more participatory methods, particularly those which would seek to use digital media as a means to harness individual and community assets.

Introduction

Advances in the technology and accessibility of digital media provide new opportunities for disseminating health messages, engaging communities, and delivering public health interventions. Media which can be used in this context include electronic media (e.g. internet, email)[1-8] and mobile 'm' technologies (e.g. mobile phones, personal digital assistants)[4;9-14], both with considerable interactive potential[5;15;16], as well as mass media[17-19], and other visual media (photography, film / video)[20-22]. Frequently, these media are used for providing information, education, or health-related feedback. More recently, more specific methodologies such as social marketing[23;24] and media advocacy[25], participatory or qualitative visual methods (photovoice, videovoice, participatory video, photoelicitation, participatory photo mapping)[21;26;27] have been developed. (Please see Table 1 (online) for a glossary with definitions of the specific approaches.)

With such a range of widely available technologies, it is now necessary to explore effectiveness and ways in which we can better understand the quality of media-related products and approaches and to address issues of ethics in relation to their use. The multidisciplinary nature of work in this field suggests that such criteria should seek to build on those already established within the contributing specialties.

While a range of systematic reviews is available on selected topics in this area (as outlined below), no overall map exists of research on digital media in public health. Similarly, while quality checklists and ethics guidelines exist for specific contexts, there is no map of interdisciplinary aspects of quality and ethics that could contribute to this field. The purpose of this scoping review was therefore to map existing research in the area of digital media use in public health as a basis for future systematic reviews and primary research, while taking account of relevant quality criteria.

Methods

The review was carried out according to the recommendations of scoping review methodology by Arksey and O'Malley (2005).[28] The authors define five stages for carrying out a scoping review: stage 1: identifying the research question; stage 2: identifying relevant studies; stage 3: study selection; stage 4: charting the data; stage 5: collating, summarising and reporting the results. They also include an optional stage 'consultation exercise'. Because we were working on a very limited research grant, we did not include a consultation exercise but did present and discuss results during a workshop session offered in the faculty. As only one researcher (CC) had any formal funding to carry out this study, the different stages of the review could not be carried out in duplicate.

Research question

How are digital media used in the area of public health?

Subquestions: What different kinds of media are used? How are they used? In what areas of public health are they used? Who are the target groups? How active is the involvement of the target groups?

Identifying relevant studies

PubMed, PsycINFO, and Google were searched for relevant information (by CC, KC, CD). Due to the rapid changes in technology, the main searches focussed on studies published since 2000. The following PubMed search strategy was adapted for use with other databases:

Sample PubMed search strategy
(("health communication*" OR "behavior change" OR "behaviour change" OR "health promotion" OR "participatory research" OR "visual anthropology" OR ethnography OR empowerment OR "health education" OR "health literacy") AND (film* OR movie* OR multimedia* OR photo* OR photograph* OR

video* OR audiovisual OR audio-visual OR multi-media*)) OR fotonovela OR "photo novella" OR "social marketing" OR "photoelicitation" OR "photo-elicitation" OR photovoice OR photo-voice OR videovoice OR video-voice OR "media advocacy" OR "visual storytelling" OR multimedia OR "video game*" OR "virtual reality tool*" OR telehealth OR imagery OR "public service announcement*" OR "social media" OR "photo mapping"

To identify systematic reviews, this search was combined with the PubMed “broad” clinical query for systematic reviews from the year 2000 up to June 2013. Results from this search were supplemented with systematic reviews identified through the other searches. Major textbooks of health psychology and public health communication were searched for additional studies.[29-31] Google searches were carried out to identify more specific information on aspects of ethics and quality.

Study selection

Primary studies or systematic reviews of digital media use in a public health context targeting any population and reporting any outcome were included in the scoping review. One reviewer focussed on visual media (CC); two reviewers focussed on electronic and online media (KC, CD), this was supplemented by additional studies in this area identified by CC. Systematic reviews focussing on prevention, health promotion and service provision (i.e. public health interventions) were analysed in more detail by one reviewer (CC), while information from other study types was used to complement the scoping map.

Data analysis – charting the data and summarising the results

Due to the amount of data identified, analysis of included studies was based on information provided in the publication abstracts. Review abstracts were analysed in detail by one reviewer (CC) based on design of included studies, target groups, health topics, type of media used,

interactivity, and outcomes assessed. Based on this information, a map of digital media use in public health was constructed and the relative frequency of certain features as reported by the abstracts was determined. This was supplemented (non-quantitatively) with data from primary studies and additional information identified. In the map, additional categories were also added, including type and purpose of message, type of methodology, level of engagement, levels of communication, and aspects of quality and ethics. Both the determination of frequency of certain review features and the listing of additional aspects not assessed in systematic reviews (or even high quality primary research studies) allowed an identification of gaps in this field.

Results

Literature search

In the electronic and supplementary searches, 4615 publications were identified, including 438 systematic reviews, based on abstract assessment. Of the systematic reviews, 221 were related to public health. The remaining studies were used as a pool for identifying and searching for additional themes covered.

Study characteristics

Table 2 shows an overview of the characteristics of the 221 public health reviews with respect to design, participants and outcomes. The vast majority (76.5%) included studies with an experimental design, 22% included observational studies, and only a minority (6%) included studies with a participatory or qualitative design. Of the reviews, most focussed on general populations, 16% focussed on children / adolescents and 4% on elderly people, 10% targeted healthcare professionals, students or researchers, and another 10% people from socially disadvantaged groups, low and middle income settings, or specific ethnic groups. Most reviews did not specify a particular setting, 14% specifically focussed on a community setting, 9% on a healthcare setting, and 8% on educational settings.

Figure 1 shows the major health topics that were targeted in the reviews. Details and review examples are shown in Table 3. The largest proportion of studies (23.5%) was concerned with general themes relating to health promotion or health education, or to health-related knowledge translation, health literacy or information seeking. A wide variety of more specific topics was covered (see Table 3), the most common of these were healthy eating, weight loss or body image (11%), physical activity or sedentary behaviour (10%), or mental health issues (9.5%).

Figure 2 represents the media covered by the reviews, with details given in Table 3. The majority of reviews focussed on eHealth, mHealth, telehealth or telemedicine (54%), followed by mass media or social marketing (32.5%). The remainder was concerned with video (9%), multimedia (8.5%) or video games (8%) used for educational purposes, observation of media use or effects (8%), and only a very small proportion (3%) evaluated participatory visual techniques such as photovoice. A large proportion of interventions (40%), especially in the first category, had an interactive component.

In terms of outcomes (see Table 3), the largest proportion of studies (42%) reported behaviour-related outcomes, around 23% each conducted some form of content analysis (e.g. of mobile phone apps, websites etc.) or analysed use respectively. Fifteen percent assessed knowledge, health literacy or attitudes, and around 7% each reported on health or mental health related parameters respectively.

Thematic map and emerging research needs

Figure 3 in the online supplement shows the thematic map. Table 4 shows details under each heading, with some additional examples. When comparing the items in the map and the public health systematic reviews classified, the following gaps in the systematic review evidence emerge:

- *Levels of communication:* the reviews appeared to cover most levels of communication, but the main focus seems to have been on interpersonal and public or mass communication, with less emphasis on community or organisational communication.
- *Level of engagement:* there was a scarcity of evidence on active participation, ownership and empowerment, with more information available on the passive reception of messages and observation. Many of the interventions using the internet and electronic communication were interactive without being participatory.
- *Purpose:* most of the media use and messages appeared to be aimed at passive reception of information and education, aiming for knowledge translation or individual behaviour change (or monitoring and feedback and decision aids in more clinical contexts); there is a particular need for research in the areas of media use for raising awareness and/or reducing prejudice, for changing policy, and for empowerment.
- *Target groups:* a range of target groups was covered, but there was less research targeting policy makers, the wider family or community (rather than just individuals), and non-medical professionals such as librarians, social workers, and teachers.
- *Theory and health models:* in-depth assessment of this aspect was not possible but we identified a scarcity of research using a salutogenic approach. Individual level behaviour-oriented approaches dominated.
- *Contributing disciplines:* studies were dominated by medical and health psychological viewpoints, with a lack of more explicitly multidisciplinary approaches, e.g. with non-academic experts such as staff from digital media companies used in the development of interventions.
- *Outcomes:* there was very little research explicitly reporting outcomes such as health- and function-related outcomes, wellbeing, quality of life and satisfaction, community change, service provision, needs and assets. There is a gap in relation to reach, scalability, sustainability, and quality and ethics.
- *Digital media:* studies on electronic media (internet, social media, mobile phones, teleHealth, email etc.) dominated. The emphasis of the use of visual media was in social

marketing / mass media campaigns and as part of public health or educational interventions, rather than in the context of qualitative or participatory research.

- *Visual methods in health:* there was a lack of information on more specific and active visual techniques, such as media advocacy, visual techniques in qualitative research (e.g. photo- or videoelicitation) or in participatory research (e.g. participatory video, photovoice, videovoice), as well as other more active and participatory methods such as photonovella, visual storytelling, participatory photo mapping, or visual problem appraisal.
- *Negative effects of media:* a range of reviews addressed the negative effects of media, such as the effects of violent video games, excessive television viewing, or advertising of unhealthy food for children. There was less information on other potential negative effects, such as bullying through social media, or body image distortion through advertising and other media portrayal.
- *Health aspects:* reviews covered a wide variety of health aspects, but approaches tended to target individual health behaviour (on topics such as healthy eating, weight loss, and/or physical activity), and with less emphasis placed on more integrated approaches towards a healthy behaviour or improving health in specific settings or in the community as a whole.

Issues of ethics and quality

Aspects of quality and ethics relevant to digital media use were explored more specifically by examining texts relevant to ethics and quality in a range of contributing disciplines, such as healthcare, health promotion, information psychology, business (organisational management), journalism, media law, and design.[32-54] Table 5 shows an overview of existing concepts and categories that can be drawn on to establish more specific criteria in the area of media and public health. No media application will stand for itself but will be linked to an iterative development process, as well as to desired outcomes. Any consideration of aspects of quality and ethics therefore has to include Donabedian's (1966)[38] criteria relating to contents; process and impact (see details in Table 5). A high quality intervention or application will also have an established quality management process, as well as a system for attending to ethical issues

(e.g. consideration by relevant ethics committees and involvement of a wide range of stakeholders). With the range of media and interventions under consideration, the criteria to be applied will vary by type of project, medium, target group, context, function, genre, and degree of interactivity, but a range of principles (e.g. relating to general ethics and quality management) will remain constant across projects.

Discussion

In theory, the digital media revolution should open new possibilities for Public Health. Broad and deep communication penetrance could offer the possibility of reaching parts of the population traditionally inaccessible to print based media and the potential for interaction could build relationships with end users based on their assets for health.

However our scoping review has shown that outwith telehealth and eHealth evaluations, current public health usage is largely based on the traditional and outmoded approach of “telling and selling” and cast the recipient in an individual and passive role. There appears to be little experience of engaging with end users in an active let alone interactive sense. Nor could we find good examples of digital media led community engagement. There is also a dearth of robust evidence on the widely presumed cost-effectiveness of media usage in public health messaging. We found relatively little information on the use of a range of more specific visual methodologies (including qualitative and participatory visual methods). These were of particular interest to us because of the potential they have to overcome literacy and language barriers.

Thus overall we worry that current digital media usage in Public Health may at best fail to impact, and at worse reinforce, health inequalities.

Quality and ethical issues relating to the use of digital media in public health also have to be considered. These relate to aspects of contents, process and outcome and can draw on established criteria from areas such as health promotion, healthcare, organisational quality management, journalism, design, and communication, and will vary by factors such as type of

project, medium, target group, context, function and degree of interactivity. Again we found surprisingly little published material in this area.

Strengths and limitations

This scoping review adopted a pre-defined methodology for identifying and classifying research in this exceptionally diverse field. Inclusion criteria were defined and extensive searches were carried out. Due to the large number of studies identified, analysis was undertaken at the level of the abstract. However, we were able to map the field more thoroughly and identify areas with only limited evidence. Had the scope of the project permitted this, it would have been desirable for more detailed analysis to be undertaken of the literature identified and to include more steps of data validation and triangulation, as well as supplementing the work by a consultation exercise. Further work will build on this scoping exercise to provide more detail and depth in selected areas.

Future research

As a next step, a systematic review of active qualitative and participatory digital visual methods based in the community or in specific settings is required. This should explore different health models and theories and their effects on any outcomes measured. Recommendations for further primary research would follow from such a review. Finally, we noted that further research might benefit from bringing together multiple disciplines (both academic and non academic) in the development of interventions to help improve their quality and impact on target populations, along with involving the target populations.

Contributions of authors

Development of research question and focus: Christine Clar, Mariana Dyakova, Peter Donnelly, Lee Knifton, Aileen Clarke

Writing and reviewing the manuscript: Christine Clar, Mariana Dyakova, Kristina Curtis, Carolyn Dawson, Peter Donnelly, Lee Knifton, Aileen Clarke

Literature searches: Christine Clar, Kristina Curtis, Carolyn Dawson

Data analysis and summary: Christine Clar

Ethical approval

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Competing interests

None declared.

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LIST OF TABLES AND FIGURES

TABLES AND FIGURES

Table 1. Glossary of terms used **[online appendix]**

Digital media	a form of electronic media where data are stored in digital (as opposed to analogue) form. It can refer to the technical aspect of storage and transmission (e.g. hard disk drives or computer networking) of information or to the "end product", such as digital video, augmented reality, digital signage, digital audio, or digital art.
Mass media	means of communication that reach large numbers of people in a short time, such as television, newspapers, magazines, and radio
Social marketing	an approach seeking to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good. Social Marketing practice is guided by ethical principles. It seeks to integrate research, best practice, theory, audience and partnership insight, to inform the delivery of competition sensitive and segmented social change programmes that are effective, efficient, equitable and sustainable.
eHealth	the transfer of health resources and health care by electronic means
mHealth	medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, tablets, personal digital assistants (PDAs), and other wireless devices. The ubiquity of mobile devices in both developed and developing countries presents an opportunity to improve health outcomes through the innovative delivery of health services and information.
Telehealth	the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration. Technologies include videoconferencing, the internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications.
Telemedicine	the use of telecommunication and information technologies in order to provide clinical health care at a distance (including transmission of medical, imaging and health informatics data from one site to another). It helps eliminate distance barriers and can improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations.
Photoelicitation	using photographs as part of a qualitative interview
Videoelicitation	using video as part of a qualitative interview
Photovoice	a method mostly used in the field of community development, public health, and education which combines photography with grassroots social action. Participants are asked to represent their community or point of view by taking photographs, discussing them together, developing narratives to go with their photos, and conducting outreach or other action. It is often used among marginalised people, and is intended to give insight into how they conceptualise their circumstances and their hopes for the future. As a form of community consultation, photovoice attempts to bring the perspectives of those "who lead lives that are different from those traditionally in control of the means for imaging the world" into the policy-making process. It is also a response to issues raised over the authorship of representation of communities.
Videovoice	as photovoice, but using video
Photo-novella	a small pamphlet akin to comic-book format, with photographs instead of illustrations, combined with small dialogue bubbles. They typically depict a simple story enveloped in a dramatic plot with respect to a particular health topic (when used in this context).

Participatory video	a form of participatory media in which a group or community creates their own film. The idea behind this is that making a video is easy and accessible, and is a great way of bringing people together to explore issues, voice concerns or simply to be creative and tell stories. It is therefore primarily about process, though high quality and accessible films (products) can be created using these methods if that is a desired outcome. This process can be very empowering, enabling a group or community to take their own action to solve their own problems, and also to communicate their needs and ideas to decision-makers and/or other groups and communities. As such, PV can be a highly effective tool to engage and mobilise marginalised people, and to help them to implement their own forms of sustainable development based on local needs.
Participatory photo mapping	a tool for exploring the "experience of place" and for communicating this experience to community stakeholders and decision-makers. Using Participatory Photo Mapping helps uncover supports and barriers to well-being, especially related to the built environment. The PPM approach uses photography, narrative stories, and mapping.

Table 2. Characteristics of public health reviews (n=221) **[online appendix]**

Design of included studies	n=169 experimental; n=48 observational; n=8 with qualitative elements; n=5 with participatory elements
Participants	
Age	mostly not specified; n=35 in children / adolescents / young people; n=9 in elderly people; n=3 in women; n=5 in couples during pregnancy / pregnant or postpartum women / parents; n=3 in men
Specific groups	mostly general population or (potentially) at risk groups; n=22 in healthcare professionals / providers / students / researchers; n=3 in caregivers; n=1 in policy makers; n=13 in patients; n=17 in socially disadvantaged groups or low and middle income settings; n=6 in specific ethnic groups
Setting	mostly not specified; n=30 community; n=19 healthcare; n=18 educational settings; n=3 workplace; n=1 sports settings
Outcomes	n=53 content analysis; n=50 analysis of use; n=92 behaviour; n=33 knowledge / attitude; n=31 health aspects / function; small numbers for empowerment, needs /assets, community change, ethical and quality issues, service provision, wellbeing, satisfaction, cost-effectiveness

Table 3. Details of interventions and outcomes in public health reviews (n=221) (in order of frequency) **[online appendix]**

Interventions	n	Example
Health topic:		
Health promotion / prevention (education / behaviour change)	33	Atherton et al. 2010[1]
Healthy eating / weight loss / body image	24	Yancey et al. 2004[55]
Physical activity / sedentary behaviour	22	Biddiss and Irwin 2010[56]
Mental health; including: social isolation / loneliness, aggression , anxiety / depression, stigma, cognitive training, dementia	21	Calear and Christensen 2010[3]
Health-related knowledge translation / health literacy /guideline dissemination / information seeking	19	Rajic et al. 2013[57]
Health services / access to healthcare	15	Moffatt and Eley 2010[58]
Sexual / reproductive health	13	Gold et al. 2011[15]
Smoking cessation / relapse prevention	14	Abroms et al. 2011[9]
Medical / nursing education	13	Chipps et al. 2012[59]
Health-related support / assistive technologies	12	Zwijsen et al. 2011[60]
Infectious diseases (incl. HIV) / infection control / vaccination	10	Bieri et al. 2012[61]
Health and safety / hygiene / injury prevention / first aid	10	Gould et al. 2010[62]
Alcohol / drinking & driving	6	Elder et al. 2004[17]
Family health / parenting / breastfeeding	6	Kattapong 2008[63]
Drug / substance abuse	4	Young 2012[64]
Screening	3	Morrow et al. 2010[65]
Community-based participatory research in (public) health	3	Catalani 2010[26]
Musculoskeletal pain	2	Verbeek et al. 2011[66]
Disability awareness / asthma education	2	Lindsey and Edwards 2013[67]
Dental health	1	Knosel et al. 2011[68]
Participation in research	1	UyBico et al. 2007[69]
Interactive	88	
Media:		
Mass media / social marketing	69	Stead et al. 2007[23]
Computer/internet-assisted/delivered interventions	26	Calear and Christensen 2010[3]
Educational videos	20	Bieri et al. 2012[61]
Telehealth/medicine technology / assistive technologies	20	Moffatt and Eley 2010[58]
Multi-media education (incl. 3D virtual worlds)	18	Wofford et al. 2005[70]
Video games	17	Biddiss and Irwin 2010[56]
Advertising bans / advertising & media effects / media coverage / media use	17	Anderson et al. 2009[71]
iPhone apps / eHealth applications	11	Abroms et al. 2011[9]
mHealth communication / text messaging	10	Whittaker et al. 2012[14]
Internet health information / new digital media use / eHealth services	9	Guse et al. 2012[11]
Telephone interventions / consultations	8	Eakin et al. 2007[72]
Social media / social networking sites	6	Gold et al. 2011[15]
Emails	6	Sawmynaden 2012[7]
Video-conference / video-based communication / chat / video messaging	6	Chipps et al. 2012[59]
Photovoice	4	Catalani and Minkler 2010[73]
Web 2.0 services / internet applications with participatory and user-generated features	3	Chou et al. 2013[74]
Media advocacy	3	Shults et al. 2009[75]
Personal digital assistants / electronic aids	3	Burke et al. 2011[76]

Interventions	n	Example
Visual feedback of medical imaging results / appearance-based interventions	2	Hollands et al. 2010[77]
Youtube	2	Tourinho et al. 2012[78]
Virtual communities	2	Eysenbach et al. 2004[79]
Discussion forums / blogs	2	Keelan et al. 2010[80]
Phone and computer-mediated support groups	1	Eysenbach et al. 2004[79]
Educational audiotapes	1	Santo et al. 2005[81]
Collaborative writing applications (wikis, Google docs etc.)	1	Archambault et al. 2012[82]
Digital interactive television systems	1	Blackburn et al. 2011[83]
Web-based decision aids	1	Thomson and Hoffman-Goetz 2007[84]
Video feedback	1	Fukkink 2008[85]
Photoelicitation	1	Riley and Manias 2004[21]
Videovoice	1	Catalani 2010[26]
Outcomes		
Behaviour / skills / adherence	92	
Content analysis	53	
Analysis of use	50	
Knowledge / health literacy / attitudes	33	
Health / physiological outcomes / function	16	
Mental health	15	
Community change / reduction of health disparity	6	
Cost-effectiveness	4	
Needs / assets	3	
Ethical issues	3	
Wellbeing / satisfaction	3	
Empowerment	2	
Quality issues	2	
Communication	2	
Service provision	2	

Table 4. Thematic research map (part I): details and examples (see online figure 3)

Levels of communication	Level of engagement	Purpose	Target groups	Theory and health models	Contributing disciplines	Outcomes

• Intrapersonal
• Interpersonal
• Organisational
• Community
• Public / mass
	• Passive reception of messages
	• Observation
	• Interactivity
	• Participation
	• Ownership / Empowerment
		• Information
		• Observation
		• Education / teaching / training
		• Raising awareness / reducing prejudice
		• Monitoring and feedback
		• Decision aids
		• Individual behaviour change
		• Policy change
		• Knowledge translation
		• Empowerment
			• General public
			• Policy makers
			• General practitioners
			• Patients
			• Nurses / midwives
			• Other health professionals
			• Family members / friends
			• Educators / teachers
			• School children / students
			• Social workers
			• Librarians
			• Mixed audience
				• Health model
				  ○ Biomedical
				  ○ Biopsychosocial
				  ○ Salutogenesis
				  ○ etc.
				• Behaviour-oriented models
				  ○ Individual level (e.g. Health Belief Model etc.)
				  ○ Interpersonal level (e.g. Social Cognitive Model etc.)
				• Environment-oriented theories
				  ○ Multilevel (e.g. empowerment theories, systems theory
				  ○ Interpersonal environment
				  ○ Organisation level
				  ○ Community level
				  ○ Society and government
				• Planning models (e.g. PRECEDE-PROCEED, Intervention mapping, social marketing)
				• Behaviour change categorisation (Michie et al. 2011)[86]
				  ○ Sources of behaviour
				  ○ Intervention functions
				  ○ Policy categories
					• Communication / media / information psychology
					• Health and environmental psychology
					• Public health and health promotion
					• Social sciences
					• Education / teaching
					• Computer science
					• Visual Design
					• Marketing / PR
					• Journalism
					• Medicine
						• Content analysis / analysis of use
						• Mental health
						• Behaviours / skills / adherence
						• Health / function / physiological outcomes
						• Psychosocial outcomes
						• Wellbeing / quality of life / satisfaction
						• Community change / reduction of health disparities
						• Needs / assets
						• Service provision
						• Quality / ethics
						• Cost-effectiveness
						• Scalability
						• Sustainability

Digital media	Visual methods in health	Negative effects of media	Health aspects

• Audio (radio, podcasts, audiotapes / CDs)
• Static photos
  ○ print media
  ○ campaigns (public service announcements, public relations)
  ○ photos as part of public health interventions (e.g. imagery-based interventions)
  ○ photos as part of qualitative and participatory research
• Moving images
  ○ TV (all genres, incl. docu-soaps etc.)
  ○ Cinema (fiction films, documentaries)
  ○ Campaigns (public service announcements, PR campaigns)
  ○ Film / video as part of public health interventions / education
  ○ Film video as part of qualitative and participatory research
  ○ Techniques (acted, real life, animation / trick film)
• Electronic media
  ○ Internet (social media, video / information sharing / filesharing sites, health information)
  ○ Electronic communication (text messages, telehealth / telemedicine, eHealth, mHealth, health apps, videoconferencing, emails, combination with other technologies (e.g. pedometer)
  ○ Personal digital assistant
• Multimedia (via internet (interactive sites, online teaching), part of public health intervention, stand-alone application)
• Video games (part of public health intervention or stand-alone)
• Virtual reality tools[87]
	• Social marketing (→ public service announcements, point of choice prompts)
	• Media advocacy
	• Qualitative methods (photoelicitation, visual anthropology)
	• Participatory methods (participatory video, photovoice, videovoice)
	• Training / education / information
	• Other
	  ○ Photonovella[88]
	  ○ Visual storytelling[89]
	  ○ (Participatory) photo mapping[27]
	  ○ Visual problem appraisal[90]
	  ○ Embedded filming[90]
		• Psychological (e.g. aggression, anxiety, suicide, anorexia…)
		  ○ Films / videos / internet (e.g. violent, scaremongering, misleading…)
		  ○ Social media (e.g. bullying, discrimination…)
		  ○ Video games (e.g. violent…)
		  ○ Body shape ideals / body image disturbance
		• Physical (e.g. obesity, cardiovascular risk factors)
		  ○ Advertising for unhealthy foods
		• Behavioural (e.g. addiction, sedentary lifestyle)
		  ○ Tobacco / alcohol advertising
		  ○ Excessive TV watching, video games, computer use
			• Public health
			  ○ Epidemiology (public health surveillance systems, risk and emergency communication)
			  ○ Prevention (primary, secondary, tertiary, screening)
			  ○ Health promotion
			• Health education / health literacy – media competence
			• Treatment of disease
			• Health themes (e.g. healthy eating, physical activity, mental health, etc.)

Table 5. Aspects of quality and ethics in public health communication through digital media

Aspects of quality and ethics	Sources of relevant criteria	Criteria vary by…

Contents
• Design / structure
• Text
• Images chosen
• Technical quality (image, sound, written text)
• Strategy / approach / method / message
 	
Process
• Needs assessment
• Planning / design of the intervention
• Implementation
• Evaluation
• Sustainability / scaling up
 	
Impact, e.g.
• Health outcomes
• Psychosocial / behavioural outcomes
• Environmental changes
• Policy changes
• Equity / access to services / usability etc.
• Adverse effects / safety
• Costs
 	
Quality control mechanisms,[32] e.g.
• Stakeholder involvement
• Product testing (e.g. focus groups, theatre testing, questionnaires)
• Clear processes and cycles
• Quality assessment and quality standards (e.g. for sources of information)
	• Healthcare
	  ○ Institute of Medicine (safe, effective, patient-centred, timely, efficient, equitable)[44]
	  ○ Campbell / Donabedian (criteria relating to structure, process and outcome)[34;38;39]
	• Business, quality management systems[37;49], e.g.
	  ○ Total quality management[36]
	  ○ European Foundation for Quality Management Model[40]
	  ○ Quality circles[37]
	  ○ Eight dimensions[41]
	• Journalism, e.g.
	  ○ Magic polygon (reduction of complexity, timeliness, originality, transparency / reflexivity, objectivity)[54]
	  ○ Media performance assessment[54]
	• Legal aspects (media law, incl. consent, privacy, confidentiality etc.)
	• Design (e.g. Gestalt principles, Golden cut, chunking) and information psychology / processing (graphics, text, structure, colours)[48]
	• Public health communication (e.g. readability testing[84], health communication guidelines such as CDCynergy[35], DISCERN[92])
	• Health promotion / public health interventions (good practice criteria[45;47], evaluation and planning frameworks[32;53], behaviour change versus empowerment approaches[52], ethical dilemmas in health promotion campaigns[35;42;43])
		• Type of project
		• Medium
		• Target group
		• Context
		• Function
		• Genre
		• Degree of interactivity (e.g. guidelines for interactive media[33;50;51;93])

Aspects of quality and ethics	Sources of relevant criteria	Criteria vary by…
Ethics • Ethics committees • Research ethics guidelines[91] • Human rights-based approaches • Context-specific and general guidelines • Image ethics / media ethics • Participation and empowerment[52] • Privacy		

Figure 1. Major health topics targeted through digital media

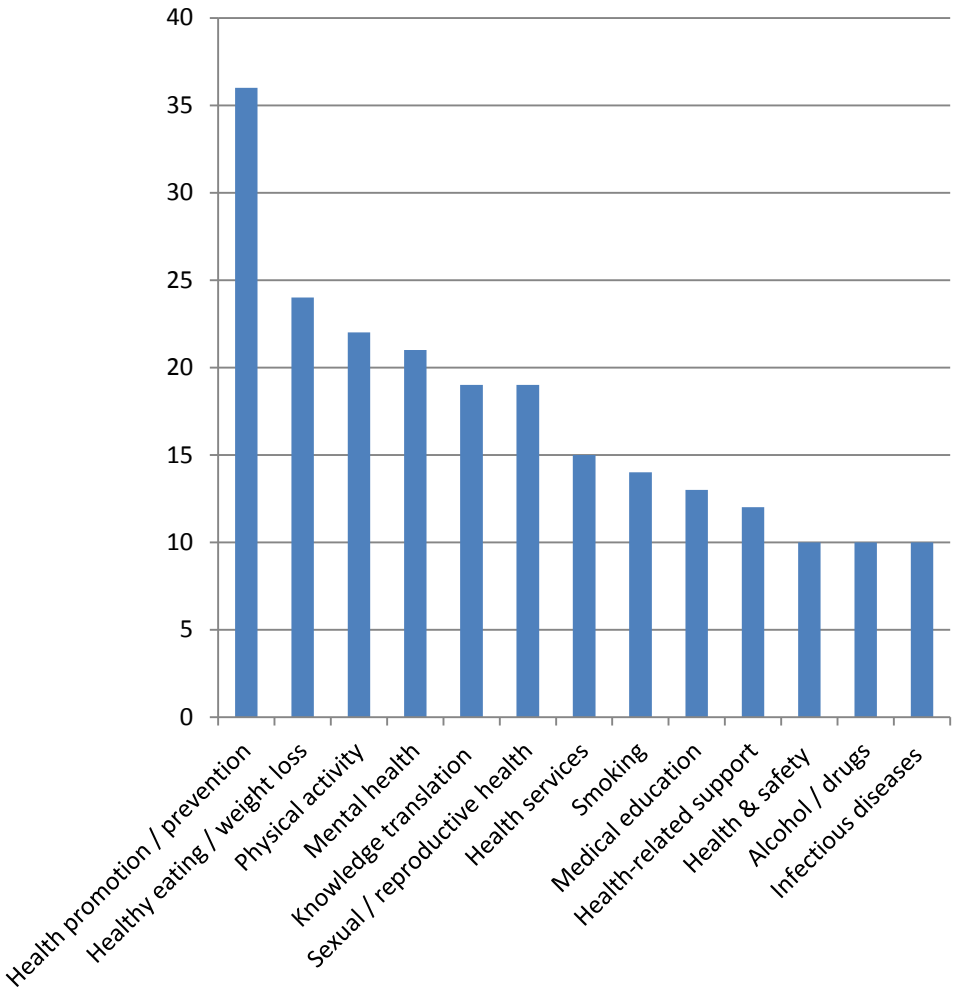


Figure 2. Media used in public health communication

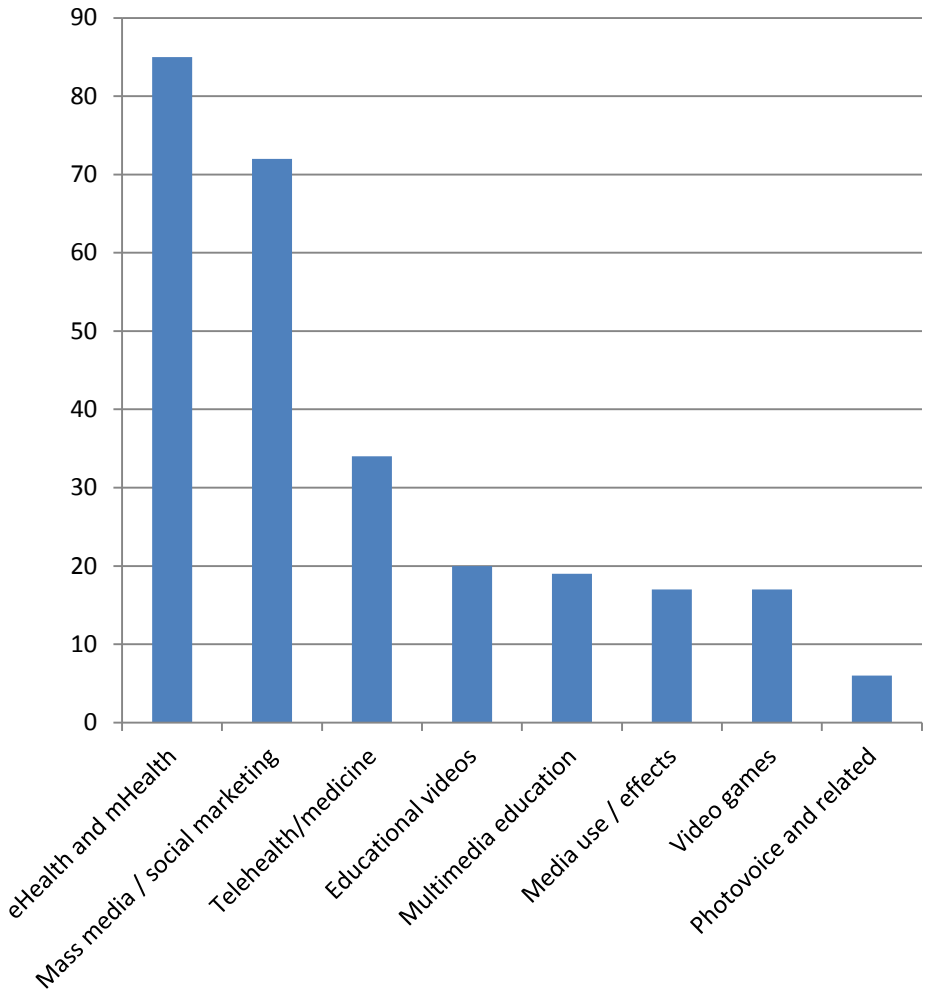
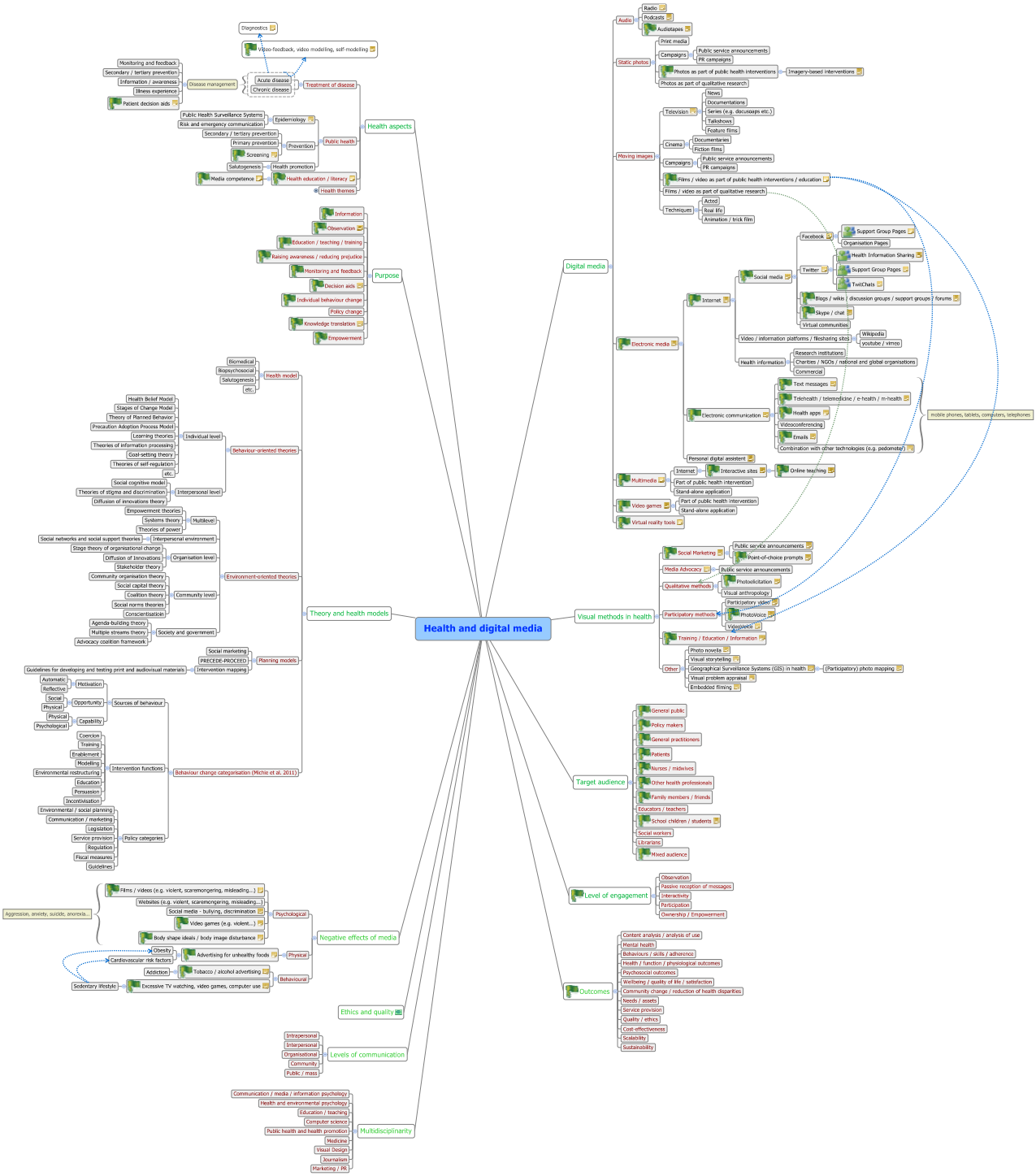


Figure 3. Research map; green flags denote topics where systematic reviews are available **[online appendix, attached separately]**

Figure(s)


Health and digital media
Health aspects
Diagnostics
Video-feedback, video modelling, self-modelling
Disease management
Monitoring and feedback
Secondary / tertiary prevention
Information / awareness
Illness experience
Patient decision aids
Acute disease
Chronic disease
Treatment of disease
Public Health Surveillance Systems
Risk and emergency communication
Secondary / tertiary prevention
Primary prevention
Screening
Prevention
Epidemiology
Public health
Salutogenesis
Health promotion
Media competence
Health education / literacy
Health themes
Purpose
Information
Observation
Education / teaching / training
Raising awareness / reducing prejudice
Monitoring and feedback
Decision aids
Individual behaviour change
Policy change
Knowledge translation
Empowerment
Theory and health models
Health model
Biomedical
Biopsychosocial
Salutogenesis
etc.
Behaviour-oriented theories
Individual level
Health Belief Model
Stages of Change Model
Theory of Planned Behavior
Precaution Adoption Process Model
Learning theories
Theories of information processing
Goal-setting theory
Theories of self-regulation
etc.
Interpersonal level
Social cognitive model
Theories of stigma and discrimination
Diffusion of innovations theory
Environment-oriented theories
Multilevel
Empowerment theories
Systems theory
Theories of power
Interpersonal environment
Social networks and social support theories
Organisation level
Stage theory of organisational change
Diffusion of innovations
Stakeholder theory
Community level
Community organisation theory
Social capital theory
Coalition theory
Social norms theories
Conscientisation
Society and government
Agenda-building theory
Multiple streams theory
Advocacy coalition framework
Planning models
Social marketing
PRECEDE-PROCEED
Intervention mapping
Guidelines for developing and testing print and audiovisual materials
Behaviour change categorisation (Michie et al. 2011)
Sources of behaviour
Motivation
Automatic
Reflective
Opportunity
Social
Physical
Capability
Physical
Psychological
Intervention functions
Coercion
Training
Enablement
Modelling
Environmental restructuring
Education
Persuasion
Incentivisation
Policy categories
Environmental / social planning
Communication / marketing
Legislation
Service provision
Regulation
Fiscal measures
Guidelines
Negative effects of media
Films / videos (e.g. violent, scaremongering, misleading...)
Websites (e.g. violent, scaremongering, misleading...)
Social media - bullying, discrimination
Video games (e.g. violent...)
Psychological
Aggression, anxiety, suicide, anorexia...
Body shape ideals / body image disturbance
Obesity
Cardiovascular risk factors
Addiction
Sedentary lifestyle
Advertising for unhealthy foods
Tobacco / alcohol advertising
Excessive TV watching, video games, computer use
Physical
Behavioural
Ethics and quality
Levels of communication
Intrapersonal
Interpersonal
Organisational
Community
Public / mass
Multidisciplinarity
Communication / media / information psychology
Health and environmental psychology
Education / teaching
Computer science
Public health and health promotion
Medicine
Visual Design
Journalism
Marketing / PR
Digital media
Audio
Radio
Podcasts
Audiotapes
Static photos
Print media
Campaigns
Public service announcements
PR campaigns
Photos as part of public health interventions
Imagery-based interventions
Photos as part of qualitative research
Moving images
Television
News
Documentations
Series (e.g. docusoaps etc.)
Talkshows
Feature films
Cinema
Documentaries
Fiction films
Campaigns
Public service announcements
PR campaigns
Films / video as part of public health interventions / education
Films / video as part of qualitative research
Techniques
Acted
Real life
Animation / trick film
Electronic media
Internet
Social media
Facebook
Support Group Pages
Organisation Pages
Twitter
Health Information Sharing
Support Group Pages
TwitChats
Blogs / wikis / discussion groups / support groups / forums
Skype / chat
Virtual communities
Video / information platforms / filesharing sites
Wikipedia
youtube / vimeo
Health information
Research institutions
Charities / NGOs / national and global organisations
Commercial
Electronic communication
Text messages
Telehealth / telemedicine / e-health / m-health
Health apps
Videoconferencing
Emails
Combination with other technologies (e.g. pedometer)
mobile phones, tablets, computers, telephones
Personal digital assistent
Multimedia
Internet
Interactive sites
Online teaching
Part of public health intervention
Stand-alone application
Video games
Part of public health intervention
Stand-alone application
Virtual reality tools
Visual methods in health
Social Marketing
Public service announcements
Point-of-choice prompts
Media Advocacy
Public service announcements
Qualitative methods
Photoelicitation
Visual anthropology
Participatory methods
Participatory video
PhotoVoice
VideoVoice
Training / Education / Information
Other
Photo novels
Visual storytelling
Geographical Surveillance Systems (GIS) in health
(Participatory) photo mapping
Visual problem appraisal
Embedded filming
Target audience
General public
Policy makers
General practitioners
Patients
Nurses / midwives
Other health professionals
Family members / friends
Educators / teachers
School children / students
Social workers
Librarians
Mixed audience
Level of engagement
Observation
Passive reception of messages
Interactivity
Participation
Ownership / Empowerment
Outcomes
Content analysis / analysis of use
Mental health
Behaviours / skills / adherence
Health / function / physiological outcomes
Psychosocial outcomes
Wellbeing / quality of life / satisfaction
Community change / reduction of health disparities
Needs / assets
Service provision
Quality / ethics
Cost-effectiveness
Scalability
Sustainability