

1 **Informing realist evaluation of health-themed public engagement activities: Lessons from Thai**
 2 **science drama to raise awareness for antimicrobial resistance and research with children**

3 **Full Evaluation Report**

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20 **Disclaimer**

21 This internal evaluation report, drafted and delivered by Marco J Haenssngen, does not necessarily
 22 reflect the views of the Mahidol Oxford Tropical Medicine Research Unit.

23 **Author Contributions**

24 Project oversight	MJH, PYC
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32 Abstract

33

34 **Background:** The salience of public engagement in global health research and funding has grown
35 rapidly. Engagement activities can help to broaden the appreciation and impact of medical research,
36 but they can also be a means for community mobilisation and for bidirectional communication with
37 the target groups and users of academic research. These activities sometimes involve creative means
38 of expression (e.g. theatre, dance) in collaboration with the arts. However, there is currently no
39 guidance on how to evaluate such public engagement activities in clinical medicine. This paper
40 provides a structured and detailed public engagement evaluation case study of drama performances in
41 Thailand to inform and guide future evaluations of health-themed public engagement activities
42 involving creative forms of expression. The drama performances involved puppet shows with the
43 themes of antimicrobial resistance and research with children

44

45 **Methods:** We followed a six-step evaluation process that (1) defines project objectives, (2) identifies
46 the evaluation approach, (3) develops an evaluation framework, (4) identifies indicators and
47 appropriate methods for data collection, (5) collects and analyses data, and (6) produces evaluation
48 findings for dissemination. Our realist evaluation framework was cognizant of artistic and medical
49 goals of the engagement activity, of implementation processes and outcomes, and of target group
50 heterogeneity. We gathered qualitative and quantitative data from audience members and project
51 stakeholders to inform the evaluation.

52

53 **Results:** The theatre performances were attended by 1,440 audience members, 880 of whom returned
54 at least a partially complete self-completion evaluation form. We complemented the quantitative
55 evaluation forms with 24 stakeholder and audience member interviews and group discussions. We
56 found mixed outcomes across our target groups depending on their prior level of information and
57 education, but also varying across the medical and artistic objectives. Process analysis indicated that
58 the collaborative setup facilitated the development of locally appropriate content and sustainable
59 professional relationships between arts and science.

60

61 **Conclusions:** Our process description and realist approach can guide future evaluations for public
62 engagement in global health and beyond. This would not only help researchers to respond to growing
63 funder requirements for effective public engagement, but more widespread evaluation would also help
64 to build a knowledge base of effective, target group specific, and locally appropriate public
65 engagement activities.

66 Keywords

67 Public engagement; Global health; Realist evaluation; Theatre; Thailand

68 List of Abbreviations

69	AMR	Antimicrobial Resistance
70	JITMM	Joint International Tropical Medicine Meeting
71	MORU	Mahidol Oxford Tropical Medicine Research Unit
72	OECD	Organisation for Economic Co-operation and Development
73	OxTREC	University of Oxford Tropical Research Ethics Committee
74	FTMEC	Mahidol University Faculty of Tropical Medicine Ethics Committee

75 Conflicts of Interest

76 PYC commissioned the evaluation and led the public engagement activity that was being evaluated in
77 this project.

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116 **Informing realist evaluation of science-themed public engagement activities: lessons from Thai**
117 **science drama to raise awareness for antimicrobial resistance and research with children**

118 **1 Background**

119 Communication between the sciences and the public has evolved “from deficit to dialogue” (Stilgoe
120 *et al.*, 2014:5)—an evolution that over past decades has replaced public education and understanding
121 with the idea of “public engagement” (Leshner, 2003; Retzbach & Maier, 2014). Mirroring the
122 developments in UK higher education, the public engagement with the sciences in general and the
123 medical sciences and global health in particular has been receiving growing attention among
124 researchers and research funders (Cohen *et al.*, 2008; Hamlyn *et al.*, 2015; Research Councils UK,
125 2011; Wilson *et al.*, 2014). Engagement activities are understood as a way to broaden the appreciation
126 and impact of research, but they can also be a means for community mobilisation and for bidirectional
127 communication with the target groups and users of the research (Kilroy *et al.*, 2007; Lafrenière & Cox,
128 2013). A broad variety of activities has been carried out globally, including, for instance, infographics,
129 science cafés, festivals, showcasing events, village drama, or applied theatre plays (Dalrymple, 2006;
130 Etherton & Prentki, 2006; Skinner *et al.*, 1991; Stilgoe *et al.*, 2014). Such activities can have creative
131 and collaborative elements, for example where theatre groups collaborate with funders or are involved
132 in conveying health-related messages (Etherton & Prentki, 2006; Haddon, 2006; Lafrenière & Cox,
133 2013).

134 While the salience of public engagement in global health research has grown, methods to evaluate its
135 effectiveness have developed comparatively slowly (Galloway, 2009; Lafrenière & Cox, 2013).
136 Collaborative arrangements with the arts add another layer of complexity through the importance of
137 pursuing artistic goals alongside education and awareness raising (Thomson *et al.*, 2013a), and
138 evaluation techniques for public engagement and activities the involve artistic expression are still very
139 limited (Etherton & Prentki, 2006; Galloway, 2009; Ledgard, 2013, 2016). The lack of methodological
140 guidance is especially problematic for forms of engagement that are based on creative and non-verbal

141 forms of expression without a straightforward health message (Lafrenière & Cox, 2013). In this report,
142 we aim to contribute to the evaluation methodology on public engagement with a focus on non-verbal
143 forms of creative expression, using the case study of a puppet theatre play in Thailand with the
144 combined theme of antimicrobial resistance and research with children.

145 We used a realist approach to establish an evaluation framework and gathered qualitative and
146 quantitative data from attendees and project stakeholders to understand the outcomes of the theatre
147 performance across our target groups. We embedded this technique within a process evaluation design
148 whose ultimate assessment criteria were effectiveness, relevance, efficiency, impact, and sustainability
149 (OECD Development Assistance Committee, 1991, 2010). The process description and indicators used
150 in this study can guide other researchers and public engagement specialists to evaluate their
151 engagement activities more systematically, appropriately, and transparently.

152 **2 Methods**

153 **2.1 Case Study**

154 We evaluate a public engagement activity in Thailand, involving a touring production of puppet theatre
155 entitled *Fishy Clouds*, which has the combined theme of antimicrobial over- and misuse and research
156 with children (the show can be viewed at <https://vimeo.com/209001558>). The activity was part of
157 ongoing public engagement activities at the Mahidol Oxford Tropical Medicine Research Unit
158 (MORU; <http://www.tropmedres.ac/>) and arose in collaboration with the Bangkok-based theatre
159 company B-Floor Theatre (<http://bfloortheatre.com/>). Although all decisions were made jointly, the
160 collaboration was initiated and led by MORU, who operated a 4-member team headed by MORU's
161 Department of Bioethics and Engagement in order to contribute scientific inputs to the production. B-
162 Floor had worked with MORU before, and its team for the *Fishy Clouds* production comprised 14
163 members (some of whom were freelance and contracted staff). The total budget for the production
164 with 12 planned shows and an accompanying documentary production was GBP 32,000.

165 The production process commenced in May 2016 with a 4-month research and data-gathering phase
166 in which B-Floor conducted interviews with MORU scientists and other groups relevant to the themes
167 of the production (e.g. farmers and paediatricians). The resulting product was a 45-minute non-verbal
168 puppet play whose story focused on antibiotic overuse throughout the ecosystem (e.g. personal use,
169 agricultural use), which contributes to antibiotic resistance. A non-verbal performance was chosen for
170 the play to be accessible for non-Thai-speaking audiences, and an accompanying multi-lingual leaflet
171 handed out to audience members provided supporting information about the storyline and the main
172 themes of antibiotic over- and misuse and research with children. *Fishy Clouds* also has an interactive
173 element in which audience members vote by wearing a hat whether they would want the character of
174 a father to allow his child to participate in medical research. Due to ongoing learning processes during
175 the performances, a written synopsis had been developed during later shows to aid understanding
176 among the audience members. The show targeted five main groups in Thailand:

- 177 1. Bangkok metropolitan theatre goers
- 178 2. School children in Bangkok
- 179 3. Scientists and healthcare workers at the Antimicrobial Awareness Week, Bangkok
- 180 4. Migrant workers in Thai-Myanmar border zones
- 181 5. Healthcare workers in Thai-Myanmar border zones

182 The first of the 12 planned performances was initially scheduled for October 2016, but the premiere
183 had to be postponed due to the passing of the King of Thailand. As a result of the re-scheduling, 11
184 performances eventually took place between 11 November and 14 December 2017—coinciding with
185 antimicrobial resistance awareness activities in Thailand—at the following venues:

- 186 • Chang Tong Eiem elementary school, Bangkok (1 performance)
- 187 • Baan Ma Muslim community, Bangkok (1 performance)
- 188 • Antimicrobial Resistance (AMR) Day Press Conference, Bangkok (1 performance)

- 189 • Thammasat University Open Day, Bangkok (2 performances)
- 190 • Democrazy Theatre, Bangkok (2 performances)
- 191 • Joint International Tropical Medicine Meeting (JITMM) conference, Bangkok (1 performance)
- 192 • A village resort and clinics at the Thai-Myanmar border, Mae Sot (3 performances)

193 Some of these venues were open and therefore not all audience members partook in the full show.

194 The evaluation for *Fishy Clouds* took place between September 2016 and March 2017. Ethical
195 approval for this study has been received from the University of Oxford Tropical Research Ethics
196 Committee (OxTREC Ref. 5125-16) and from the Mahidol University Faculty of Tropical Medicine
197 Ethics Committee (No. TMEC 16-102). The evaluation was led by an external evaluator who had not
198 been involved in the *Fishy Clouds* production, but it also had a capacity building objective, owing to
199 which two research interns, two consultants, and three assistants participated in the evaluation. We
200 explain the evaluation process in the following section.

201 **2.2 Evaluation Process**

202 Noting the sparse literature to inform this evaluation, we decided to develop a detailed case study to
203 inform future evaluation practice in public engagement with global health. We employed a realist
204 approach using a mixed method evaluation design and judge the success of the engagement activity
205 through evaluation criteria developed by the OECD Development Assistance Committee (which are
206 widely used in the area of aid project evaluation, OECD Development Assistance Committee, 1991,
207 2010). The evaluation project adhered rigorously to the process description in Figure 1 to build the
208 evaluation case study. During the development of the *Fishy Clouds* performance, project objectives
209 for the evaluation were formulated, an evaluation approach selected, an evaluation framework
210 developed, and concrete indicators and methods for their measurement identified. We collected
211 qualitative and quantitative data during and after the theatre performances, and data analysis took place
212 in the following two months for dissemination thereafter.



Figure 1. Generic Evaluation Process

Source: Authors.

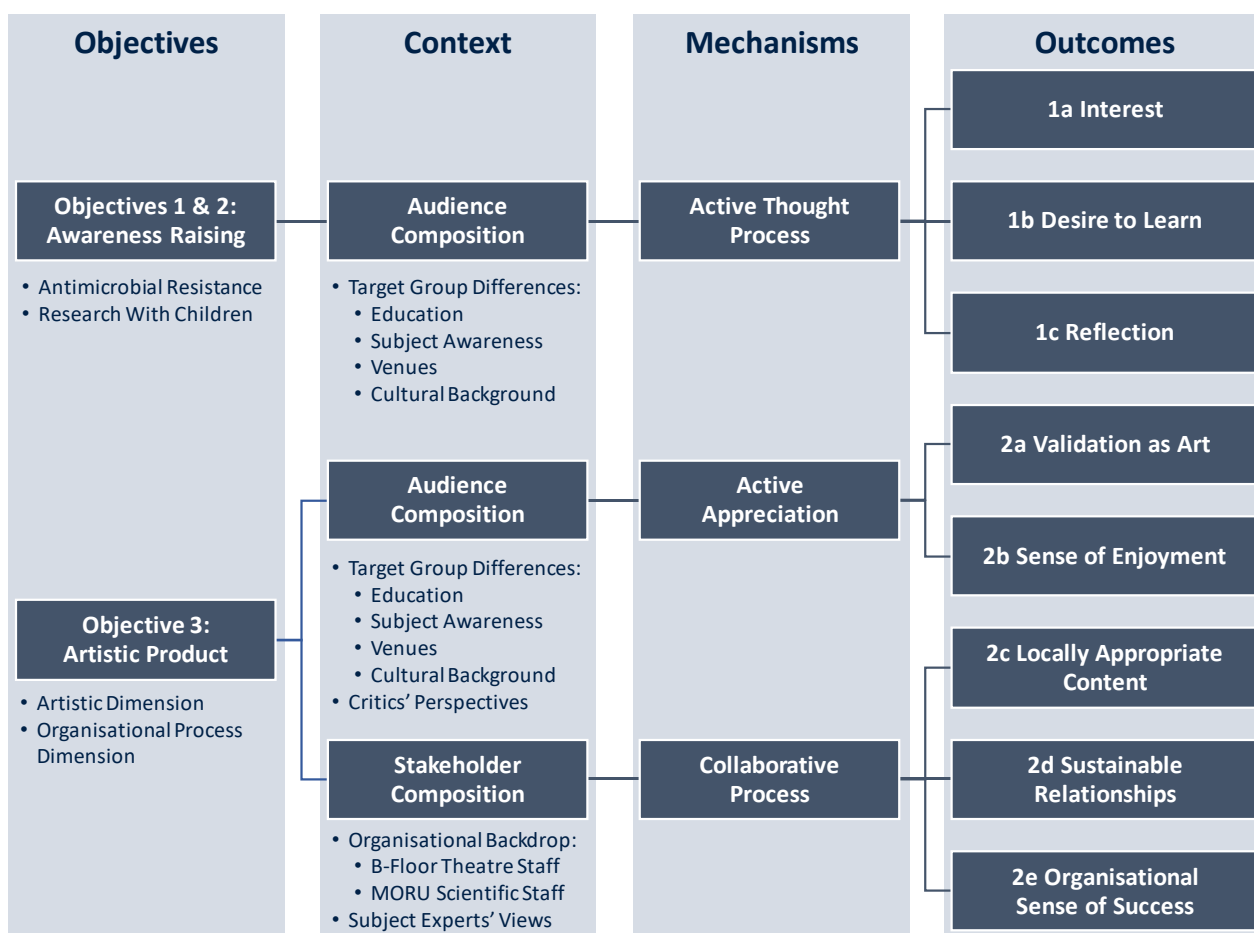
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217 The first stage of the evaluation consisted of formulating explicit objectives for the engagement
218 activity against which success could be measured. For the evaluation to be meaningful, the engagement
219 objectives had to reflect both parts of the artistic-scientific collaboration (Thomson *et al.*, 2013a). This
220 process required multiple iterations between the medical and artistic partners of the project. The final
221 agreed project objectives were:

- 222 1. To raise awareness of antimicrobial overuse and misuse (the fact that there simply is a problem)
- 223 2. To raise awareness of the importance of research with children – including those involving
224 antimicrobials (to help children themselves, provided that the research is useful, carefully
225 thought out, ethical)
- 226 3. To produce a science-themed performance of entertainment value and high artistic quality

227 Following the agreement of the objectives to evaluate project success, the second step involved
228 identifying an evaluation approach. Guiding considerations thereby were that (a) the evaluation is
229 independent (rather than an action research approach), (b) responses between different target groups
230 are likely to be heterogeneous, (c) the possible outcomes and underlying mechanisms of drama-based
231 public engagement activities are little understood and project specific, (d) limited guidance regarding
232 theatre and drama evaluation methods exists, and (e) the public engagement activities are implemented
233 without scope for an experimental evaluation design. Considerations (d) and (e) prevented an impact
234 evaluation approach. Among the remaining options were ex post evaluation approaches using logical
235 frameworks, and process evaluation approaches using participatory action research and realist
236 evaluation frameworks (Blakewell & Garbutt, 2005; Chinyowa, 2011; Galloway, 2009; Mirzoev *et al.*,
237 2016; Reason, 2006; Wong *et al.*, 2012). The need for independent evaluation (consideration [a])
238 rendered a participatory action research approach infeasible because it would entail influencing the
239 engagement activity while it is still ongoing (Breel, 2015; Reason, 2006). The probable presence of
240 group-specific outcomes and the yet limited methodological evaluation knowledge around drama
241 performances for public engagement (considerations [b] and [c]) further meant that we judged a closed-
242 ended logical framework approach inferior to a realist evaluation (Mirzoev *et al.*, 2016).

243 We therefore decided to pursue a theory-based and process-oriented realist evaluation approach
244 (Galloway, 2009; Mirzoev *et al.*, 2016), the framework for which was developed in the third step. The
245 framework draws on the existing yet limited evaluation literature around culture and the arts, within
246 and outside of the health sector (Calzia *et al.*, 2005; Galloway, 2009; Jackson, 1998; Jackson *et al.*,
247 2003; Lafrenière & Cox, 2013; Thomson *et al.*, 2013a). Based on our literature review and the project
248 characteristics, we constructed a two-part framework that gives equal weight to the medical and artistic
249 project objectives, depicted in Figure 2 and described below. (Whereas the evaluation of 1a, 1b, 1c,
250 2a, and 2b focused primarily on the outcomes of the performance, the evaluation of 2c, 2d, and 2e also
251 involved a more explicit consideration of the collaborative process of production.)



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Figure 2. Initial Evaluation Framework

Source: Authors, based on Calzia *et al.* (2005); Galloway (2009); Jackson (1998); Jackson *et al.* (2003); Lafrenière and Cox (2013); Thomson *et al.* (2013a).

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For the medical objectives of raising awareness, we argued that awareness generated from the non-verbal, metaphorical performance is not of a factual nature but instead involves (1a) a growing interest in, (1b) a desire to learn more about, and (1c) reflection about one's own ideas and values regarding antimicrobial resistance and research with children. We hypothesised that the principal mechanism underlying these outcomes is the stimulation of active thoughts through the creative expressions of the performance (Jackson, 1998; Jackson *et al.*, 2003). However, the context of the intervention involved audiences with varying degrees of prior information and education to absorb and reflect on the expressions in the drama performance (e.g. school children vs. scientists).

265 For the artistic objective of producing an artistically worthwhile and entertaining product, we
266 considered target group as well as stakeholder outcomes. Target group outcomes included (2a) the
267 acknowledgment of the performances as “art” and (2b) a sense of enjoyment stemming from it, enacted
268 by validating the performances through active appreciation (Lafrenière & Cox, 2013). Because we
269 considered art as an intrinsic element of this play, the target group for this objective did not only
270 include the theatre audiences listed in Section 2.1, but also critics and performing arts experts. We
271 recognised the challenges in imposing a definition of “art” onto the audiences (Jackson, 1998; Jackson
272 *et al.*, 2003), and therefore embraced their own understanding and descriptions of the artistic value of
273 the performance.

274 Stakeholder outcomes included (2c) the production of locally appropriate content, (2d) a lasting
275 network of multi-stakeholder relationships, and (2e) a sense of success and improvement within the
276 participating organisations. We hypothesised that these outcomes are realised through the collaborative
277 development of creative forms of expression between artistic and scientific project partners (Jackson,
278 1998; Lafrenière & Cox, 2013). However, we expected that variation in these outcomes emerges across
279 different organisational and regional backgrounds of the stakeholders. This being an evaluation, we
280 were also aware of unintended negative outcomes (Etherton & Prentki, 2006; Guetzkow, 2002),
281 although the absence of established evaluation frameworks prevented us from pre-formulating such
282 outcomes. Our choice of qualitative methods (see below) was designed to identify both positive and
283 negative unintended outcomes.

284 The fourth preparatory step prior to the performance consisted of identifying data collection methods
285 to inform the evaluation framework. Considering the logistical constraints of gathering data from
286 touring theatre audiences, we decided to utilise one-page self-completion evaluation forms owned by
287 the theatre company and to substantiate them through qualitative data (interviews, focus group
288 discussions) with audience members and stakeholders (UCL Public Engagement Unit, 2010). We
289 chose to combine these qualitative and quantitative instruments in order to utilise their individual

290 strengths, namely an understanding of scale from the standardised evaluation forms and a more
291 nuanced and personal understanding of experiences related to the project processes and outcomes
292 (Onwuegbuzie & Leech, 2005; Teye, 2012). Qualitative methods in isolation would be unable to
293 produce defensible claims about the entire study population, and quantitative instruments alone would
294 invite misleading and decontextualized interpretations (Teddlie & Tashakkori, 2009). Due to the lack
295 of benchmark indicators for public engagement projects, we refrained from assigning target values,
296 intending instead to build a reference point for future work.

297 The quantitative evaluation forms asked the same 11 questions (plus basic demographic information)
298 to all audience members. The questions on the form therefore had to be held simple as it would be used
299 with general public of all age ranges and educational backgrounds (e.g. asking about reflections on
300 medicine use in general rather than antimicrobial resistance specifically). The qualitative interview
301 and discussion guides were developed to inform the categories of the evaluation framework, but also
302 to understand how the target audiences answered the evaluation form questions (e.g. how is “correct
303 use of medicine” understood?), and the various interpretations of the non-verbal performance and
304 potential unintended consequences resulting therefrom.¹ Audience members included in this
305 evaluation were theatre goers, school children, and scientists and healthcare workers interested in
306 antimicrobial resistance in Bangkok; and healthcare workers and migrant workers in Thai-Myanmar
307 border zones. We also included drama critics as relevant stakeholders to evaluate the artistic and
308 entertainment value of the performances more broadly (two reviews published during the evaluation
309 period were included thus in the analysis; Mahasarinand, 2016; Pongpipat, 2016). Project stakeholders
310 relevant for this evaluation were scientists working in MORU and B-Floor Theatre staff collaborating

¹ Note that variations in interpretations are to be expected in an artistic performance and do not mean that the audience “misunderstands” the play. Deviations from the intended messages are relevant for the assessment of whether the project itself achieved its stated goals.

311 in the production of Fishy Clouds, and medical doctors and scientists specialising in antimicrobial
312 resistance and research with children.

313 The evaluation forms were administered to all audience members after the performances. The audience
314 member interviews and group discussions were intended to inform the interpretation of the evaluation
315 forms and to gauge the retention of the theatre play approximately three weeks after the actual
316 performance. Interviews with stakeholders were intended to assess the nature of the collaboration in
317 the process of developing the performances. Sampling was purposive to include all across audience
318 member and stakeholder categories (including recruiting male as well as female audience members).
319 The interview guides, evaluation forms, and consent documents were produced in English, Thai,
320 Karen, and Burmese to be inclusive for all target groups.

321 Following this preparatory work, the data collection commenced together with the performance of the
322 theatre shows on 11 November 2016. Self-completion evaluation forms were collected immediately
323 after the shows between 11 November and 14 December 2016; audience member interviews followed
324 three weeks after each show (respondents were recruited based on contact details provided on the
325 evaluation forms); and stakeholder interviews were carried out between 1 December 2016 and 12
326 January 2017.

327 We analysed the data from the evaluation forms quantitatively, using descriptive statistical analysis to
328 identify responses to the forms across target groups. Considering that the quantitative sampling was
329 non-probabilistic (every audience member was invited), we can only speak for the sample of
330 respondents (880 out of 1,440 participants). The qualitative data was analysed using thematic analysis
331 that considers responses in the context of the personal characteristics (e.g. target group) and
332 institutional constraints (e.g. employing organisation) of the respondents (Kohler Riessman, 2006;
333 Lieblich *et al.*, 1998). We pre-formulated themes for the analysis based on the evaluation framework,
334 but were also receptive to emerging themes in the qualitative data. Following the data analysis, we
335 judged the overall success of the project according to the criteria of effectiveness, relevance, efficiency,

336 impact, and sustainability. We used Stata 13 for quantitative analysis, and Nvivo 11 for qualitative
337 analysis (QSR International, 2017; StataCorp, 2013).

338 The final stage culminated in knowledge sharing of the experience through a collaborative workshop
339 and a stakeholder meeting at MORU, and through case study publications (including on the Global
340 Health Network) to share lessons of the evaluation with the wider community of global health
341 researchers.

342 **3 Results**

343 By the time of this evaluation, 11 *Fishy Clouds* shows had been completed with 1,440 people attending
344 the performances in total, nearly twice the anticipated audience of 800. Due to the higher-than
345 anticipated demand (especially at a Bangkok school, where almost 500 instead of expected 200
346 children attended), only 1,276 evaluation forms were distributed, of which 943 were returned by the
347 audience members. The sample of returned questionnaires does therefore not reflect the entire
348 audience. For example, during the first school performance, 360 evaluation forms were handed out to
349 an audience of 480. Because students in lower grades entered the performance venue first, the 120
350 omitted audience members are older children from higher grades (5th and 6th grade, aged 10 to 12
351 years). Similarly, observations when handing out evaluation forms at Bangkok AMR events showed
352 that specialist audiences occasionally declined completing the form, indicating that their possibly
353 critical view would skew the analysis.²

354 Ultimately, 880 forms had partial or complete information, which were the basis for our quantitative
355 descriptive analysis (summary statistics are presented in Table 1). We complemented this information
356 with interviews and focus group discussions, involving 21 female and male respondents from all target

² The self-administered questionnaires did not permit us to capture reasons for refusal systematically, but informal conversations with audience members during the AMR Day Press Conference and the JITMM Conference highlighted the reasons given above. The lower inclination of scientists to participate in the evaluation can also be seen in the low response rate of 13% at the JITMM Conference (39 out of administered 289 forms were returned), compared to an average response rate of 92% in all other performances.

357 audience groups (incl. 3 focus group discussions with school children, theatre goers, and Mae Sot
 358 healthcare workers), and 10 “stakeholders” comprising theatre critics, the B-Floor Theatre and MORU
 359 teams,³ and subject specialists in antimicrobial resistance and research with children. Interviews were
 360 conducted in Thai, English, and Karen, yielding approx. 11:30 hours of recorded interview material
 361 and 135,000 words of transcripts and interview notes. Field notes collected during the performances
 362 served to contextualise the analysis. A summary of the evaluation form responses is displayed in Figure
 363 3, indicating variations across the five main target audiences. Overall, our analysis of the qualitative
 364 and quantitative data suggests that the *Fishy Clouds* project was partially successful in achieving its
 365 objectives.

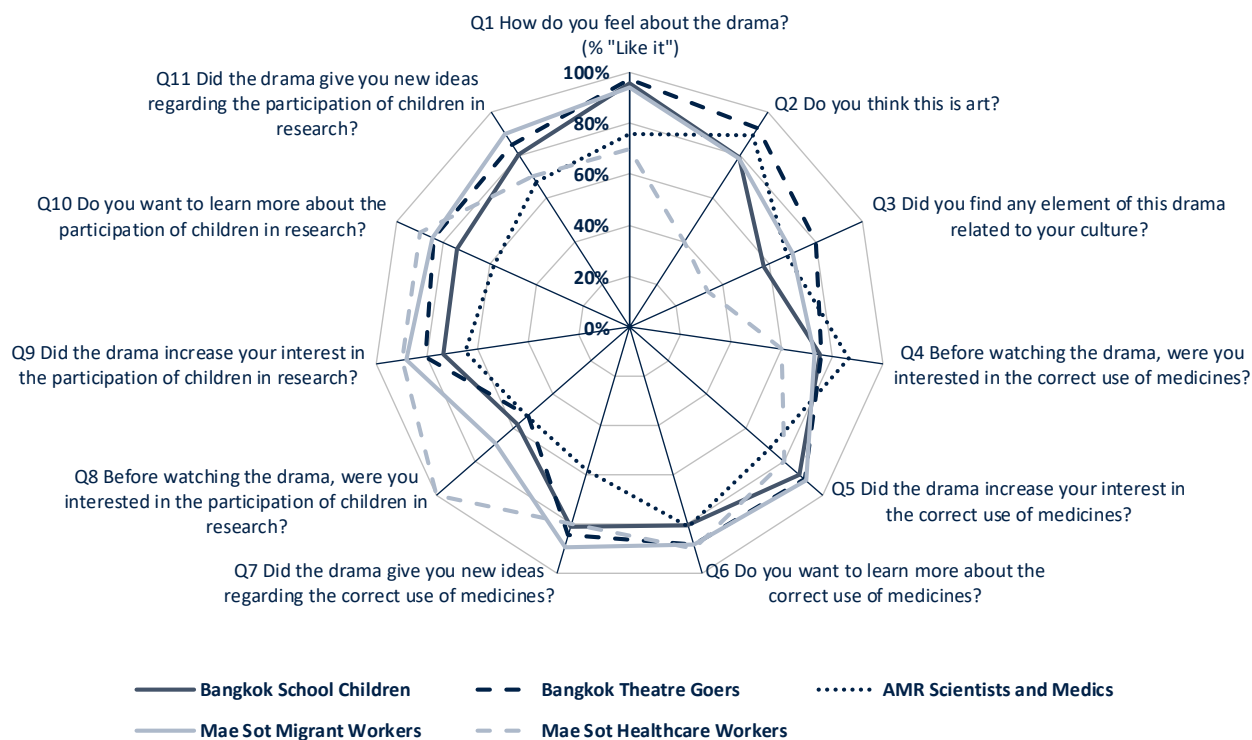
366
 367 *Table 1. Summary Statistics of Evaluation Form Responses*

Category		n	%	Category		n	%
Target Group	Bangkok School Children	418	57.5	Age Group	Below 12 Years	342	38.9
	Bangkok Theatre Goers	155	21.3		12 to 17 Years	171	19.4
	AMR Scientists and Medics	37	5.1		18 to 29 Years	149	16.9
	Mae Sot Migrant Workers	107	14.7		30 to 49 Years	156	17.7
	Mae Sot Healthcare Workers	10	1.4		Above 50 Years	62	7.1
	<i>Total</i>	<i>727</i>	<i>100.0</i>		<i>Total</i>	<i>880</i>	<i>100.0</i>
Venues	Bangkok School	314	35.7	Education	None	9	1.1
	Bangkok Muslim Community	63	7.2		Primary	418	52.7
	AMR Day Press Conference	32	3.6		Secondary	221	27.9
	Thammasat University Open Day	98	11.1		Undergraduate	86	10.8
	Democracy Theatre	82	9.3		Graduate and Above	59	7.4
	JITMM Conference	30	3.4		<i>Total</i>	<i>793</i>	<i>100.0</i>
	Mae Sot Wattana Resort	98	11.1	Ethnic Background	Myanmar and Burmese Ethnic Groups	217	25.5
	Mae Sot Wang Pa Clinic	66	7.5		Thai	39	4.6
	Mae Sot Mawker Thai Clinic	97	11.0		Other Asia	577	67.7
	<i>Total</i>	<i>880</i>	<i>100.0</i>		Rest of the World	17	2.0
Sex	Female	518	59.8	<i>Total</i>	<i>850</i>	<i>100.0</i>	
	Male	349	40.3				
	<i>Total</i>	<i>867</i>	<i>100.0</i>				

368 Source: Authors.

369 Notes. A complete audience member census was attempted, therefore no underlying random sampling procedure and no standard errors
 370 reported. Total population of audience members comprised a larger fraction of Thai school children aged 11 to 12 years old (i.e. 5th and
 371 6th grade students). Discrepancies in total percentages due to rounding errors.

372
³ For simplicity, we refer to freelance and contracted staff working with B-Floor on the production as “B-Floor team.”



373
374 Figure 3. Target Group Differences in Evaluation Form Response

375 Source: Authors.

376 Notes. Values as fraction of people responding "I like it" to Question Q1 and "yes" to Questions Q2 to Q10. Questions Q1 to Q3 relate
377 to the artistic objective of the project, the remainder relates to the awareness-raising objective with respect to the themes of
378 antimicrobial resistance (Q4 to Q7) and research with children (Q8 to Q11).

379 3.1 Achievement of Project Objectives

380 3.1.1 Awareness

381 The first part of the evaluation considers the awareness-raising objectives of *Fishy Clouds*, focusing
382 on antimicrobial resistance and research with children. The play intended to draw attention to these
383 broad problem areas rather than conveying precise factual knowledge. We considered that such
384 awareness-raising activities therefore stimulate the interest in (Outcome 1a), a desire to learn more
385 about (Outcome 1b), and a process of reflection about one's own ideas and values (Outcome 1c)
386 regarding these two themes. We argue that these outcomes are realised through an active thought
387 process, enabled by the creative expressions within the performance. However, we are also cognizant
388 of variation and emerging themes in people's interpretation of the performance, which we explored
389 through qualitative research. Overall, the quantitative indicators from the evaluation forms draw a
390 positive picture (Table 2), but the qualitative evidence from the audience members indicates that

391 interpretations can be various and partly at odds with the intended message (we discuss the limitations
392 of the data collection methods in Section 4). We consider the overall achievement of the awareness-
393 raising objectives as mixed.

394

395 The overall response to the awareness-related evaluation form items among all audience members was
396 high, indicating a positive reaction related to increased interest in (88%), desire to learn more about
397 (84%), and reflection about medicine use (81%); research with children received similarly high results
398 with 78%, 79%, and 80%, respectively. Bangkok theatre goes and Mae Sot migrant workers responded
399 most positively to the questions about correct medicine use (related to antimicrobial resistance),
400 whereas the Mae Sot healthcare workers produced the most positive responses about research with
401 children. The scientific and healthcare audiences of the AMR Day Press Conference and the JITMM
402 Conference exhibited the lowest responses, with 58% agreeing that the play gave them new ideas about
403 medicine use and increased their desire to learn more about research with children. However, still 81%
404 of this group indicated that they would like to learn more about correct medicine use. Bangkok school
405 children also had high results ranging from 74% to 88% across the various awareness-related questions
406 (Q4-Q7, Q9-Q11).

407 We are acutely aware that a self-administered evaluation form is prone to response biases, including
408 primacy effects of the “yes” option presented first, and the possibility of a more general tendency for
409 yes-saying in self-completion questionnaires (Bowling, 2005). Yet, even if response biases and mode
410 effects existed in the administration of self-completion evaluation forms, the extensive literature
411 comparing various questionnaire administration modes suggests that it is improbable that the majority
412 of *Fishy Clouds*’ audience members produced systematically misleading answers (e.g., Fouladi *et al.*,
413 2002; Kaplan *et al.*, 2001; Siemiatycki, 1979). We therefore have reason to believe that the
414 performance has indeed raised awareness among the audience groups with respect to medicine use and
415 research with children.

Table 2. Awareness-Related Evaluation Form Responses Across Audience Groups

	Target Groups					Education Level					Venues								
	Bangkok School Children	Bangkok Theatre Goers	AMR Scientists and Medics	Mae Sot Migrant Workers	Mae Sot Healthcare Workers	None	Primary	Secondary	Undergraduate	Graduate and Above	Bangkok School	Bangkok Muslim Community	AMR Day Press Conference	Thammasat University Open Day	Democracy Theatre	JITMM Conference	Mae Sot Wattana	Mae Sot Wang Pa	Mae Sot Mawker Thai Clinic
Theme: Antimicrobial Resistance																			
Q4 Before watching the drama, were you interested in the correct use of medicines?	75% (410)	76% (148)	86% (37)	73% (96)	60% (10)	57% (7)	74% (405)	78% (215)	75% (84)	90% (58)	76% (308)	79% (62)	81% (32)	72% (97)	72% (75)	83% (29)	89% (94)	80% (60)	66% (92)
Q5 Did the drama increase your interest in the correct use of medicines?	88% (418)	91% (150)	72% (36)	91% (101)	80% (10)	88% (8)	86% (411)	93% (220)	91% (85)	71% (59)	86% (314)	90% (63)	84% (31)	94% (98)	91% (77)	69% (29)	81% (97)	92% (63)	90% (94)
Q6 Do you want to learn more about the correct use of medicines?	81% (414)	89% (150)	81% (37)	89% (96)	90% (10)	89% (9)	78% (404)	90% (218)	92% (86)	83% (58)	80% (310)	81% (63)	94% (32)	89% (98)	88% (77)	76% (29)	90% (94)	93% (59)	82% (93)
Q7 Did the drama give you new ideas regarding the correct use of medicines?	81% (417)	85% (151)	58% (36)	89% (95)	80% (10)	67% (9)	78% (409)	90% (216)	80% (85)	63% (57)	77% (313)	90% (63)	74% (31)	91% (98)	84% (79)	54% (28)	77% (92)	90% (59)	83% (92)
Theme: Research With Children																			
Q8 Before watching the drama, were you interested in the participation of children in research?	58% (416)	53% (152)	53% (36)	69% (98)	100% (9)	44% (9)	60% (406)	64% (219)	56% (86)	55% (58)	59% (312)	60% (63)	53% (32)	59% (98)	42% (79)	54% (28)	72% (94)	73% (60)	63% (91)
Q9 Did the drama increase your interest in the participation of children in research?	74% (417)	81% (150)	65% (37)	88% (93)	90% (10)	67% (9)	73% (403)	83% (215)	84% (86)	73% (59)	72% (313)	76% (63)	91% (32)	81% (98)	79% (77)	52% (29)	85% (94)	92% (60)	79% (86)
Q10 Do you want to learn more about the participation of children in research?	74% (410)	84% (152)	58% (36)	85% (97)	90% (10)	100% (8)	74% (401)	86% (219)	83% (86)	78% (59)	73% (307)	75% (63)	91% (32)	87% (97)	78% (79)	57% (28)	90% (96)	92% (62)	79% (90)
Q11 Did the drama give you new ideas regarding the participation of children in research?	80% (417)	85% (150)	68% (37)	90% (99)	70% (10)	89% (9)	77% (408)	90% (220)	82% (85)	61% (57)	78% (313)	83% (63)	84% (32)	91% (98)	83% (77)	55% (29)	76% (96)	82% (62)	79% (92)

417 Source: Authors.

418 Notes. Values as fraction of people responding "yes" to respective questions. Number of observations per question and group in parentheses.

419 However, while the questions in the self-completion forms indicate a positive response to the play
420 among the target audiences, they do not illuminate the nature of awareness, and whether people's
421 interpretations and sense-making processes were in line with the intentions of the play. With the help
422 of the qualitative data, we consider in the following the outcomes and the underlying mechanisms in
423 greater depth. The overall conclusion of the qualitative analysis is that the positive responses to the
424 evaluation forms may overstate the awareness gains in the specific areas of antimicrobial resistance
425 and research with children. We will demonstrate that, firstly, the intended awareness-raising outcomes
426 of "interest," "desire to learn," and "reflection" appeared to be more prevalent and more nuanced with
427 regard to antimicrobial resistance (AMR) rather than research with children. Secondly, audience
428 members rarely related to the specific themes of AMR and research with children, but rather to the
429 broader themes of health, illness, and medicine (AMR) and general medical research and treatment
430 (research with children). Thirdly, the non-verbal performance created a wide range of interpretations,
431 some of which were at odds with the scientific messages.

432 As far as the first point on awareness outcomes is concerned, respondents from different groups
433 indicated that the play "*was clear*" (male migrant worker, 53 years, primary education), "*easy to*
434 *understand*" (male theatre goer, 37 years, undergraduate-level education), and that "*the science*
435 *message came out quite clearly*" (female AMR scientist, 28 years, currently pursuing PhD). Some of
436 the interviewed audience members were indeed clear about the subject matter and echoed the expected
437 outcomes, highlighting for example that,

438

439 *"There's a comment from [...] my daughter [who attended the show with the respondent], that*
440 *she couldn't relate the rain ... so feeding the fish with antibiotics, she understood that the*
441 *colourful glitter was antibiotics and she was quite sure. But how does growing the plants and*
442 *the animals using antibiotics make people sick?"* (female theatre goer, 49 years, graduate-level
443 education)

444

445 *“I was wondering since there’s a drama that tries to communicate this [research with children],*
446 *I was wondering if it actually exists, if they’re really doing it [research], and where [...]. Is the*
447 *problem actually real?”* (theatre goer focus group discussion, female, 24 years, currently in
448 graduate education)

449

450 *“I think that, one thing that was kind of like ‘Hey, I’m secretly impressed and I never thought*
451 *of’ was about that, about the experiments using kids as participants.”* (female AMR scientist,
452 28 years, currently pursuing PhD)

453

454 Such statements indicate that is plausible that some audience members considered and reflected on the
455 intended themes in *Fishy Clouds*. However, the interviewees would typically articulate interests, desire
456 to learn, and reflection in relation to antimicrobial resistance rather than research with children, which
457 was less readily recognised as a theme (*“far-fetched;”* male theatre goer, 37 years, undergraduate-level
458 education) and required deeper probing during the interviews (we explain in Section 3.1.2 that
459 “research with children” had become subordinated to the theme of AMR in the production process,
460 which may be reflected in the audience members’ perception). Consider for example the following
461 exchange on a *Fishy Clouds* scene on research with children:

462

463 Q: “[Referring to a scene a doctor measures a child’s head to determine appropriate medicine
464 dosage through clinical research] *So did that scene give you any thoughts or views about*
465 *...*”

466

R: *“Oh, yes, I forgot. I forgot to tell you about that.”*

467 Q: *“Yes, what is it?”*

468 R: *“Oh, that, I mean I don’t know how it’s related to drug resistance.”* (male theatre goer, 37
469 years, undergraduate-level education)

470

471 Even where a theme was recognised, an articulated desire from the respondent to learn more about the
472 subject was often connected with an admission that no information was actually sought.

473 The nonetheless positive responses in the evaluation forms relate to the second point, namely that
474 audience members tended to relate to broader themes than antimicrobial over- and misuse and research
475 with children. Especially non-medical and non-academic respondents without prior knowledge of
476 AMR tended to relate to antibiotics in particular (in line with imagery in the show and the messages
477 in the accompanying information leaflet) as well as to medicine use and illness more generally:

478

479 *“I think [I want to learn more about] antibiotics – [...] how many types there are and what types*
480 *that ... in fact the medicines that we take every day or even our food, they never tell us about*
481 *the ingredients.”* (male theatre goer, 40 years, high school education)

482

483 *“It was interesting because every time I take medicines – if I have a stomach ache, I’d take*
484 *Paracetamol to ease the pain.”* (male school child, 13 years, 7th grade)

485

486 *“[Fishy Clouds] wanted to tell us about, about germs and things, and wanted to [...] tell us that*
487 *the germs are easy to pass on. [...] Even the smallest things can get us sick, diseased.”* (female
488 school child, 16 years, 11th grade)

489

490 The theme of “research with children” was more often understood as stressing the importance of
491 research in general and the correct dosage of medicine:

492

493 “[Referring to the audience vote on the child character’s participation in research] *I understood*
494 *that the show wanted to emphasize the final [message], meaning they wanted to know if after*
495 *watching the whole show, the audience realises the importance of research or not. Right?*
496 *Because it’s about doing research.”* (female theatre goer, 49 years, postgraduate-level
497 education)

498

499 “*I want to learn more on how much medicine we should give to children so we can treat them*
500 *properly.”* (healthcare worker focus group discussion, all female, 21 to 32 years, all high school
501 education)

502

503 The wide interpretation of the play’s themes suggests that *Fishy Clouds* raised awareness with regard
504 to health, medicine, and research more broadly, rather than specifically for antimicrobial use and
505 research with children.

506 While the overall direction of the interpretations in the interviews is line with the intention of the
507 science-themed drama, also unexpected and potentially detrimental interpretations emerged. This is
508 the third and final point relating to the awareness-raising outcomes of the play (the entire spectrum of
509 interpretations within the interviews and focus group discussions is displayed in Figure 4). Some of
510 the unexpected interpretations revolved for instance around the spread of germs and the need for
511 handwashing to limit their spread:

512

513 “[The drama is trying to tell the audience] *to take care of ourselves, take care of ourselves and*
514 *avoid doing things, what it is? Things that can negatively impact us. For example, be mindful*
515 *when eating or wash our hands before eating, things like that. We have to take care of ourselves*
516 *first.*” (female school child, 16 years, 11th grade)

517

518 Q: “*What did the teacher [drama teacher who brought the school children to see Fishy Clouds*
519 *at Democrazy theatre] teach you after seeing the show?*”

520 R1: “*She says if you get diseased you have to protect yourself, you have to use medicines.*”
521 (female, 13 years, 7th grade)

522 R2: “*Wash your hands often.*” (male, 14 years, 2nd grade)

523 R3: “*But not protect in the way that ...*” (female, 12 years, 7th grade)

524 R1: “*When you want to eat something, you have to wash your hands to prevent the germs from*
525 *getting in.*” (female, 13 years, 7th grade)

526 R3: “*When you protect yourself, you can’t protect yourself in the way that you use medicines*
527 *for everything, no matter how minor.*” (female, 12 years, 7th grade)

528 R1: “*You have to be careful.*” (female, 13 years, 7th grade)

529 (school child focus group discussion)

530

531 Other unintended interpretations were more concerning, relating to the use of medicine specifically,
532 but with diverging implications:

533

534 “*I’m not comfortable taking medicines anymore.*” (theatre goer focus group discussion, female,
535 24 years, undergraduate-level education)

536

537 “*This drama teaches me that if I don’t take the medicines, the germs will increase and make us*
538 *sick, then we would have to take even more medicines and get injections and take 3-4 pills*
539 *every day. So I’m scared. And from then on, I take all the medicines.*” (school child focus group
540 discussion, female, 14 years, 7th grade)

541

542 “[Interpreting the scene where a pill-shaped hat was measured for a child:] *We should take*
543 *medicines and take care of ourselves to be safe from the germs so we can feel better.*” (female
544 school child, 16 years, 11th grade)

545

546 These statements illustrate that the spectrum of interpretations emanating from *Fishy Clouds* can
547 include potentially problematic conclusions. Increased awareness about antimicrobial use and the
548 “correct” use of medicine can therefore also include conclusions that one should take more medicine
549 rather than less (or more appropriately), which might not be desired or supported by the play.
550 Especially groups with presumably little contextual experience with the topics of AMR and research
551 with children (migrant workers, school children) uttered a broader and unexpected range of
552 interpretations of *Fishy Clouds*.

Themes Related to Interpretation of <i>Fishy Clouds</i>		Bangkok School Children	Bangkok Theatre Goers	AMR Scientists and Medics	Mae Sot Migrant Workers	Mae Sot Healthcare Workers
AMR & Antibiotics	Resistance, drugs in general					
	Resistance, antibiotic					
	Antibiotics or medicines in agriculture					
	Antibiotics aren't bad when use wisely					
	Antibiotics cycle in all lives					
	Seriousness of AMR problem					
Health	Tuberculosis					
	Health awareness					
	Follow doctors' instructions					
	Take care of health, medical treatment					
	Injections					
	Being exposed to diseases by swimming in hot water					
	Health implications of sleep deprivation					
	Health implications of reading too much					
	Health implications of working too hard					
	Wash hands, eat good food					
	Treating illness before going to doctor					
Germs	Protection from germs, diseases					
	Watch out for germs					
	Germs spread easily					
Using Medicine	Do not buy medicines or antibiotic on your own					
	Take medicine only when necessary, reduce usage					
	Different medicines fit different people					
	Not taking medicines at all isn't right					
	Take medicines correctly when you buy them					
	Take correct medicines for illness and body weight					
	Being stubborn (not taking medicines) will make you more ill					
	Medicines have both good and bad sides					
	Do not take expired medicine					
	Read medicine labels					
	Take medicine rather than not					
	Take more or various medicines to cover every symptom					
Research (With Children)	Consent is needed before treatment					
	Guardian should get enough information about treatment					
	Guardian giving consent for treatment					
	Research to find new medicines					
	Experiments with child participants					
	General public's cooperation in research					
	Doctors identifying ways to make guardians comply					
	Guardian giving consent for experiment					
	Research to help the child in <i>Fishy Clouds</i>					
Research with drugs (efficacy, side effects)						
	Research to find the right medicine for a person					
Other Agriculture Topics	Agriculture being the origin of diseases					
	Diseases originating in agriculture ending with humans/doctor					
	Fish or plants [<i>Fishy Clouds</i> images] spreading diseases					
Other Topics	Hat [<i>Fishy Clouds</i> image] cures illnesses					
	Puppets have different illnesses					
	Performance reflecting real life, society					
	Toxins' various origins					
	Toxins produced by humans are the cause of all illnesses					
	Hat [<i>Fishy Clouds</i> image] represents immunity					
	Unsure about imagery and interpretation					

Figure 4. Interpretations of *Fishy Clouds* Across Target Audiences

Source: Authors.

Notes. Themes as emerging from interviews and focus group discussions with audience members. Shaded cells indicate that theme arose within the respective target group.

553

554

555

556

557

558

559 We explain below how the hypothesised mechanism of “active thought processes” contributes to the
560 heterogeneous interpretations of *Fishy Clouds*’ main themes.⁴ To begin with, active thought processes
561 in relation to the themes of antimicrobial resistance and research with children were influenced by
562 audience members’ prior interest in, knowledge of, and understanding of the problem areas:

563

564 *“Do they want to say that the fish is sick and spreads the germs to the girl? At first I thought*
565 *that because from the material [referring to accompanying information leaflet] and my own*
566 *understanding, I knew they wanted to do the play on antibiotics, right? So from my basic*
567 *knowledge I know that antibiotics are used for feeding, it’s in the food, the food for fish,*
568 *something like that. It can be for both planting and raising animals.”* (female theatre goer, 49
569 years, postgraduate-level education)

570

571 *“[Drug resistance] is something I’ve read about before. But it [the drama] might enforce the*
572 *impact, because before this I just read it through and may have forgotten it without caring that*
573 *much. But with this drama, it’s embedded in my head more so now I know that it’s serious*
574 *[...].”* (male theatre goer, 40 years, high school education)

575

576 While some audience members suggested that awareness-gains may be limited in light of their existing
577 knowledge (*“It didn’t change [my ideas about antibiotic use] because I’m already aware about this;”*

⁴ Note that respondents also reflected in response to the evaluation form and interviews. For example, a theatre-going focus group respondent indicated that, *“When I saw the questions [on the evaluation form] I thought ‘Is it [research with children] really that serious?’”* The evaluation process itself has therefore influenced the active thought processes of respondents, but spontaneous reflection in response to interview questions have not been considered in this evaluation.

578 male theatre goer, 49 years, postgraduate-level education),⁵ prior knowledge and awareness about the
579 topic appeared to help audience members to interpret the performance.

580 The audience members also related the story and its imagery to their personal experiences in the
581 process of interpretation. For instance, a male scientist stated that the play can enable patients to “*see*
582 *their own mistakes by not taking medicine while somebody is advising it [...]. That’s good that they*
583 *get like a ... mirror to see*” (male scientist, 29 years, PhD-level education) Similarly, respondents in
584 focus group discussions related the show explicitly to their own experiences:

585

586 *“There were parts that are just like my life. Sometimes my mother takes me to the doctor and*
587 *the medicines are too large for kids, so she would try... It was like the doctor was trying to ask*
588 *her for permission.”* (school child focus group discussion, female, 12 years, 7th grade)

589

590 *“It makes me look back to [pause] to the real treatment method for myself. What medicines I*
591 *should use for specific conditions. I started to realise and think ‘If I have a stomach ache, what*
592 *should I actually do? I should do this, right?’ [...]. In the past it’s been quite wrong [laughed].”*
593 (theatre goer focus group discussion, female, 24 years, undergraduate-level education)

594

595 These statements indicate that personal experiences can be important to realise the awareness-related
596 outcomes of *Fishy Clouds*. This reflective process is complicated if an audience member does not have
597 a clear, pre-formulated concept of antimicrobial resistance and research with children (especially non-
598 academics and non-medics). The play itself is not necessarily able to establish these categories on its
599 own. For example, the interviewed children typically referred to medicine in general, being unfamiliar

⁵ Similar responses were uttered by researchers as a reason to refuse completing the evaluation forms for *Fishy Clouds*.

600 with the colloquial as well as the technical terms for antibiotics. Interpretations therefore revolved
601 around medicine use more general. Likewise, interviews with migrant workers at the Thai-Myanmar
602 border indicated that the respondents had a general interest in health-related subjects, but the play did
603 not appear to have stimulated any interest or desire in relation to the specific thematic foci. A female
604 migrant worker in Mae Sot was asked if the play changed her view relating to antibiotic resistance,
605 replying that, “*I do not know about that. But those working in the factory and do not get enough sleep,*
606 *it damaged their brain and exposed them to viruses*” (female migrant worker, 15 years, primary
607 education). This suggests that the play may be insufficient to produce a first awareness about the
608 scientific themes without complementary information or pre-existing knowledge (indeed, pre-existing
609 awareness).

610 The show did provide complementary information in the form of information leaflets,⁶ but the
611 interviews and our own observations during the performances indicate that they weren’t necessarily
612 read (“*If I read the brochure they handed out before the show, I would have understood it more but I*
613 *didn’t read it;*” male theatre goer, 37 years, undergraduate-level education). In addition, the language
614 in the leaflets could be ambiguous for groups not familiar with drug resistance. For example, the
615 English version of the leaflet’s title (“*The antibiotic resistance story*”) translates into Thai as “เรื่องดื้อๆ”
616 (“Rueang due due,” can be translated as “*The story of resistance*” but also as “*The story of*
617 *stubbornness*”). The expression “ดื้อยา” (“due yaa”) is the only (and unambiguous) description of “drug
618 resistance” in Thai. Yet, the terminology of “stubbornness” has been misinterpreted by a child in the
619 focus group discussion, who indicated that, “*I also have drug resistance;*” meaning that she is
620 “stubborn” and often refuses to take medicine. Her reflections based on this interpretation led her to
621 conclude that, “*even though I can’t take the pills, I would try very hard to take them*” (school child
622 focus group discussion, female, 14 years, 7th grade). Though uncommon, such observations reinforce

⁶ Later shows in Mae Sot also involved short sessions to explain antimicrobial resistance and research with children to audience members, but we have no qualitative information about the effectiveness of these measures.

623 the notion that interpretations of the performance without prior knowledge and awareness can be
624 ambiguous.

625 Discussion about *Fishy Clouds* is a facilitator for raising awareness in light of the possible
626 misunderstanding or confusion about the non-verbal messages. The interviews revealed that
627 conversations during and after the performance took place between peers, between children and their
628 parents, and between audience members and the theatre staff. Such discussions can involve the
629 meaning of specific metaphors and images as well as the overarching message of the play, entailing
630 clarification and refinement of understanding:

631

632 *“I told him, I said, ‘Son, I think they’re talking about people who don’t know how to take*
633 *medication properly.’ But I didn’t look away when I said that. I only used my shoulder to nudge*
634 *him so I don’t disturb his viewing. Only used my shoulder to nudge him to look, and he did. But*
635 *I don’t know while watching if he followed my thoughts or had the same thoughts as me. But*
636 *one thing that I got from that performance was he paid decent attention on it, even when I*
637 *nudged him and said ‘I think he’s not taking those medicines correctly, wrong type,’ I tried to*
638 *communicate with him that way. We somewhat talked after the performance, to some extent.”*
639 (male theatre goer, 40 years, high school education)

640

641 *“I asked him [a theatre staff member after the show] what the fish [a character in *Fishy Clouds*]*
642 *represented because the most confusing point for me was the fish, I didn’t know if the fish ...*
643 *Because everything is fantasy, it requires imagination, it’s surreal so I couldn’t tell how real*
644 *the fish was. Was it a normal fish, was it sick, or was it an overdosed fish?”* (male theatre goer,
645 37 years, undergraduate-level education)

646

647 “*There were some [parts of the show] that I did not understand so I asked my husband and he*
648 *said it was about getting ill and getting diseases.*” (female migrant worker, 15 years, primary
649 education)

650

651 Conversations about the play did not follow automatically, did not necessarily entail active discussion
652 (“*I told my mom that I went to see that. And my mom didn’t say anything;*” female school child, 16
653 years old, 11th grade), and did not inevitably adhere to the intended messages of the show. But our
654 qualitative research underlines that *Fishy Clouds* stimulated discussion as an important mechanism to
655 support active thought processes to interpret the play and to achieve its awareness-raising objectives.

656 The final theme in understanding the active thought process underlying the intended awareness-raising
657 outcomes of *Fishy Clouds* was the retention of the play’s message. Our post-performance interviews
658 between 2 and 4 weeks after the play indicated that audience members retained what they considered
659 the main messages of the show, but struggled to recall details. A male theatre goer for example warned
660 that our post-performance interviews might be ambitious, considering that, “*As soon as the*
661 *performance is over, we know we have the same understanding, then our brains immediately go*
662 *somewhere else*” (male theatre goer, 40 years, high school education). While imperfect retention
663 should be expected, it appeared to be weaker with topics that were more remote to respondents’
664 personal experiences: Compared to medicine use, the topic area of research with children was rarely
665 raised by respondents, and spoken about less readily even after probing. This does not necessarily
666 mean that reflections and discussions about the broader topic cease, but we may argue (once more)
667 that the intended message associated with the play may require more systematic reinforcement, for
668 example as part of the school curriculum (as suggested by a theatre critic).

669 In summary, we consider the awareness-raising objectives of *Fishy Clouds* as partially achieved. The
670 quantitative indicators from the evaluation forms depicted a positive response to the awareness-raising

671 objectives of *Fishy Clouds*, but the qualitative analysis suggested that messages received by the
672 audience extended beyond AMR and research with children. It appeared thus that the play raised
673 awareness about health, medicine, and research more generally, and that the theme of “research with
674 children” was less easily received by the audiences than the theme of antimicrobial over- and misuse.
675 Target group differences thereby emerged especially with respect to prior awareness about and
676 understanding of the intended themes:

- 677 • Children and migrant workers without contextual knowledge exhibited the widest range of
678 interpretations and therefore might benefit from more explicit guidance on the topic and
679 ongoing reinforcement of the messages through discussion and complementary information
680 campaigns.
- 681 • Scientists and healthcare workers had existing subject knowledge and might not consider
682 themselves to be an awareness-raising priority group, but may find the play inspiring as the
683 evaluation forms indicate.
- 684 • Metropolitan theatre goers with comparatively high education (two-thirds had at least
685 undergraduate education) represented an intermediate group who appeared more likely to
686 absorb, reflect on, and discuss the intended themes with their children.

687 We conclude that the imagery and depiction of health-and research-related topics interacted with and
688 reinforced existing conceptions among the target audiences. Audience members with more background
689 knowledge were therefore more likely to absorb and reflect on the intended themes of *Fishy Clouds*,
690 while less informed groups were more likely to exhibit varied and potentially problematic
691 interpretations of the play. As a result, *Fishy Clouds* appeared to be more effective in raising existing
692 awareness about medicine use and health, rather than generating specific awareness about
693 antimicrobial misuse and research with children where before there was none.

694 **3.1.2 Artistic and Entertainment Value**

695 **3.1.2.1 ArtArt and Enjoyment**

696 Two outcomes related to the artistic objective of the theatre production are (2a) the acknowledgment
697 of the performances as art and (2b) a sense of enjoyment stemming from it. We argued that a key
698 mechanism to realise these outcomes is the active appreciation of the show among the target audiences
699 (rather than mere attendance). We considered audience as well as critics' views about the artistic
700 validity of the performance. Our evaluation indicates that *Fishy Clouds* achieved these outcomes:
701 Although the artistic expression received mixed reviews, its entertainment value was agreed among
702 audience members and critics. The show also appeared to exercise a positive influence on promoting
703 the (performing) arts more broadly.

704 As far as validation of among the target group is concerned, three questions in the evaluation forms
705 related specifically to the impressions of the play and the overall response among all audience members
706 was positive. The first question in the forms asked whether the audience member liked the drama, with
707 95% agreeing overall. The second question asked whether they think it is art, with 81% agreeing that
708 it is. The third question asked whether the elements of the play relate to the respondent's culture, which
709 attracted a more conservative yet still positive response of 64% overall. Group-specific responses are
710 depicted in Table 3 and explained below.

711

Table 3. Art-Related Evaluation Form Responses Across Audience Groups

	Target Groups					Education Level					Venues								
	Bangkok School Children	Bangkok Theatre Goers	AMR Scientists and Medics	Mae Sot Migrant Workers	Mae Sot Healthcare Workers	None	Primary	Secondary	Undergraduate	Graduate and Above	Bangkok School	Bangkok Muslim Community	AMR Day Press Conference	Thammasat University Open Day	Democracy Theatre	JITMM Conference	Mae Sot Wattana	Mae Sot Wang Pa	Mae Sot Mawker Thai Clinic
Q1 How do you feel about the drama? (% "Like it")	95% (417)	97% (151)	76% (37)	94% (99)	70% (10)	100% (7)	94% (413)	95% (220)	93% (86)	89% (56)	95% (313)	100% (63)	90% (31)	97% (98)	97% (79)	75% (28)	94% (97)	95% (62)	94% (93)
Q2 Do you think this is art? (% "Yes")	79% (418)	93% (150)	89% (37)	79% (99)	40% (10)	57% (7)	73% (412)	86% (216)	94% (85)	93% (59)	74% (314)	87% (63)	97% (32)	97% (98)	92% (77)	86% (29)	80% (94)	70% (61)	76% (93)
Q3 Did you find any element of this drama related to your culture? (% "Yes")	57% (416)	80% (150)	68% (37)	70% (96)	33% (9)	71% (7)	55% (408)	71% (217)	79% (85)	81% (59)	51% (312)	84% (63)	78% (32)	76% (98)	75% (77)	62% (29)	65% (95)	65% (60)	64% (91)

Source: Authors.

Notes. Values as fraction of people responding "yes" to respective questions. Number of observations per question and group in parentheses.

712

713

714 The results of the evaluation forms indicate that the overall high level of validation of the play varied
715 among audience groups. Bangkok metropolitan theatre goers and Mae Sot migrant workers indicated
716 the highest level of approval according to the evaluation forms. The international scientists and
717 healthcare workers attending the Antimicrobial Resistance Week appeared to be less in favour of the
718 play, but still appreciated its artistic value. The small group of healthcare workers at the Thai-Myanmar
719 border in Mae Sot produced the lowest responses, with only 4 out of 10 understanding the play as a
720 piece of art. School children reported a positive attitude towards the play but were also less likely to
721 validate the artistic expression. School children also indicated a relatively weak relationship between
722 the elements of the drama and their own culture, which might result from the concept of “culture”
723 being difficult to assess in a short evaluation form. However, school children had a similar response
724 rate for this question as for other questions in the self-completion form. Furthermore, migrant workers
725 and healthcare workers at the Thai-Myanmar border and international audiences (JITMM, Mae Sot
726 Wattana Resort) indicated relatively low responses in this category as well, which may reflect the fact
727 that the show was initially targeted at urban Bangkok families (see next section on locally appropriate
728 content).

729 The comparatively low overall rating by the healthcare workers and migrant workers in Mae Sot
730 suggests that the play was perceived by some audience members as factual health education rather than
731 a creative play. For instance, a migrant worker explained that the show was not art because it
732 “*demonstrated illness and different kinds of symptoms*” (male migrant worker, 53 years, primary
733 education). Similarly, a healthcare worker in a focus group discussion described the play as
734 “*knowledge*” instead of art. This does not necessarily mean that they do not appreciate *Fishy Clouds*,
735 but that for some people entertainment value arose from an interesting subject rather than from artistic
736 expression:

737

738 *“In the beginning I was not interested because the big fish came out and I thought it was a*
739 *show for small children, and later as I continued watching I understood that it was related to*
740 *taking medicines and I became interested.”* (healthcare worker focus group discussion, all
741 female, 21 to 32 years, all high school education)

742

743 Yet, other audience members, both in Mae Sot and in Bangkok, highlighted the artistic quality of the
744 puppetry, performance, and live music in particular. Especially the interviewed school children
745 enjoyed the puppets and music as both artistic and entertaining. The following statements illustrate the
746 largely positive reception of the performance:

747

748 *“I’ve always liked puppets. [...] Especially with something very academic, if I had to only sit*
749 *and listen, I would fall asleep. But when they make the story interesting by sharpening it with*
750 *art, I feel that it’s... it’s got more to offer. It’s enthralling.”* (theatre goer focus group discussion,
751 female, 24 years, undergraduate-level education)

752

753 *“It was art in many ways because for example, the... the characters, the materials, those are*
754 *artwork. The performance, the presentation as a nonverbal drama, that’s one kind of art.”*
755 (female theatre goer, 49 years, graduate-level education)

756

757 *“I think it is art because there’re puppets that they made themselves. And I really liked the*
758 *music, they make that themselves.”* (male school child, 13 years, 7th grade)

759

760 *“The cartoon characters, the sounds, things like that. It was interesting.”* (female school child,
761 16 years old, 11th grade)

762

763 While part of the show’s appeal emanated from an active appreciation of the performance and the
764 theme, B-Floor Theatre’s reputation as an avant-garde theatre company was arguably an attractor as
765 well. After having seen earlier rehearsals, a theatre goer focus group participant stated that she came
766 to the Democrazy Theatre performance because of B-Floor Theatre, but she *“never thought it was a*
767 *science drama”* (theatre goer focus group discussion, female, 24 years, undergraduate-level education).

768 A scientist familiar with public engagement similarly stated that *“I’d seen the name B-Floor before*
769 *and I saw it again then so I knew they’d perform and I also knew it’d be about antibiotic resistance”*
770 (female scientist, 28 years, currently pursuing PhD).

771 From an audience member perspective, the objective of creating an artistic product with high
772 entertainment value has therefore been achieved. But the project also had another unforeseen positive
773 consequence in the artistic sphere, namely promoting the arts among local Thai audiences. Two
774 excerpts from the interviews demonstrate how the performance itself had been inspiring for artistic
775 endeavours among the audience:

776

777 *“I think the puppets were interesting because the school [my son is attending] is also starting*
778 *to make puppets. They have different methods. It was the puppets and the music that I went to*
779 *see after the show ended. [...] But when I watched [the show,] I didn’t watch the performers, I*
780 *watched the facial expressions and props – the props they make – because they kids were very*
781 *interested in those so I went to see with the kids. I want to know their interests because when*
782 *they have an interest, they’ll pick that up and apply it.”* (male theatre goer, 40 years, high school
783 education)

784

785 R5: “*This show, if there’s a chance, we’d make it our show that we perform.*” (female, 14 years,
786 7th grade)

787 R2: “*But teacher [teacher’s name] told us we had to rehearse a lot.*” (male, 14 years, 2nd grade)

788 R3: “*But we’re willing to.*” (female, 12 years, 7th grade)

789 R5: “*We want to continue performing this drama [Fishy Clouds]. Like they’re our original and*
790 *we take it over from them.*” (female, 14 years, 7th grade) [...]

791 R3: “*We’re about to create a performance, a puppet performance. But the puppets ... we still*
792 *haven’t mastered handling them. [...]* *We went to watch the show [Fishy Clouds] so we*
793 *can do it more smoothly because when we do it [currently], the audience pays more*
794 *attention on us when they should pay more attention on the puppets.*” (female, 12 years,
795 7th grade)

796 (school children focus group discussion)

797

798 This emerging theme is therefore consistent with the artistic objective of the project. The B-Floor-
799 MORU collaboration has not only produced a product that is validated as artistic and enjoyable by
800 most parts of the target audience, but that also has the potential to inspire further artistic activity among
801 them.

802 The perspective of the critics is more conservative than the audience’s. The critics acknowledged the
803 artistic dimension of the play, in particular the artistic skills of the performers, the ability of *Fishy*
804 *Clouds* to stimulate meaningful discussion, and the live music accompanying the performance. As an
805 artistic product, however, they deemed the play “*only partially successful*” (critic). One reason for this
806 view was the storyline of the play. On the one hand, a published review described the play as “easy to

807 understand and straight to the point” (Mahasarinand, 2016:10B). On the other hand, one reviewer
808 argued that the play struggled to convey its story (“*If I’m brutally honest, I didn’t really know what was*
809 *going on most of the time;*” critic) and suggested that too little interaction between the puppets and the
810 audience took place (“*maybe the contact with the audience would have helped the narrative;*” critic).
811 Another point of concern was that the accompanying leaflet, though considered to be essential for
812 understanding the moral of the play, was also criticised for framing the performance in a way that
813 contradicts artistic expression. The play therefore appeared to be geared more towards messaging than
814 artistic expression: Asked whether *Fishy Clouds* broadened the outreach of the arts to audiences with
815 hitherto little exposure, one critic responded, “*Well, I think the main message is about the—like we*
816 *should not just like popping pills—and they shouldn’t be like just popping pills into your body. [...]*
817 *For me, it’s more of that message than like exposure to art*” (critic). Although B-Floor Theatre had
818 been acclaimed in a published review of *Fishy Clouds* to be “more than capable of going beyond their
819 usual tag of politically oriented physical theatre company” (Mahasarinand, 2016:10B), they also
820 appeared to be somewhat uncomfortable with the scientific theme in the view of the critic (“*it seems*
821 *like it’s not their cup of tea;*” critic).

822

823 The critics’ nuanced positions were somewhat at odds with the stakeholders who were involved in the
824 production process, whose views were unambiguously positive. For the theatre staff, the play was an
825 abstract means to communicate ideas and stimulate discussion; the scientists appreciated the creative
826 interpretation of the subject by skilled artists:

827

828 “*[Fishy clouds] is specifically designed to promote discussion about a particular topic that is*
829 *generally concern at the moment. So it’s contemporary art because it’s of the moment, it’s*
830 *facing a problem that we are facing right now.*” (B-Floor Theatre team)

831

832 “Art always communicates but what it communicates, it depends on each piece of art.” (B-
833 Floor Theatre team)

834

835 “I feel that they tried to make it into the theatre style, with our voice, with our narrations.”
836 (MORU team)

837

838 “[Fishy clouds] includes creativity. It includes colours. There’s a whole scenario. And even
839 though there’s a scientific, like health-related message that you don’t decide, of course, that is
840 based on evidences. There’s still a part to know how to make the message, how to transmit it.
841 So, it’s about creativity. It’s about imagination. It’s about trying to inspire people. And so, of
842 course, it’s art. Yes, it is.” (MORU team)

843

844 However, even if the artistic expression in the play is partly compromised, critics, stakeholders, and
845 audiences agree that the play offers high entertainment value (“visually entertaining;” critic),
846 especially for children. This facet of the artistic objective can therefore be understood as achieved.

847 **3.1.2.2 Collaborative Process**

848 Aside from audience and stakeholder validation, we considered outcomes resulting from the
849 collaborative production of the science-themed drama. The outcomes in our evaluation framework
850 included (2c) the production of a locally appropriate science-themed drama, (2d) lasting relationships
851 in this collaboration between the arts and the sciences, and (2e) a shared sense of organisational
852 learning and success. This section will focus first on the collaborative process and its outcomes on the
853 organisation, before discussing the appropriateness of the content from the stakeholder perspective.

854 This section demonstrates overall project success with respect to the collaborative process (2d and 2e),
855 but stakeholders' feedback also questioned the cost-effectiveness of the collaboration (2e) and raised
856 doubts about the appropriateness of the play for target groups beyond families with children (2c).

857 As far as the process itself is concerned, the project stakeholders acknowledged that the collaborative
858 production was constructive:

859

860 *“During the research process, we worked with the research team and met with different doctors*
861 *that work in this field. And then we also worked with the playwright, yes, to like, to identify the*
862 *topic that we're interested [in] from the research process with the doctors.” (B-Floor Theatre*
863 *team)*

864

865 *“I think I quite like it [the process] in the way that they [B-Floor Theatre] tried to get a lot of*
866 *researchers, they ask all stakeholders as much as they can and I point to the outside doctors*
867 *outside of Thailand, the pharmacies, the activist[s] who work on this area and they try to*
868 *research everything.” (MORU team)*

869

870 The process naturally involved reconciling different positions and translation between the artistic and
871 scientific stakeholders, which was a new experience and partly challenging, but not an obstacle for
872 project implementation:

873

874 *“Actually it's kind of, I think that scientists are like a book. Maybe more like a text book. We*
875 *have to like decode and find what they are interesting in. and we have to decode that to become*
876 *like a performance. This is the most hard work I think. Because it's not [an] easy topic, that*

877 *you can explain easy to the people can understand this. That is the most exciting part for this*
878 *project.”* (B-Floor Theatre team)

879

880 *“In terms of my early involvement with interviews I think that was all fine. They [B-Floor]*
881 *seemed to pick up on [...] what I would say was the important themes related to AMR.”* (MORU
882 team)

883

884 *“I mean we see how [the themes of antimicrobial resistance and research with children] are*
885 *related but to weave it into a smooth kind of narrative, and one round story for action was quite*
886 *difficult I think.”* (B-Floor Theatre team)

887

888 Concerns only arose with respect to operational processes, where photography demands and the
889 evaluation process itself (i.e. handing out evaluation forms) interfered with the delivery of the
890 performances, making the theatre staff *“uncomfortable”* (B-Floor Theatre team). The scientific
891 collaborators also voiced concern about not having a focal contact person in their own team who speaks
892 the local language, stating that, *“Having some persons in the main [MORU] team who are Thai to*
893 *work with them [B-Floor Theatre] would be better [for the communication between the teams]”*
894 (MORU team). Despite occasional frictions, the stakeholders overall perceived the process to be
895 collaborative and a constructive learning experience that compromised neither side’s fundamental
896 interests in the collaboration.

897 The project stakeholders understood the outcomes of the collaborative process to be successful from
898 an organisational perspective (2e). This included statements which reflected satisfaction, excitement,
899 and pride, but also the impression of breaking new ground, doing something useful, and having a
900 supportive organisational environment. For example,

901

902 *“I thought they did a very good job.”* (MORU team)

903 *“It’s been an honour that MORU is still interested to work with us for a second time.”* (B-Floor
904 Theatre team)

905

906 An unintended outcome in this respect was that the stakeholders themselves learned and reflected,
907 which arguably contributed to the impression of organisational success. This impression of learning
908 was prevalent among both the artistic and scientific stakeholders – artists learning about scientific
909 topics and scientists reflecting on the value of the arts for scientific communication and engagement.
910 A selection of responses to the question “What have you learned from this process?” illustrates this
911 process of mutual learning and reflection:

912

913 *“We start to [...] tell the people around us more about what we’ve learned. [...] There’s more*
914 *thinking, there’s more ‘Okay, there’re good bacteria, too. Don’t forget them.’”* (B-Floor
915 Theatre team)

916

917 *“I’ve learnt that you can actually do quite a lot in terms of bringing [across] these kind of, you*
918 *know, normally dry sciencey things.”* (MORU team)

919

920 In line with the positive collaborative experience, the stakeholders perceived the relationships created
921 and reinforced by this project as sustainable (2d). The *Fishy Clouds* project was itself a continuation
922 of a previous joint project entitled *Survival Games*, which already indicates the partners’ willingness
923 to engage in a longer-term collaboration. The present project appeared to have fortified these previous

924 links, although the attitudes towards future project opportunities vary. On the one hand, the theatre
925 team was explicitly in favour of continued work with *Fishy Clouds* and of collaborating with MORU
926 in particular (“*I hope MORU and Wellcome Trust [are] up for it;*” B-Floor Theatre team), but MORU
927 was understood to be the driver of such a collaboration (“*I suspect it’s more to do with if MORU*
928 *perceives there to be continuing value;*” B-Floor Theatre team). On the other hand, MORU scientists
929 expressed future collaborative potential in vaguer terms, stressing that both partners would have to
930 want to work together again (“*possible if both sides want to;*” MORU team), and reflecting on the
931 general value of collaborations between arts and science relative to their impact and cost-effectiveness:

932

933 *“I strongly believe that art can be a powerful vector [...] but it has to be well-thought and*
934 *adapted to the population you’re targeting.”* (MORU team)

935

936 *“I can see the kind of added value of theatre. It is much more engaging. You’re in there, you’re*
937 *drawn into it a lot more than you would by watching a video. But yeah, the down side is it’s*
938 *not really scalable in any meaningful way.”* (MORU team)

939

940 Though partly sceptical, the overall positive viewpoints and experiences of the collaborators suggest
941 that the project was successful in reinforcing and developing sustainable relationships between the two
942 organisations. The processes of mutual learning and reflection also holds promise that MORU and B-
943 Floor Theatre engage in and expand future arts-science collaborations, potentially also with other
944 partners.

945 The production of locally appropriate content (Outcome 2c) received more heterogeneous views. The
946 dominant position among the stakeholders was that the presentation of the content was appropriate.
947 The theatre group members thereby emphasised the non-verbal modes of communication and the

948 logistical requirements for a touring production, whereas subject specialists and MORU staff involved
949 in the project highlighted the ability of the performance to draw attention to scientific topics and to
950 communicate antimicrobial resistance appropriately (little was said on research with children; see
951 below). Both theatre critics supported this position, at least in connection with the accompanying
952 information leaflet.

953 However, both artistic and scientific stakeholders qualified their positive views. Theatre staff, critics,
954 and scientists understood that target group differences (e.g. different age groups) could influence the
955 successful delivery of the drama's messages. Scientists and critics also acknowledged that the target
956 group might require a pre-existing understanding of the topic. The theatre critics further suggested that
957 familiarity with non-verbal performances would be helpful for understanding *Fishy Clouds*, and that
958 complementary information (e.g. “*an education package that goes with [the play] for different age*
959 *groups;*” critic) would help the audience to grasp the scientific messages of the play more effectively.
960 In addition, the theatre team highlighted differences in effectiveness of communication depending on
961 whether the show is performed in open or closed spaces. B-Floor Theatre also acknowledged the
962 requirement to discuss the content during and after the show in order to make the performance
963 effective. This discussion was envisaged to take place especially between children and their parents,
964 noting that the performance had initially been designed with families in mind (“*family and children*
965 *orientated;*” theatre staff); the target group only later expanded. Recognising this original focus, one
966 of the published reviews of the play also considered that *Fishy Clouds* appears to speak to “younger
967 audiences” in particular (Mahasarinand, 2016:10B).

968 More critical perspectives existed as well, primarily among the critics and scientists. Some questions
969 related to whether the medium is indeed the most suitable to convey a complex scientific topic, and
970 one scientist felt that the imagery used in the play was generally unsuitable for this purpose (“*too*
971 *abstract and too subtle;*” subject specialist). Moreover, as the two thematic areas of AMR and research
972 with children were difficult to reconcile artistically, the non-artistic stakeholders also saw the

973 combination of the two different themes as “*somewhat coerced*” (MORU team), and research with
974 children was perceived to be subordinate to the theme of antimicrobial resistance, which corresponds
975 to audience responses. Overall, the positive impressions of appropriateness appear to outweigh these
976 doubts, but most stakeholders maintain the pragmatic position that the play is unlikely to suit all
977 audiences who were ultimately included. The varying ability of the audiences to relate the play to their
978 culture (Table 3 in Section 3.1.2.1) reinforces this conclusion.

979 **3.2 Overall Assessment of Evaluation Criteria**

980 We summarise in this section the findings of the evaluation and relate them to the overarching
981 evaluation criteria of effectiveness, relevance, efficiency, impact, and sustainability. Owing to the
982 novelty of creative-expression-based public engagement evaluations, we rely on a qualitative appraisal
983 and acknowledge especially the limitations in assessing long-term impact of *Fishy Clouds*. However,
984 our consideration of these overarching evaluation criteria provides an opportunity to build the
985 knowledge base of benchmark indicators for future public engagement evaluations.

986 According to our assessment, we conclude that *Fishy Clouds* was implemented efficiently and it was
987 partly successful in meeting its objectives. The play also addressed topical issues which have, however,
988 mixed relevance for its diverse target groups. Final judgements on the cost-effectiveness, impact, and
989 sustainability of the public engagement activity require further benchmark information and longer-
990 term evaluations.

991 **3.2.1 Effectiveness**

992 The criterion of effectiveness assesses whether and to what extent the project objectives have been
993 achieved (OECD Development Assistance Committee, 2010). We will examine each objective
994 separately in detail below, but the overall conclusion from the discussion is that the awareness-raising
995 objectives have been partially achieved, whereas the artistic objective has been achieved on the whole.

996 We supplement our qualitative evaluation of effectiveness with an achievement score from 0 (not
997 achieved) to 10 (fully achieved).

998

999 **Objective 1 – To raise awareness of antimicrobial overuse and misuse: Partially achieved (6 of**
1000 **10).**

1001 The available evidence suggests that *Fishy Clouds* raised awareness about antimicrobial misuse and
1002 overuse among a part of the target audience, but it also yielded interpretations that are potentially at
1003 odds with its intended message. Awareness about antimicrobial over- and misuse, specifically in
1004 relation to antibiotics, was raised primarily among target group members with pre-existing
1005 understanding and awareness, but who do not consider themselves experts in the topic. This pertained
1006 especially to comparatively highly educated Bangkok metropolitan theatre goers. The play was able
1007 to inspire specialist audiences including scientists and healthcare workers with new ideas as well, but
1008 these audiences also indicated that they were already aware of the subject. Uninformed audiences
1009 including school children and migrant workers linked the play to broader themes of health, illness, and
1010 medicine use. Interpretations of the “medicine use” theme thereby led audience members to consider
1011 the appropriate use of medicine but also scared some and—occasionally—led others to conclude that
1012 they have to use more medicine than they currently do. Overall, *Fishy Clouds* appeared successful in
1013 reinforcing existing awareness about antimicrobials, but less successful in generating it without a prior
1014 basis.

1015

1016 **Objective 2 – To raise awareness of the importance of research with children: Partially achieved**
1017 **(4 of 10).**

1018 Compared to antimicrobial use, *Fishy Clouds* was less successful in raising awareness about “research
1019 with children,” the importance of which was less widely recognised among the target audiences. The
1020 various interpretations of this theme included research with children but also medical research more
1021 generally and the importance of correct medicine dosing, but none that we could consider problematic.

1022 It appeared that *Fishy Clouds* was most successful in raising awareness about research with children
1023 among healthcare workers in Thai-Myanmar border zones and with Bangkok theatre goers, but the
1024 theme itself was subordinated to antimicrobial misuse both in the play's production and in the
1025 audience's reception.

1026

1027 **Objective 3 – To produce a science-themed performance of entertainment value and high artistic**
1028 **quality: Achieved (9 of 10).**

1029 The validation of the artistic expression was widespread among the target audiences and among theatre
1030 critics, complimenting in particular the puppetry, acting, and the live music support. However, critics
1031 also considered the storyline of the play to be obscure and the performance inhibited by a mismatch
1032 between a politically oriented theatre company and a science-themed play. Despite the disagreements
1033 in the artistic value, the entertainment value was considered high both within the qualitative and
1034 quantitative evaluation instruments and among all audience and stakeholder groups. An unintended
1035 positive outcome contributing to this objective was the promotion of the (performing) arts among the
1036 target audiences more generally.

1037 From a process perspective, the collaboration between B-Floor Theatre and MORU was successful in
1038 generating an organisational sense of success and in reinforcing existing and developing new
1039 relationships between the project stakeholders—notwithstanding the impression that both groups see
1040 MORU as the initiator of the present and potential future collaborations. The project also entailed
1041 processes of personal and organisational learning, inspiring the artistic stakeholders with scientific
1042 themes, and leading the scientific stakeholders to reflect on the opportunities of creative expression
1043 and other forms public engagement. Merely the outcome of locally appropriate content was not fully
1044 realised, considering the absence of a Thai focal contact among the MORU team, the implicit targeting
1045 of metropolitan theatre-going families for *Fishy Clouds*, and the difficult combination of two scientific

1046 themes. Overall, the project was implemented successfully and it represents an organisational success,
1047 though the performance itself appeared to address too broad an audience with too many themes.

1048 **3.2.2 Relevance**

1049 Relevance considers whether the objectives of the project correspond to target group requirements, but
1050 also to national and global priorities as well as partner's and donors' policies (OECD Development
1051 Assistance Committee, 2010). Antimicrobial resistance is a global and regional health priority, while
1052 research with children is a salient topic in the clinical research of MORU. Public engagement more
1053 generally is gaining increasing recognition in academic practice and is promoted by funders as well as
1054 academic institutions such as MORU. This suggests global, national, and partner relevance of the
1055 activity, but it does not automatically imply relevance of the project for all identified target groups.

1056 Antimicrobial over- and misuse is a problem recognised for Thailand (Lim *et al.*, 2016) and directly
1057 connected to people's healthcare experiences and healthcare-seeking behaviour (from both a demand
1058 and a supply perspective). The theme can also be relevant beyond the identified target groups for
1059 limitedly trained formal and informal healthcare providers. However, while the general public may not
1060 be aware of the importance of the problem, a "lack of awareness" about antibiotic misuse might not
1061 be a priority issue for scientists and healthcare workers attending tropical medicine conferences and
1062 specific events for antimicrobial resistance (these groups may already be aware about global health
1063 priorities). Conversely, research with children is arguably relevant for scientists and healthcare
1064 workers who are involved in clinical research with MORU and research more generally, but this
1065 specific theme (rather than research more generally) appeared too remote for the general public (school
1066 children, theatre goers, migrant workers).

1067 The criterion of relevance further considers whether the project proposed a plausible mechanism to
1068 achieve the intended objectives with the proposed activities, and whether the project aligned with
1069 other, related activities (e.g. to raise awareness about health and research, to increase the appreciation

1070 of science among the general population, and to promote the arts). The activity intended to extend
1071 beyond metropolitan theatre goes through non-verbal communication and as a touring production,
1072 which is a suitable design to be accessible to broader groups. However, the assumed mechanism did
1073 not take account of complementary knowledge and educational activities to *enable* awareness among
1074 the least aware target groups like children and migrant workers. As a sole instrument, *Fishy Clouds*
1075 might be insufficient to raise awareness among these high-priority groups. In terms of alignment, the
1076 theatre play was integrated into AMR and research-related activities in Bangkok (AMR week, JITMM)
1077 but a lack of alignment with existing health education mechanisms for non-academic and non-medical
1078 target groups left *Fishy Clouds* short of its awareness-raising potential.

1079 In summary, the project addressed important subject areas but the target group relevance was
1080 diminished by the heterogeneity of the groups spanning lay audiences as well as experts, and by the
1081 lacking integration with complementary health education activities to reinforce the non-verbal
1082 messages.

1083 **3.2.3 Efficiency**

1084 The criterion of efficiency considers the operational efficiency of production but also cost-
1085 effectiveness and allocative efficiency of the project (OECD Development Assistance Committee,
1086 2010). Considering the yet limited knowledge base of public engagement evaluations and the
1087 associated absence of reference values, we limit ourselves to a brief discussion rather than a
1088 comparative assessment.

1089 In terms of production efficiency, the project complied with its production timeline, only being
1090 subjected to an external event (the passing of the King of Thailand) that prevented and delayed the
1091 first performances of *Fishy Clouds*. The show had otherwise been implemented according to plan,
1092 having reached 1,440 audience members, which corresponds to 180% of the initial estimates. The
1093 overall project costs of GBP 32,000 correspond to GBP 22 per audience member reached. It is possible

1094 that *Fishy Clouds* performances continue in the future, or that video recordings of the show are being
1095 shown instead, both of which would spread the fixed costs of production and reduce the costs per
1096 audience member thus.

1097 Cost-effectiveness would have to be assessed not merely in terms of output (audience numbers) but in
1098 terms of awareness (or enjoyment and artistic appreciation) created (O'Brien, 2010). We do not attempt
1099 to develop such a measure but point to the target group differences in awareness raising, which
1100 suggests that not all 1,440 audience members have become more aware about the problem of
1101 antimicrobial over- and misuse and about the importance of research with children. An optimistic
1102 estimate from the evaluation forms (which, as we argued above, are overestimates) would suggest that
1103 71% (600 out of 848 valid responses) of the audience experienced increased interest both in medicine
1104 use and in research with children, which would correspond to GBP 31 per “more aware” audience
1105 member. Considering the arguable overstatement in the quantitative data (owing to the wide range of
1106 interpretations), the actual costs per aware audience member are presumably higher. A conclusive
1107 statement would also have to account for more tacit forms of awareness over the longer term that are
1108 less readily measured through an evaluation form or through interviews. Lastly, the target group
1109 differences indicate that some groups may be reached more effectively through this medium than
1110 others. For example, Bangkok theatre goers responded positively to the performance, school children
1111 might require complementary activities to increase the cost-effectiveness of the performance, and the
1112 cost-effectiveness of addressing scientists might be comparatively low.

1113 Owing to the lack of benchmark indicators, we cannot provide a concluding assessment of the project’s
1114 efficiency, but we reiterate the efficient implementation of the project alongside the mixed cost-
1115 effectiveness across different target group members.

1116 3.2.4 Impact and Sustainability

1117 Impact is a criterion that assesses the positive and negative, intended and unintended long-term
1118 implications of the project (OECD Development Assistance Committee, 2010). Because this
1119 evaluation was designed as a process evaluation to understand the nature of context, mechanisms, and
1120 outcomes related to public engagement using creative forms of expression, we are not in a position to
1121 appraise long-term impact, which also relates to the criterion of sustainability (Kilroy *et al.*, 2007). In
1122 both cases (impact and sustainability), we can only provide hypotheses and outline the sustainability
1123 risks, which we hope are useful for future evaluations of public engagement activities.

1124 The theme of retention has indicated that the explicit messages of the play wane (not surprisingly)
1125 especially for topic areas to which individuals cannot relate personally. If not embedded into a set of
1126 complementary activities that establish and reinforce a basic understanding of the problem areas (e.g.
1127 health education) and that relate the audience to the artistic forms of expression (e.g. drama classes),
1128 the performance as a one-off event may be unable to yield sustainable impacts among the target groups
1129 (Munier & Etherton, 2006). Such impact may take the form of increased acknowledgement of and
1130 discussions about the scientific themes and the arts in public discourse; changes in health behaviour
1131 and research interests; active contributions to and participation in artistic activity; and more general
1132 understanding and ongoing reflection about the drama's topics (Calzia *et al.*, 2005; Dalrymple, 2006;
1133 Etherton & Prentki, 2006; Gallagher *et al.*, 2010; Kilroy *et al.*, 2007; Mitchell *et al.*, 2011; Thomson
1134 *et al.*, 2013a).⁷ Beyond the target groups, the project itself promises to establish sustainable cooperative
1135 relationships between the project stakeholders, aided by mutual processes of personal reflection and
1136 organisational learning. However, it is yet too early, and public engagement evaluation toolkits are yet
1137 too limited, to articulate an assessment of impact and sustainability.

⁷ Note that a single project like *Fishy Clouds* will be unable to demonstrate impact on higher-order development outcomes like antimicrobial resistance or mortality on a national level and cannot be judged by such a standard.

1138 **4 Discussion**

1139 This evaluation was conducted with the explicit purpose of informing future evaluations of public
1140 engagement with science using creative forms of expression. In this section, we highlight the
1141 shortcomings and advantages of the mixed-methods approach, and reflect on and develop the
1142 evaluation framework.

1143 With respect to the evaluation methodology, we combined quantitative and qualitative instruments to
1144 assess the project's achievement of awareness-related and artistic objective. Our evaluation design has
1145 four main limitations. First, the cross-sectional design is unable ascertain causal relationships between
1146 the *Fishy Clouds* play and its outcomes rigorously. The insufficient knowledge base on how to assess
1147 the various interpretations of the non-verbal performance together with a largely self-selected audience
1148 and the absence of a counterfactual rendered an experimental design infeasible (Etherton & Prentki,
1149 2006; Guetzkow, 2002);⁸ and logistical constraints and possible priming effects also prevented a
1150 quantitative before-and-after comparison. We therefore analysed a cross-section of self-reported
1151 project outcomes from evaluation forms and complemented the interpretation of these data through
1152 interviews and focus group discussions. This provides us with a better understanding of the underlying
1153 mechanisms and the likely direction of causality (Galloway, 2009), but longer-term and rigorous
1154 quantitative studies would be necessary to establish our claims more firmly (see e.g. Dalrymple, 2006).
1155 Second, our quantitative evaluation was bound by the need for a simple, easy-to-administer evaluation
1156 form that suited different lay and specialist audiences at once (note that the evaluation forms were not
1157 owned by the evaluation team but by the theatre company). The reported interest in and positive
1158 reception of the scientific messages reflects established patterns in the literature (Durant *et al.*, 1989),

⁸ The self-selection of the audiences became apparent in our quantitative and qualitative data collection (based on contact information from the evaluation forms). Rather than a cross-section of target groups like "Bangkok school children" or "Bangkok metropolitan theatre goers," *Fishy Clouds* appeared to be more likely to attract individuals who are involved in drama studies. Considering their experience with medium of non-verbal drama, especially their responses relating to the artistic value of the show were notably different from the remaining audiences. However, due to the small sample and variable information on "occupation" in the evaluation form, we refrained from a quantitative comparative analysis between groups with different level of involvement with the arts.

1159 but our qualitative work indicated a tendency of acquiescence and a wide range of interpretations
1160 associated with the answers in the evaluation forms (note that unforeseen interpretations are an
1161 intrinsic feature of creative expression and not necessarily problematic). A limitation of the analysis is
1162 thereby the temporal mismatch between the self-completion evaluation forms (administered
1163 immediately after the performance) and the qualitative data collection (carried out between 2-4 weeks
1164 after the performances). Considering the broad answer categories, the limited recall, and the potential
1165 response biases, we therefore concluded that the positive responses in the quantitative part of the
1166 evaluation are probably an overestimate of the actual project outcomes, which are still positive rather
1167 than negative. While the “true” outcomes of the project are difficult to detect with certainty (requiring
1168 additional representative quantitative data collection at different points after the performances), the
1169 complementary qualitative study helped to interpret the otherwise crude quantitative evaluation
1170 instrument (Calzia *et al.*, 2005). Response biases in future quantitative studies of this kind could be
1171 mitigated by varying the answer categories (alternating “yes” and “no” answers on different versions
1172 of the evaluation forms), and by having target-group specific evaluation forms based on prior
1173 qualitative research to establish an understanding of interpretive categories (e.g. simpler questions for
1174 children and more specific questions for scientists and healthcare workers).

1175 Third, this project has developed a set of outcome categories and underlying mechanisms for the
1176 evaluation of science-themed public engagement using creative forms of expression. Considering the
1177 yet limited knowledge base of this kind of evaluation in global health, we caution against the uncritical
1178 application of our evaluation categories to other projects (Thomson *et al.*, 2013a). Repeated process-
1179 based realist evaluation approaches will still be required in order to broaden our understanding of
1180 outcomes and mechanisms, and to develop a range of benchmark indicators in order to articulate
1181 evaluation targets in future public engagement projects. Complementary evaluation designs (e.g. long-
1182 term impact and ex-post evaluation of engagement programmes rather than individual project) can
1183 then help to ascertain the evolution of understanding, attitudes, and behaviours associated with public

1184 engagement activities, which is a limitation of our realist evaluation approach. Our evaluation case
1185 study is therefore only one among the first steps towards established evaluation practice in theatre-
1186 based public engagement activities.

1187 Lastly, a methodological limitation of the evaluation was that junior members of the evaluation team
1188 were also part of the department that commissioned and coordinated *Fishy Clouds*. In order to maintain
1189 independence of the evaluation (OECD Development Assistance Committee, 1991:5; World Bank
1190 Independent Evaluation Group, 2015:29), the evaluation process has been overseen closely by an
1191 external evaluator who was not involved in the production and operation of *Fishy Clouds*, and who
1192 carried out the data analysis and the reporting of this evaluation.

1193 Our evaluation framework was informed by the limited yet evolving literature on evaluating the arts
1194 and public engagement in particular, including Calzia *et al.* (2005); Galloway (2009); Jackson
1195 (1998); Jackson *et al.* (2003); Lafrenière and Cox (2013); Thomson *et al.* (2013a); Thomson *et al.*
1196 (2013b). Our exploratory research approach has helped to inform and specify our initial categories,
1197 reiterating themes observed in the existing literature and combining them into a harmonised
1198 framework. Our data suggested that important and inter-related elements within active thought
1199 processes to raise awareness include recognising the topic area within the creative expression, relating
1200 the story and its elements to existing knowledge and personal concepts and experiences, interpreting
1201 the both verbal and non-verbal messages provided by the performance, discussing and sharing
1202 messages from the performance with peers, and retaining the interpretation and messages over time
1203 (Lafrenière & Cox, 2013). These elements of the thought process interact with characteristics of the
1204 audience, including their pre-existing awareness and understanding of the subjects, their cultural
1205 background, their education and experience with creative forms of expression, the nature of the
1206 performance venue (influencing audience member focus and interaction between audience and actors),
1207 and the informational environment providing complementary information and reinforcing messages to
1208 support the play. The awareness-related outcomes of interest, desire to learn, and reflection were

1209 informative though difficult to measure and disentangle, and we noted the presence of potentially
1210 problematic unforeseen interpretations of both verbal and non-verbal messages.

1211 The mechanisms underlying the artistic outcomes included the active appreciation of the play, which,
1212 according to our qualitative research, included audience members' conceptualisation of art and health
1213 education (which can but need not be opposites), the presence of artistic attractors to increase attention
1214 and appreciation, and inspiration following from exposure to the performance (Jackson, 1998; Jackson
1215 *et al.*, 2003; Thomson *et al.*, 2013a). We identified the promotion of the arts as an emerging outcome
1216 aside from the validation of the play as art and a sense of enjoyment gained from attending *Fishy*
1217 *Clouds*. Theatre experience is arguably an important (though not decisive) characteristic of the
1218 audience to influence these outcomes.

1219 We also considered the organisational process dimension of the artistic production in a collaborative
1220 process, of which the (power) balance and frictions between the different stakeholders and processes
1221 of mutual reflection and learning were important elements underlying the realisation of the pre-
1222 formulated outcomes of appropriate content, sustainable relationships, and an organisational sense of
1223 success (Haddon, 2006; Jackson, 1998; Jackson *et al.*, 2003; O'Connor *et al.*, 2006). We see
1224 organisational learning not only a process in itself but also a desirable outcome of the collaboration
1225 between the sciences and the arts (Haddon, 2006).

1226 We summarise the lessons for the evaluation framework in Figure 5. We caution against using this
1227 framework as a template for future public engagement evaluations, but it can serve as a basis to
1228 consider possible pathways and outcomes in other evaluation projects.

1229

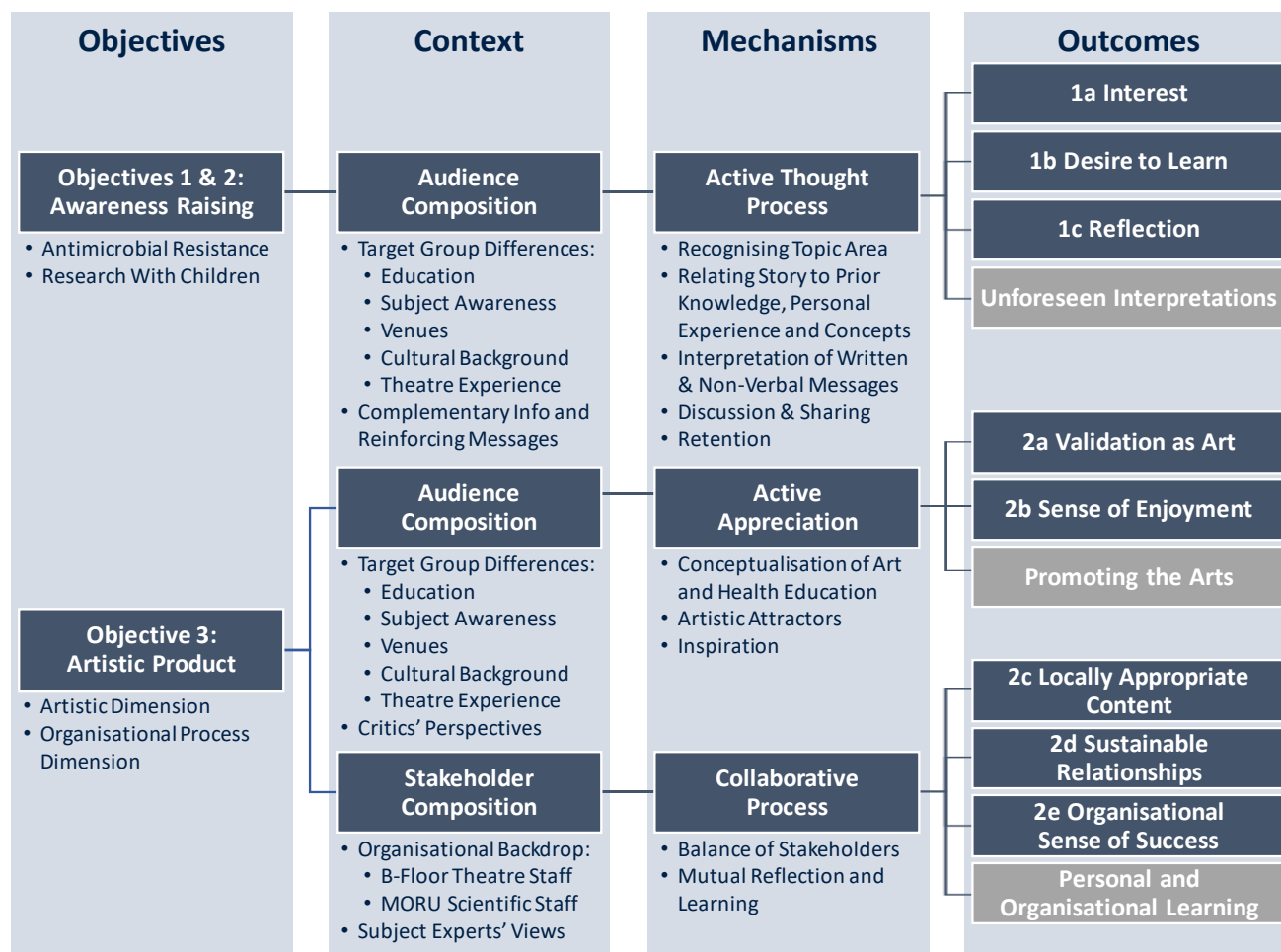


Figure 5. Augmented Evaluation Framework

Source: Authors, based on Calzia *et al.* (2005); Galloway (2009); Jackson (1998); Jackson *et al.* (2003); Lafrenière and Cox (2013); Thomson *et al.* (2013a).

Note. Grey-shaded fields are additions to the initial framework.

5 Conclusions

In the context of increasing research funder and academic interest in public engagement, we carried out an evaluation of the science-themed puppet theatre *Fishy Clouds* as a case study to inform evaluation practice. The engagement activity intended to raise awareness about two scientific themes (antimicrobial over-/misuse, research with children) and to create an artistic product with high entertainment value. We followed a six-step evaluation process, used a realist evaluation approach, and employed qualitative and quantitative research methods. Target group heterogeneity and imbalanced scientific themes meant that the achievement of the awareness-raising objectives was mixed, but the achievement of the artistic objective was successful from an organisational as well as audience perspective.

1245 The evaluation has shown that public engagement activities can engage certain groups of the public
1246 with scientific themes while promoting the arts and fostering interdisciplinary cooperation.
1247 Methodologically, this case study provided an evaluation process description, a framework example,
1248 and indicative benchmark values for outcome indicators and evaluation criteria. The yet limited
1249 understanding of context, mechanisms, and outcomes of public engagement using creative forms of
1250 expression also highlights the need for broader qualitative and quantitative research studies about the
1251 ability of different activities to inform and engage the public with scientific themes effectively, and
1252 the role of age and education in shaping the range of interpretations resulting from creative forms of
1253 expression.

1254 Our case study also offers modest lessons for science-themed drama. According to our analysis, future
1255 public engagement projects should consider limiting the specificity of scientific themes, responding to
1256 and working with target groups' background knowledge, existing conceptions, and understanding.
1257 Such activities should be focused on justified priority target groups (e.g. in terms of awareness-raising
1258 need, potential for inspiration, ability to act on awareness) in order to be cost effective. Effectiveness
1259 in general and cost effectiveness in particular could also be enhanced by:

1260

- 1261 • using simple, clear, and target-group specific messages to accompany a non-verbal
1262 performance (e.g. simple messages in accompanying leaflets, live narration, colourful picture
1263 books for children),
- 1264 • expanding the audience through video screenings of the performance (whose effectiveness
1265 would need to be evaluated separately),
- 1266 • offering a long-term series of activities rather than isolated, one-off events,
- 1267 • embedding the engagement activity within a broader educational programme like school
1268 curricula, information campaigns, and participatory pre- and post-performance workshops
1269 (Chinyowa, 2011; Kilroy *et al.*, 2007; Skinner *et al.*, 1991), and/or

- aligning various public engagement consistently for priority target groups.

1271

1272 Evaluations should then focus on programmatic action rather than isolated engagement activities,
1273 evaluating overall effectiveness, efficiency, relevance, internal consistency of the various activities,
1274 and long-term impacts (Thomson *et al.*, 2013a). Where a collaborative relationship puts the sciences
1275 and the arts on an equal level, it is also important that the goals of the project reflect the intentions of
1276 the participating stakeholders. Lastly, we recommend that future public engagement projects explore
1277 and articulate the mechanisms leading to the expected outcomes, recognise potentially detrimental
1278 outcomes, and, ideally, formulate an evaluation strategy and agree on qualitative and quantitative
1279 indicators of success at the design stage of the project (Dalrymple, 2006; Galloway, 2009; Lafrenière
1280 & Cox, 2013; O'Connor *et al.*, 2006; Thomson *et al.*, 2013a). An ongoing challenge in this context
1281 will be to balance the needs for evaluating effectiveness, artistic freedom and experimentation, and
1282 scientific rigor and awareness raising within one project (Thomson *et al.*, 2013a).

1283 In conclusion, artistic means of expression can offer a vehicle to engage the public with the sciences,
1284 but the interpretation of artistic expressions can create a tension with scientific awareness-raising
1285 objectives. Ambiguous and unintended interpretations do not necessarily mean that a project is
1286 necessarily unsuccessful, and a recent workshop by the Wellcome Trust argues that “funders should
1287 be sufficiently flexible and understand the unpredictable nature of these [artistic] projects to allow
1288 them to flourish” (Austen, 2016:44). However, open-endedness and unpredictability does not relieve
1289 arts-science collaborations of the need to be relevant, effective, efficient, and sustainable. Our process
1290 description and realist approach can inform future evaluations for this type of public engagement in
1291 global health and beyond. This would not only help researchers to respond to funder requirements, but
1292 more widespread evaluation would also help to build a knowledge base of cost-effective, target group
1293 specific, and locally appropriate public engagement activities.

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1423

1424

1425

Appendix 1: Coding Frame

Theme
1. Awareness about AMR and research with children
M1 Process - Active Thought
M1O1 Interest in AMR
Already interested
No interest
Yes
Antibiotic Discovery
Effect of AMR in agriculture on human
Relationship between rain and AMR
Resistance
Taking medicines
M1O2 Interest in RWC
No interest, distant subject
Prescribing different dose for children
Yes research , not with Children
Antibiotic Discovery
Conflicts with thoughts, wish for changes
Experiments should happen
Experiments to cure sickness
Importance of research
Yes research, yes children
Existence
Frequently mentioned subject
Out of expectation
Participation of children in experiments
M1O3 Desire to learn AMR
No desire to learn
Revision
Yes
Antibiotic
Antibiotic discovery
Effect of AMR in agriculture on human
Ingredients in antibiotic and names
Types of antibiotic
Correct use of medicine
Drug resistance
Germs and diseases
Medicines' effects and side effects
Relation to othes, to help, to educate
Self protection
Yes but...
Yes but desire already existed prior to show
Yes but no action
Yes but unrelated show
M1O4 Desire to learn RWC
No desire to learn RWC
Yes
Existence
Experiment to find treatment
Right dose for children
Scientific experiment
Yes but no action
M1O5 Reflect on AMR
AMR
AMR in Agriculture and food
Antibiotic Discovery
Antibiotics aren't always bad
Antibiotics in general
Mouthwash
Needs rescriptions or doctor
Resistance
Virus VS Bacteria
Medicines
Changing medicine behaviours

Correct medicine for symptoms

Take more medicines

Use when necessary

No reflection

Reflecting on prior knowledge, experience

Reflecting on the show

Created question for show

Metaphor and symbols

Unexpected subject

Unrelated to AMR

Cold weather

Germs causing sickness

Medicines' appearances and ingredients

Sickness in general

Taking care of health

M106 Reflect on RWC

No reflection

Reflection only after question

Unrelated to research or children

Being scared of treatments

Money Issue

Scientific experiment

Yes

Guardian allowing treatment

Linking research with AMR

Questioning existence

To cure the patient, unnecessarily children

To find children's dose

To find treatments for other people

To produce custom-made medicines

Other outcomes

Audience wanting more

Aware already and not learning more

Disagreeing with message

General desire to learn

General interest

General reflection

Interpretation of message

AMR

AB or medicines in agriculture

ABs aren't bad when use wisely

AB's cycle in all lives

Resistance, antibiotic

Resistance, drugs in general

Seriousness of AMR problem

Health

Being exposed to diseases via swimming in hot water

Following doc's instructions

Germs

Germs spread easily

Protection from germs, diseases

Watch out for germs

Health Awareness

Injections

Not getting enough sleep damages brain and increases virus

Not working too hard

Reading too much makes eyes weak

Take care of health, medical treatment

TB

Treating illness before going to doctor

Using medicines

Being stubborn and not taking medicines will make you more ill

Different medicines fit different people

Meds have both good and bad sides

Not buying medicines or antibiotic on their own

Not taking expired med

Not taking meds at all isn't right

Reading medicines labels

Take correct medicines for illness and body weight

Take medicines correctly when you buy it

Take meds only when necessary, reduce

Take meds rather than not

Take more or various medicines to cover every symptoms

Wash hands, eat good food

Other agriculture topics

Agriculture being the origin of diseases

Diseases begins in agriculture ends at human or doctor

Fish or plant spreading diseases

Other topics

Hat cures illnesses

Hat is immunity

Performance reflecting real life, society

Puppets have different illnesses

Toxins' many origins

Toxins produced by human are the cause of all illnesses

RWC

Consent is needed before treatment

Doctors figuring out ways to make guardians comply

Experiments with child participants

General public's cooperation in researches

Guardian giving consent for experiment

Guardian giving consent for treatment

Guardian should get enough info about treatment

Research to help the kid

Research with drugs

Researches to find new medicines

Researches to find right medicine for a person

Unsure

M100 Not relating to topic

No change

Not seeing the messages

Other lessons

Reinforcing existing awareness

Process

(impression of) clarity

Abstract

already interested in topic

Attention because artistic

Awareness about topic

Complementary activities

Difficulty in understanding, confusion

Experience with theatre

General understanding and communication

Interactive performance

Lack of specific information

Local categories of thought

Metaphors

Non-verbal communication

Prior knowledge

Reflection through evaluation

Relating to oneself

Retention

Sharing and discussing

Target-group specific

Unforeseen interpretations

2. Artistic product

M2 Process - Active appreciation

M201-1 Audience validation

Art

Abstract, metaphors, interpretation

Beautiful

Creative

Music and sound

Puppetry and performance

Stimulating understanding
Unspecific yes
Don't know
Not art
Factual, non-fiction
M2O1-1 Stakeholder validation
Partially positive or negative
Improvements
Longer
Storyline
Too abstract
More health than art
Narrative challenging
Partial success
Too much framing, too constrained
Positive
Abstract, space for interpretation
Creative
Good artists
It communicates ideas
Music
Naturally understood as art
Promoting discussion
Puppet and actor performance
Visual expression
M2O2-1 Audience enjoyment
Negative
Not interesting
Too short
Positive
Exciting
Funny
Generally positive
Interesting content and presentation
Music
Puppet performance and props
Stimulating imagination
Storyline
M2O2-2 Stakeholder view on enjoyment
Engaging for children
Music
Not engaging
Positive entertainment value
Other outcomes
Promoting the arts
Process
Attractors
B-Floor reputation
Interesting subject
Show happening
Unaware of show, competing priorities
First time theatre experience
M3 Process - Collaboration
M3O3 Appropriate content
M3O0 Stakeholder view on appropriateness
Negative
Abstract
Difficulty in understanding
Ineffective medium
Ineffective message
Ineffective metaphors
RWC forced
Positive
Appropriate AMR
Appropriate medium
Appropriate RCW
Clear message

Generally appropriate
 Generating attention
 Logistically appropriate
 Non-verbal appropriateness
 Not too abstract
 Universal topic that people can relate to

Qualifiers

Complementary info and activities
 Complexity of message
 Discussion
 Familiarity with medium
 General target group differences
 General understanding and communication
 Local inputs for appropriate content
 Non-verbal challenges
 Prior knowledge and sophistication
 Space, open versus closed

M304 Lasting relationships

Continuation of collaboration
 Depends on MORU, MORU as scientific driver
 Expecting it to last
 If both want to
 Importance of arts-science collaboration
 Positive relationship
 Stakeholders wanting more
 Still a new kind of relationship

M305 Sense of organisational success

Broken new ground, new world
 Excitement
 Limitedly keen on science
 Outreach
 Pride
 Satisfaction
 Successful
 Supportive
 Unclear (cost) effectiveness, curiosity
 Useful

Process

B-Floor-MORU working together
 Balancing demands, force-fitting themes
 B-Floor's style, method
 Dealing with frictions, challenges, solving problems
 Interactions
 Language, translation, mutual inputs
 MORU initiated
 Collaborative
 Experimental
 Internal and outside processes
 Stakeholders reflecting, learning, and changing views

```

1427 Appendix 2: Stata Code
1428 //adjust variable labels for readability
1429 label var Q1 "1. How do you feel about the drama?"
1430 label var Q2 "2. Do you think this is art?"
1431 label var Q3 "3. Did you find any element of this drama related to your culture?"
1432 label var Q4 "4. Before watching the drama, were you interested in the correct use of
1433 medicines?"
1434 label var Q5 "5. Did the drama increase your interest in the correct use of medicines?"
1435 label var Q6 "6. Do you want to learn more about the correct use of medicines?"
1436 label var Q7 "7. Did the drama give you new ideas regarding the correct use of medicines?"
1437 label var Q8 "8. Before watching the drama, were you interested in the participation of
1438 children in research?"
1439 label var Q9 "9. Did the drama increase your interest in the participation of children in
1440 research?"
1441 label var Q10 "10. Do you want to learn more about the participation of children in research?"
1442 label var Q11 "11. Did the drama give you new ideas regarding the participation of children
1443 in research?"
1444
1445 //assign venue labels
1446 label define lsites 1 "BKK school"
1447 label define lsites 2 "BKK muslim comm.", add
1448 label define lsites 3 "AMR day", add
1449 label define lsites 4 "Thammasat", add
1450 label define lsites 5 "Democrazy", add
1451 label define lsites 6 "JITMM", add
1452 label define lsites 7 "Mae Sot Wattana Resort", add
1453 label define lsites 8 "Mae Sot Wang Pa clinic", add
1454 label define lsites 9 "Mae Sot Mawker Thai clinic", add
1455
1456 gen site_new = .
1457 replace site_new = 1 if Site == "th048"
1458 replace site_new = 2 if Site == "th042"
1459 replace site_new = 3 if Site == "th043"
1460 replace site_new = 4 if Site == "th044"
1461 replace site_new = 5 if Site == "th045"
1462 replace site_new = 6 if Site == "th046"
1463 replace site_new = 7 if Site == "th047"
1464 replace site_new = 8 if Site == "th013"
1465 replace site_new = 9 if Site == "th014"
1466 label values site_new lsites
1467
1468
1469 //recode ethnic background
1470 gen str25 ethn = ""
1471 label var ethn "Nationality/ethnic background"
1472 replace ethn = "ROW" if NATION == "AUSTRALIAN"
1473 replace ethn = "ROW" if NATION == "BRITISH"
1474 replace ethn = "" if NATION == "BUDDHA"
1475 replace ethn = "Burma & ethnic groups" if NATION == "BURMESE"
1476 replace ethn = "Burma & ethnic groups" if NATION == "BURMESE-KAREN"
1477 replace ethn = "ROW" if NATION == "CANADA"
1478 replace ethn = "ROW" if NATION == "CANADIAN"
1479 replace ethn = "other Asia" if NATION == "CHINESE"
1480 replace ethn = "ROW" if NATION == "DUTCH"
1481 replace ethn = "other Asia" if NATION == "FILIPINO"
1482 replace ethn = "ROW" if NATION == "FINLAND"
1483 replace ethn = "ROW" if NATION == "FRENCH"
1484 replace ethn = "ROW" if NATION == "GERMAN"
1485 replace ethn = "ROW" if NATION == "GERMANY"
1486 replace ethn = "ROW" if NATION == "HUNGARIAN"
1487 replace ethn = "other Asia" if NATION == "INDIA"
1488 replace ethn = "other Asia" if NATION == "INDIAN"
1489 replace ethn = "other Asia" if NATION == "INDONESIA"
1490 replace ethn = "" if NATION == "ISLAM"
1491 replace ethn = "ROW" if NATION == "ITALIAN"
1492 replace ethn = "other Asia" if NATION == "JAPAN"
1493 replace ethn = "Burma & ethnic groups" if NATION == "KAREN"

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1494 replace ethn = "Thai" if NATION == "KRABI"
1495 replace ethn = "other Asia" if NATION == "LAOS"
1496 replace ethn = "Burma & ethnic groups" if NATION == "MON"
1497 replace ethn = "Burma & ethnic groups" if NATION == "MYANMAR"
1498 replace ethn = "Burma & ethnic groups" if NATION == "MYANMR"
1499 replace ethn = "Burma & ethnic groups" if NATION == "MYO"
1500 replace ethn = "Burma & ethnic groups" if NATION == "MYO-KAMI"
1501 replace ethn = "Burma & ethnic groups" if NATION == "PA-O"
1502 replace ethn = "" if NATION == "NA"
1503 replace ethn = "Burma & ethnic groups" if NATION == "POE KAREN"
1504 replace ethn = "Burma & ethnic groups" if NATION == "POE-KAREN"
1505 replace ethn = "ROW" if NATION == "POLISH"
1506 replace ethn = "Burma & ethnic groups" if NATION == "RAKHINE"
1507 replace ethn = "Burma & ethnic groups" if NATION == "SAKAW-KAREN"
1508 replace ethn = "Burma & ethnic groups" if NATION == "SAWAW KAREN"
1509 replace ethn = "Burma & ethnic groups" if NATION == "SHAN"
1510 replace ethn = "ROW" if NATION == "SWEDISH"
1511 replace ethn = "other Asia" if NATION == "TAIWAN"
1512 replace ethn = "Thai" if NATION == "THAI"
1513 //note that "THAT" was initially labelled "THAI" in test database, so this is certainly
1514 THAI rather than "unknown"
1515 replace ethn = "Thai" if NATION == "THAT"
1516 replace ethn = "Burma & ethnic groups" if NATION == "TONGSU"
1517 replace ethn = "ROW" if NATION == "UK"
1518 replace ethn = "ROW" if NATION == "USA"
1519 replace ethn = "ROW" if NATION == "WORLD"
1520
1521
1522
1523 //code target groups
1524 //note: some locations contain exclusively one group (school), others contain none (Wattana)
1525 //selection based on age, location, occupation
1526 //"migrant workers" not including school children but out-of-school school-aged children
1527 label define ltarget 1 "BKK school children"
1528 label define ltarget 2 "BKK theatre goers", add
1529 label define ltarget 3 "AMR scientists etc", add
1530 label define ltarget 4 "Mae Sot migrant workers", add
1531 label define ltarget 5 "Mae Sot healthcare workers", add
1532
1533 gen str25 job_new = ""
1534 label var job_new "job recode"
1535 replace job_new = "BKK school child" if site_new == 1
1536 replace job_new = "BKK school child" if site_new == 2 & (JOB == "STUDENT") & AGE <= 18
1537 replace job_new = "BKK school child" if site_new == 4 & (JOB == "SCHOOL STUDENT" | JOB ==
1538 "STUDENT" | JOB == "STUDENTS") & AGE <= 18
1539 replace job_new = "BKK school child" if site_new == 5 & (JOB == "SCHOOL STUDENT" | JOB ==
1540 "STUDENT" | JOB == "STUDY DRAMA ART") & AGE <= 18
1541 //note: MS HCW does not include the one Karen HCW who participated at the Wattana Resort
1542 show - unsure of double-counting and actual work location
1543 replace job_new = "MS HCW" if site_new == 8 & (JOB == "HEALTH WORKER" | JOB == "MIDWIFE" |
1544 JOB == "NURSE")
1545 replace job_new = "MS HCW" if site_new == 9 & JOB == "HEALTH WORKER"
1546
1547 replace job_new = "MS migrant" if site_new == 8 & ((JOB != "HEALTH WORKER" & JOB != "MIDWIFE"
1548 & JOB != "NURSE" & JOB != "SMRU STAFF" & JOB != "SMRU" & JOB != "SMRU" & JOB != "") | ((JOB
1549 == "STUDENT" | JOB == "") & AGE >= 18))
1550 replace job_new = "MS migrant" if site_new == 9 & ((JOB != "HEALTH WORKER" & JOB != "STUDENT"
1551 & JOB != "STUDY" & JOB != "") | ((JOB == "STUDENT" | JOB == "") & AGE >= 18))
1552
1553
1554 gen int target = .
1555 label var target "Target Group Category"
1556 label values target ltarget
1557
1558 //anyone who is defined as student
1559 replace target = 1 if site_new == 1 | (site_new == 2 & job_new == "BKK school child") |
1560 (site_new == 4 & job_new == "BKK school child") | (site_new == 5 & job_new == "BKK school
1561 child")

```



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1562
1563 //anyone not a student, or students >= 18 years
1564 replace target = 2 if site_new == 2 & AGE >= 18
1565 replace target = 2 if site_new == 3 & ((JOB == "STUDENT" & JOB != "ACADEMIC" & JOB != "POST
1566 DOC" & JOB != "RESEARCHER" & JOB != "SCIENTIST" & JOB != "") | AGE >= 18)
1567 replace target = 2 if site_new == 4 & AGE >= 18
1568 replace target = 2 if site_new == 5 & ((JOB != "SCHOOL STUDENT" | JOB != "STUDENT" | JOB !=
1569 "STUDY DRAMA ART") | AGE >= 18)
1570
1571 //scientists or (research) students above 18
1572 replace target = 3 if site_new == 3 & ((JOB == "STUDENT" | JOB == "ACADEMIC" | JOB == "POST
1573 DOC" | JOB == "RESEARCHER" | JOB == "SCIENTIST") & AGE >= 18)
1574 replace target = 3 if site_new == 6 & ((JOB != "PROGRAMMER" & JOB != "") & AGE >= 18)
1575
1576 //anyone who is not defined as a school child (not included for Mae Sot!) and not a healthcare
1577 worker in Mae Sot clinics
1578 replace target = 4 if job_new == "MS migrant"
1579
1580 replace target = 5 if job_new == "MS HCW"
1581
1582
1583 //define age groups
1584 label define lage 1 "<12"
1585 label define lage 2 "12 - <18", add
1586 label define lage 3 "18 - <30", add
1587 label define lage 4 "30 - <50", add
1588 label define lage 5 "50+", add
1589
1590 gen int age_group = .
1591 label var age_group "Age Group Category"
1592 label values age_group lage
1593
1594 replace age_group = 1 if AGE < 12
1595 replace age_group = 2 if AGE >= 12 & AGE < 18
1596 replace age_group = 3 if AGE >= 18 & AGE < 30
1597 replace age_group = 4 if AGE >= 30 & AGE < 50
1598 replace age_group = 5 if AGE >= 50
1599
1600
1601 //recode education
1602 label define ledu 1 "None"
1603 label define ledu 2 "Primary", add
1604 label define ledu 3 "Secondary", add
1605 label define ledu 4 "Undergraduate", add
1606 label define ledu 5 "Graduate & above", add
1607
1608 gen int edu = .
1609 label var edu "Education Group Category"
1610 label values edu ledu
1611
1612 replace edu = 1 if GRADE == 0
1613 replace edu = 2 if GRADE >= 1 & GRADE <= 6
1614 replace edu = 3 if GRADE >= 7 & GRADE <= 12
1615 replace edu = 4 if GRADE == 13
1616 replace edu = 5 if GRADE == 14 | GRADE == 15
1617
1618 //Recode questions to only show yes vs. no/dk
1619 label define lq 0 "No / don't know"
1620 label define lq 1 "Yes", add
1621
1622 foreach var in Q* {
1623 recode `var' (2 = 0) (8 = 0)
1624 label values `var' lq
1625 }
1626
1627
1628 save "$analysis\working-file.dta", replace
1629

```

```
1630
1631 ///////////////////////////////////////////////////////////////////
1632 ///////////////////////////////////////////////////////////////////
1633 //                                                                    //
1634 //              Now generating outputs                                //
1635 //                                                                    //
1636 ///////////////////////////////////////////////////////////////////
1637 ///////////////////////////////////////////////////////////////////
1638
1639
1640 //descriptive statistics
1641 tab target
1642 tab SEX
1643 tab ethn
1644 tab site_new
1645 tab age_group
1646 tab edu
1647
1648 //Results
1649 //overall
1650 su Q*
1651
1652 //awareness
1653 tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(target) stat(mean n)
1654 tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(educ) stat(mean n)
1655 tabstat Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11, by(site_new) stat(mean n)
1656
1657 //artistic dimension
1658 tabstat Q1 Q2 Q3, by(target) stat(mean n)
1659 tabstat Q1 Q2 Q3, by(educ) stat(mean n)
1660 tabstat Q1 Q2 Q3, by(site_new) stat(mean n)
1661
1662 //effectiveness of awareness raising (% increased interest) - overall and target groups
1663 tab Q5 Q9, ce
1664 tab Q5 Q9 if target >= 1 & target <= 5, ce
```