PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Reconceptualizing precision public health
AUTHORS	Olstad, Dana; Mcintyre, Lynn

VERSION 1 – REVIEW

REVIEWER	William Riley National Institutes of Health USA
REVIEW RETURNED	18-Apr-2019

GENERAL COMMENTS	This manuscript focuses the concept of "precision public health" on social position and health inequities. The points made in the manuscript are quite reasonable and the framework is useful. However, the authors seem to position this perspective as "instead of", not "in addition to" prior work describing precision public health. The prior work is characterized as merely an extension of the biomedical perspective on precision medicine or health which is somewhat simplified and a bit of a strawman to contrast their position. More importantly, while social position and related social determinant mechanisms for health inequities are an important aspect of any precision public health effort, this is a partial and incomplete perspective of malleable public health mechanisms that are predictive of various health outcomes, not just disparities of those outcomes.

REVIEWER	Sandro Galea Boston University, United States
REVIEW RETURNED	27-Apr-2019

GENERAL COMMENTS	I think in revised form this paper makes an interesting contribution. I have one central question that I would urge the paper to make clear: what is the added value of using the term "precision public health"? Why do we even need such a term to begin with? Insofar as such a term has utility, I think this revised paper presents a good case for what that term could mean. I think though that adding a discussion about why we need the term at all may be critical to the paper's long-term salience.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
This manuscript focuses the concept of "precision public health" on social position and health inequities. The points made in the manuscript are quite reasonable and the framework is useful. However, the authors seem to position this perspective as "instead of", not "in

addition to" prior work describing precision public health. The prior work is characterized as merely an extension of the biomedical perspective on precision medicine or health which is somewhat simplified and a bit of a strawman to contrast their position. More importantly, while social position and related social determinant mechanisms for health inequities are an important aspect of any precision public health effort, this is a partial and incomplete perspective of malleable public health mechanisms that are predictive of various health outcomes, not just disparities of those outcomes.

Response: We agree and have made the following key revisions:

1. Page 4: Regardless of whether precision medicine succeeds in tailoring treatment to the biological risk profiles of individual patients, because of the limited explanatory power of individual level risk factors, it cannot on its own yield the promised transformations in ill health at a population level.
2. Page 6: That the modern conception of precision public health should be so heavily rooted in a biomedical paradigm of health is antithetical to the very foundations of public health, and points to a need to both enlarge the scope of, and refocus current definitions on core public health concepts.
3. Page 6: The purpose of this paper is to posit a precision public health approach that expands upon and refocuses current definitions on the social causation of health and health inequities
4. Page 15: Thus, social position and its context-specific interacting dimensions, determinants, and health consequences constitute the central locus of study within a precision public health approach, while considering relevant biological and behavioural factors
5. Page 16 change to the definition of precision public health: *Precision public health investigates how multiple dimensions of social position interact to confer health risk differently for precisely defined population subgroups according to the social contexts in which they are embedded, while considering relevant biological and behavioural factors.*

- Page 21: Current conceptualizations of precision public health based primarily in a biomedical model of health cannot therefore, on their own, yield significant progress toward this end. Precision public health is not simply precision medicine at a population level, and therefore its definition must illuminate social position as a determinant of health and health inequities

Reviewer: 2

I think in revised form this paper makes an interesting contribution. I have one central question that I would urge the paper to make clear: what is the added value of using the term "precision public health"? Why do we even need such a term to begin with? Insofar as such a term has utility, I think this revised paper presents a good case for what that term could mean. I think though that adding a discussion about why we need the term at all may be critical to the paper's long-term salience.

Response: The reviewer raises an excellent point. We will address this point two ways. First, we draw attention to the sections of the manuscript where we believe we have addressed this point:

- Page 6: We argue that the proposed framework may offer greater potential to improve health and reduce health inequities than primarily biomedically-based notions of precision public health that do not address root causes, and public health as currently practiced which, although it addresses root causes, does so in a homogenizing way
- Page 14: In this way, the proposed framework affords potential for more effective intervention than primarily biomedically-based notions of precision public health that do not address root causes, and current public health research that homogenizes individuals' health experiences.
- Page 20: Although limited progress is evident in some cases,[57] these programs and policies have largely proven incapable, on their own, of substantially reducing health inequities,[58-63] suggesting that new, complementary approaches may be needed. Interventions formulated within a precision public health paradigm may represent one such complementary approach. Greater precision in formulating public health interventions may help to avoid creation of programs and policies that meaningfully apply to no one because they concern factors that shape the health of 'average' disadvantaged individuals who may not actually exist.
- Page 20-21: Social position is an inherently dynamic social construct, consisting of mutually constituted objective and subjective components. It is precisely this complexity that most previous investigations have ignored, that we maintain may in fact be perpetuating health inequities. Embracing this complexity through a precision public health approach may yield considerable progress in improving health and reducing health inequities, but will require a

fundamental paradigm shift in the manner in which social position is conceptualized and operationalized within research, and ultimately within practice (Table 1).

- Page 22: Health inequities may be driven by multiply marginalized populations who experience excess health risk.[21-23 41 74] Expanding beyond master categories of social position, and operationalizing these categories in more precise ways across place and time, can enrich public health research through greater attention to the heterogeneity of social positions, their causes and health effects, leading to identification of points of intervention that are specific enough to be useful in reducing health inequities. Failure to attend to this level of particularity may mask the true nature of risk, the causal mechanisms at play and the most appropriate interventions. Conceptualized thus, precision public health is a research endeavour and an aspect of public health practice with much to offer by way of understanding and intervening on the causes of poor health and health inequities.

And second, we acknowledge that the reviewer's comment indicates that we need to make this point more explicit. We have therefore revised the last bullet point above as follows:

- Page 22: Some might question whether the term 'precision public health' is even necessary. We believe that 'precision' may be a valuable addition to the public health lexicon because it signals a departure from the conventional public health paradigm by drawing attention to the heterogeneity of social position. Health inequities may be driven by multiply marginalized populations who experience excess health risk.[21-23 41 74] It is precisely this complexity that most previous investigations have ignored, that we maintain may be perpetuating health inequities. Expanding beyond master categories of social position, and operationalizing these categories in more precise ways across place and time, can enrich conventional public health research through greater attention to the heterogeneity of social positions, their causes and health effects, leading to identification of points of intervention that are specific enough to be useful in reducing health inequities. Failure to attend to this level of particularity may mask the true nature of risk, the causal mechanisms at play and the most appropriate interventions. Conceptualized thus, precision public health is a research endeavour and an aspect of public health practice with much to offer by way of understanding and intervening on the causes of poor health and health inequities.

VERSION 2 – REVIEW

REVIEWER	William Riley National Institutes of Health USA
REVIEW RETURNED	16-Jul-2019

GENERAL COMMENTS	This manuscript expands current conceptualizations of precision public health and grounds it more in the foundations of public health, social determinants, and health inequities. The manuscript presents well conceived and well argued positions, providing a strong basis for future research in precision public health. It also offers a useful set of recommendations for future directions to advance precision public health. A few mostly minor concerns: pg 7: Authors attempt to make clear that this it is not an "either-or" choice between focusing on both social determinants vs. biological and health behavior determinants, but a bit more here about the possibility that these various determinants could be better integrated, not viewed so separately, would be useful. On pg 9, the authors argue that precision public health is distinct from precision health - fair enough, but primarily because the biomedical world pays insufficient attention to it, not because it is inherently distinct and unable to be integrated into a larger comprehensive framework. The authors make this integration clear when they

	describe their framework (pg 14 on), but it doesn't appear that they are going in this direction in their intro. pg 8: The description of WHO Commission and the role of social position on health comes close to describing individuals as helpless victims of the social position in which they were born. Some acknowledgement of the role of individual, family, and group actions to escape this feedback loop and change social position, or at least develop a resilience to the health determinants inherent in their current social position, should be acknowledged. pg 9 and beyond: The authors do a good job of describing the complexities of social position and the strengths and weaknesses of various indicators of it. But in doing so, they have missed the point about "precision" in precision public health. For precision public health to advance, these complex interactions of these dimensions of social position need to be operationalized, precisely measured (not just measured as per convenience as the authors note) and developed into a common ontology or conceptual measurement model. We're not there yet, but the authors could make the point that we need to be if we are going to truly be "precise". pg 12-13: This "case in point" is problematic and inconsistent with the complexities of interactions in social position just previously argued. The authors take a linear argument - differential incremental value in educational attainment can be addressed by changing educational processes. Putting aside why gendered teaching styles would result in greater incremental value of educational attainment of women, it also could be that other factors unrelated to education interact to suppress the value of educational attainment for some groups or enhance it for other groups. I suggest cutting this paragraph. pg 13-14: The authors tend to tip their hand a bit much regarding their own political persuasions with terms like "inadequate minimum wage policies" and "colonialist practices" . While acceptable in some academic circles, the article would be more palatable to a wider readership (including even those who believe that market forces can establish minimum wages or that education can include the history of how some groups seriously harmed and disadvantaged other groups without arguing that this makes our current social structures illegitimate) if they deleted these examples. pg 16: The point about theory is reasonable, but the authors could push the field a bit more regarding the precision of these theories. Most are inprecise descriptions of how social position is produced or maintained and how social position impacts health. More detailed, empirically-grounded theory of how various aspects of social position interact, how each interacts and is influenced by societal processes, and how these interactions of various aspects of social position influence health would substantially improve the field.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

This manuscript expands current conceptualizations of precision public health and grounds it more in the foundations of public health, social determinants, and health inequities. The manuscript presents well conceived and well argued positions, providing a strong basis for future research in precision public health. It also offers a useful set of recommendations for future directions to advance precision public health.

Response: Thank you for taking the time to review our paper and for your careful and thoughtful consideration of this manuscript and its key points. Your suggestions have been very helpful in improving the quality of the manuscript.

A few mostly minor concerns:

pg 7: Authors attempt to make clear that this it is not an "either-or" choice between focusing on both social determinants vs. biological and health behavior determinants, but a bit more here about the possibility that these various determinants could be better integrated, not viewed so separately, would be useful. On pg 9, the authors argue that precision public health is distinct from precision health - fair enough, but primarily because the biomedical world pays insufficient attention to it, not because it is inherently distinct and unable to be integrated into a larger comprehensive framework. The authors make this integration clear when they describe their framework (pg 14 on), but it doesn't appear that they are going in this direction in their intro.

Response: We agree that we could strengthen the point that precision public health can integrate a variety of health determinants within a single framework. Please see the following changes:

Page 2 Abstract: “This paper outlines a framework for precision public health that, in contrast to its current operationalization, is consistent with public health principles because it integrates factors at all levels within an overarching population-based approach to supporting health and health equity, while illuminating social position as a fundamental determinant of health and health inequities.”

Page 6: “In this way, the framework offers a means to integrate factors at all levels within an overarching population-based approach to supporting health and health equity, while illuminating social position as a fundamental determinant of health and health inequities.”

Page 7: “We begin with a brief review of the conceptual foundations of public health, then present a case for more precise attention to social position within a reconceptualized and more comprehensive framework for precision public health…”

Page 7: “Individual biology and health behaviours are included, but occupy a less prominent role as mediators through which the social determinants of health act to shape health”

Page 15: “We now use the preceding discussion as a basis to outline a framework for precision public health that integrates factors at all levels factors at all levels, from the biological to the social, within an overarching population-based approach to supporting health and health equity. The framework is distinguished by its explicit focus on social position as a root cause of ill health, and in seeking to operationalize this construct in more precise ways. In this way, the proposed framework affords

potential for more effective intervention than primarily biomedically-based notions of precision public health that are less comprehensive in their orientation because they do not address root causes, and current public health research that homogenizes individuals' health experiences."

Page 22: "Precision public health is not simply precision medicine at a population level, and therefore its definition must encompass factors at all levels, while illuminating social position as a fundamental determinant of health and health inequities."

On page 9 (now page 10) we argue that precision public health is distinct from public health as currently practiced, which is an argument that Reviewer #2 had previously deemed important to speak to the "added value of precision public health". Reviewer #1 above indicates that we argue "precision public health is distinct from precision health" and thus it is not clear if the reviewer meant to write "precision medicine"? We are unclear on the Reviewer's comment here. This is an important distinction because, as we argue in the introduction, precision medicine operates at the individual level and our paper does not argue for/against levels of intervention, but rather that current definitions of precision public health downplay the role of social position as a fundamental cause of health. We agree with the Reviewer that precision public health should be a comprehensive framework that integrates biological, behavioural and social considerations and have revised the paper accordingly. However, arguments as to whether precision medicine and precision public health are both needed are beyond the scope of the current article as our intent was to reconceptualize precision public health.

pg 8: The description of WHO Commission and the role of social position on health comes close to describing individuals as helpless victims of the social position in which they were born. Some acknowledgement of the role of individual, family, and group actions to escape this feedback loop and change social position, or at least develop a resilience to the health determinants inherent in their current social position, should be acknowledged.

Response: On pages 8-9 we summarize the WHO CSDH conceptual framework. We believe that the current summary is consistent with both the text and the figure as presented in this paper. For this reason, when summarizing the framework itself we could not add the reviewers' suggestions above. Nevertheless, we wholeheartedly agree with the Reviewers' point and have therefore added a summary of the accompanying framework for tackling inequities in SDH, as it presents a somewhat less deterministic perspective, along with our own commentary. Pease see page 8-9:

"4) Health outcomes feedback to affect individuals' social position (whether positively or negatively), along with the operation of social, political and economic institutions. Thus, the framework provides a means of understanding how factors at all levels, from the biological to the social, interact to shape health at a population level, and their relative importance in this respect. With its strong emphasis on social structures the conceptual framework is perhaps overly deterministic, however the accompanying framework for tackling inequities in social determinants highlights the importance of policies that not only address social structures, but that simultaneously promote intersectoral action and social participation and empowerment; the latter of which can assist individuals, families and communities to exercise their agency in health-promoting ways and thereby escape negative feedback loops."

pg 9 and beyond: The authors do a good job of describing the complexities of social position and the strengths and weaknesses of various indicators of it. But in doing so, they have missed the point about "precision" in precision public health. For precision public health to advance, these complex interactions of these dimensions of social position need to be operationalized, precisely measured (not just measured as per convenience as the authors note) and developed into a common ontology or conceptual measurement model. We're not there yet, but the authors could make the point that we need to be if we are going to truly be "precise".

Response: We agree completely with the Reviewer and indeed, if we understand the Reviewer's point correctly, we believe that is what we have done on pages 9 and beyond. For instance:

Page 11: "Focusing on these unitary categories of difference to the exclusion of others or in isolation from one another, as many studies do, may obscure understanding of the complexity of social position. A more comprehensive perspective acknowledges social position as a context-specific social construct that represents a mixture of these and other axes of social differentiation,[16] including age, gender/sex, race/ethnicity, wealth, citizenship status, religion and disability.[4]"

Page 11: "In addition to expanding beyond master categories of social position, attending to the heterogeneity within them may further improve understanding of health inequities by examining individuals as persons whose experiences of health cannot be ascertained on the basis of any one indicator.[16 22]"

Page 12: "Dimensions of social position must therefore be interrogated in tandem, because it is at the nexus of these intersecting domains that a precise social identity is created whose health effects cannot be understood on the basis of its individual parts.[26] Failure to attend to these interactions may limit understanding of how the meanings of different dimensions of social position are mutually constituted, simultaneously experienced, and jointly associated with health, thereby yielding misleading results.[27]"

Page 12: "Beyond considering its varied, mutually-constituted and reinforcing dimensions, there are many other ways in which social position could be operationalized in more precise ways to advance public health research." We proceed to elaborate on these.

Text Box 1: "Recommendations for achieving greater precision in public health. Precision should be sought in the areas that are the most theoretically meaningful within the context of each individual study, while acknowledging that a minimum of two should be implemented in tandem to constitute an instance of precision public health.

1. Provide explicit and **precise descriptions of the theoretical rationale** underlying the selection and operationalization of social positions, social contexts, health outcomes, and potential confounders. **The proposed causal pathways should be precisely identified a priori**.
2. **Identify the precise social positions of populations of interest** and investigate their associations with health by expanding beyond common unitary categories to examine other dimensions of social position, and the heterogeneity that exists within social categories. Measures of **perceived social position** should be explored more fully.
3. **Operationalize social position in more precise ways**, such as by using continuous measures or more categories, considering qualitative and quantitative features, and considering factors at multiple levels.

4. **Describe the precise time and context of measurement of social position** and study the health effects of social position **in a variety of contexts and at multiple time points across the life course**.
5. Use **precise language to describe health inequities** (e.g. inequities in cardiovascular disease according to wealth and gender).
6. Use knowledge of the health effects of individuals' precise social positions to inform the study of **precise contextual mechanisms** responsible for situating them there. Leverage this information to propose **precise interventions** to ameliorate health inequities"

To address the Reviewers' comment more explicitly we have also added the following on page 23: "Critical next steps will entail development of a common precision public health ontology and conceptual measurement models."

pg 12-13: This "case in point" is problematic and inconsistent with the complexities of interactions in social position just previously argued. The authors take a linear argument - differential incremental value in educational attainment can be addressed by changing educational processes. Putting aside why gendered teaching styles would result in greater incremental value of educational attainment of women, it also could be that other factors unrelated to education interact to suppress the value of educational attainment for some groups or enhance it for other groups. I suggest cutting this paragraph.

Response: We believe that it is helpful for readers if we provide an example to illustrate how interactions among different dimensions of SEP, in this case education x gender and education x race/ethnicity, can prompt a search for contextual origins of these differences. The Reviewers' point about our linear illustration using educational processes is well taken, and thus we have revised this section as follows, substituting some of the text suggested by the Reviewer:

Page 14: "These findings could prompt a search for contextual factors that suppress the value of educational attainment for some groups, while enhancing it for others. In this respect, Zajacova et al[28] recommend that investigators leverage differences in policies and other contextual conditions that exist across geopolitical boundaries and/or changes in these over time to understand how contextual factors might exacerbate or mitigate education-health associations."

pg 13-14: The authors tend to tip their hand a bit much regarding their own political persuasions with terms like "inadequate minimum wage policies" and "colonialist practices" . While acceptable in some academic circles, the article would be more palatable to a wider readership (including even those who believe that market forces can establish minimum wages or that education can include the history of how some groups seriously harmed and disadvantaged other groups without arguing that this makes our current social structures illegitimate) if they deleted these examples.

Response: We have deleted the term "colonialist practices." We have replaced "minimum wage policies" with "inadequate social protection policies" (page 13). Given that virtually all developed societies have social protection policies of some form, we believe this represents a politically neutral example.

pg 16: The point about theory is reasonable, but the authors could push the field a bit more regarding the precision of these theories. Most are inprecise descriptions of how social position is produced or maintained and how social position impacts health. More detailed, empirically-grounded theory of how various aspects of social position interact, how each interacts and is influenced by societal processes, and how these interactions of various aspects of social position influence health would substantially improve the field.

Response: This is an excellent point and has been added in two spots below:

Page 17: “Nevertheless, the utility of some theories may be limited, given that they often entail rather imprecise notions of how social position shapes health. Results from precision public health analyses may, over time, contribute greater precision to these theories.”

Page 23: “We anticipate that adoption of our proposed framework will accelerate progress toward this end, while also helping to generate more detailed, empirically-grounded theory of how aspects of social position interact with one another and with societal processes to shape health across the life course.”