

Overweight and obesity in Switzerland

Part 2: Overweight and obesity trends in children

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EXECUTIVE SUMMARY

- This report presents key information about overweight and obesity among children living in Switzerland, based on data from several cross sectional surveys. It is intended to support the development of an evidence-based approach to prevention, management and treatment of obesity in children.
- The proportion of children who are overweight did increase in Switzerland. Between 1960/65 and 2007, the prevalence of overweight among children aged 6 to 12/13 rose from 5.1% to 11.3% in boys and from 5.4% to 9.9% in girls. Forecast projections, based on a non-linear regression model, indicate that in 2022 the proportion of overweight children may increase to 12.5% in boys and 18.4% in girls.
- Between 1960/65 and 2007, the prevalence of obesity among children aged 6 to 12/13 rose from basically 0% to 5.4% in boys and from 0% to 3.2% in girls. Forecast projections show that in 2022 the proportion of obese children will increase to 4.3% in boys and 3.4% in girls.
- Between 1960/65 and 2007, the combined prevalence of overweight and obesity among children aged 6 to 12/13 rose from 5.4% to 16.8% in boys and from 5.8% to 13.1% in girls. Forecast projections show that until 2022 the proportion of overweight and obese children may increase to 16.8% in boys and 22.7% in girls.
- Clearly, the presently available data on the prevalence of overweight and obesity in children are not ideally suited for an accurate forecasting. Based on the observed increase in prevalence in overweight and obesity since the early sixties until last year, a further increase may be expected when using a logistic function model. Results of coming surveys are definitely needed to clarify the predicted increase in prevalence.
- Between 1992 and 2007, the prevalence of overweight among adolescents and young adults (BMI >25) aged 15 to 24 rose from 9.9% to 11.7% in the total population aged 15-24, increased in men reaching a total of 15.4% and grew from 6.8% to 7.7% in women. Forecast projections show that until 2022 the proportion of overweight adolescents and young adults with BMI $\geq 25 < 30$ may slightly decrease from 9.9% (2007) to 9.7%, is expected to slightly increase from 13.6% to 14.5% in men and may increase from 7.7% in 2007 to 9.3% in 2022 in women.
- Between 1992 and 2002, the prevalence of obesity among adolescents and young adults aged 15 to 24 rose overall from 0.9% to 1.8%, grew from 1.1% to 1.8% in the male segment and from 0.7% to 1.7% in the female segment. Forecast projections show that between 2007 and 2022 the proportion of obese adolescents and young adults appears to remain stable at 1.7%, may remain basically unchanged at 1.7% compared to 1.8% (2007) in men and is expected to remain at 1.7% in women.



- Assuming, this projected development in the youngest segment (15-24 years) of the overweight adult population (BMI >25) immediately following the paediatric population (age 6-12/13) is corroborated by corresponding findings from upcoming health surveys (2012, 2017), it may safely be concluded that the overweight segment of the Swiss population aged 15-24 may reach its maximum in the next 15 years irrespective of the actual trend analysis in the paediatric segment of the Swiss population presented in this report.

In conclusion, the uncertainty about the observed as well as the projected increase in the number of overweight and obese children in Switzerland represents a major challenge for Swiss health authorities. Obviously, prevalence and trends in childhood obesity need to be frequently and closely monitored because of their public health importance later on in adulthood. However, it is entirely possible that – based on observations in the youngest segment (15-24 years) of the overweight adult Swiss population (BMI >25) – the peak level in the paediatric overweight segment of the population may be reached in the near future, i.e. the next few years, or – under best circumstances – may have been passed already.



KURZFASSUNG

- In diesem Bericht werden gestützt auf Daten aus verschiedenen bereichsübergreifenden Erhebungen die wichtigsten Informationen zu Übergewicht und Adipositas bei Kindern in der Schweiz präsentiert. Damit soll die Entwicklung eines evidenzbasierten Ansatzes für die Prävention, das Management und die Behandlung von Adipositas bei Kindern gefördert werden.
- Der Anteil der übergewichtigen Kinder in der Schweiz hat zugenommen. Zwischen 1960/65 und 2007 stieg die Übergewichtsprävalenz in der Gruppe der 6- bis 12/13-jährigen Kinder bei den Jungen von 5,1% auf 11,3% und bei den Mädchen von 5,4% auf 9,9%. Vorausschätzungen anhand eines nichtlinearen Regressionsmodells weisen darauf hin, dass sich der Anteil der übergewichtigen Kinder bis 2022 bei den Jungen auf 12,5% und bei den Mädchen auf 18,4% erhöhen könnte.
- Zwischen 1960/65 und 2007 stieg die Adipositasprävalenz in der Gruppe der 6- bis 12/13-jährigen Kinder bei den Jungen von praktisch 0% auf 5,4% und bei den Mädchen von 0% auf 3,2%. Gemäss Vorausschätzungen wird der Anteil der adipösen Kinder 2022 bei den Jungen 4,3% und bei den Mädchen 3,4% betragen.
- Zwischen 1960/65 und 2007 stieg die kombinierte Übergewichts- und Adipositasprävalenz in der Gruppe der 6- bis 12/13-jährigen Kinder bei den Jungen von 5,4% auf 16,8% und bei den Mädchen von 5,8% auf 13,1%. Nach Vorausschätzungen wird sich der Anteil der übergewichtigen und adipösen Kinder bis 2022 bei den Jungen auf 16,8% und bei den Mädchen auf 22,7% erhöhen.
- Die gegenwärtig verfügbaren Daten zur Übergewichts- und Adipositasprävalenz bei Kindern sind nicht ideal für genaue Prognosen. Wird ein logistisches Regressionsmodell angewandt, ist jedoch gestützt auf den beobachteten Anstieg der Übergewichts- und Adipositasprävalenz seit Anfang der Sechzigerjahre bis 2007 eine weitere Erhöhung zu erwarten. Es werden unbedingt die Resultate künftiger Erhebungen benötigt, um den vorausgesagten Anstieg der Prävalenz zu klären.
- Von 1992 bis 2007 erhöhte sich die Übergewichtsprävalenz (BMI >25) bei den 15- bis 24-jährigen Jugendlichen und jungen Erwachsenen insgesamt von 9,9% auf 11,7%, stieg bei den Männern auf 15,4% und bei den Frauen von 6,8% auf 7,7%. Vorausschätzungen zeigen, dass bis 2022 der Anteil der übergewichtigen Jugendlichen und jungen Erwachsenen mit einem BMI $\geq 25 < 30$ leicht von 9,9% (2007) auf 9,7% zurückgehen könnte, wobei bei den Männern eine leichte Zunahme von 13,6% auf 14,5% und bei den Frauen ein Anstieg von 7,7% im Jahr 2007 auf 9,3% im Jahr 2022 erwartet wird.



- Zwischen 1992 und 2002 stieg die Adipositasprävalenz bei den 15- bis 24-jährigen Jugendlichen und jungen Erwachsenen insgesamt von 0,9% auf 1,8%, erhöhte sich bei den Männern von 1,1% auf 1,8% und bei den Frauen von 0,7% auf 1,7%. Vorausschätzungen lassen erwarten, dass der Anteil der adipösen Jugendlichen und jungen Erwachsenen zwischen 2007 und 2022 stabil bei 1,7% bleiben wird, sich bei den Männern mit 1,7% im Vergleich zu 1,8% im Jahr 2007 praktisch nicht verändern wird und bei den Frauen bei 1,7% bleiben wird.
- Geht man davon aus, dass die prognostizierte Entwicklung im jüngsten Segment der übergewichtigen Erwachsenen (15-24 Jahre; BMI >25), das unmittelbar auf die Gruppe der 6- bis 12/13-jährigen Kinder folgt, durch entsprechende Ergebnisse in den künftigen Gesundheitsbefragungen (2012, 2017) erhärtet wird, lässt sich ohne Weiteres schliessen, dass der Anteil der Übergewichtigen in der Gruppe der 15- bis 24-Jährigen in der Schweiz ungeachtet der aktuellen Trendanalyse zum Kindersegment, die in diesem Bericht präsentiert wird, in den nächsten 15 Jahren seinen Höchststand erreichen wird.

Abschliessend ist festzuhalten, dass die Ungewissheit bezüglich der beobachteten und der prognostizierten Zahl von übergewichtigen und adipösen Kindern in der Schweiz für die Schweizer Gesundheitsbehörden eine grosse Herausforderung darstellt. Aufgrund ihrer Bedeutung für die öffentliche Gesundheit im Erwachsenenalter müssen die Adipositasprävalenz bei Kindern und die entsprechenden Trends unbedingt engmaschig und genau überwacht werden. Aufgrund von Beobachtungen in der jüngsten Gruppe (15-24 Jahre) der übergewichtigen Erwachsenen in der Schweiz (BMI > 25) ist es allerdings absolut möglich, dass im Segment der übergewichtigen Kinder in naher Zukunft, d. h. in den nächsten paar Jahren, der Spitzenwert erreicht oder dass dieser – im besten Fall – bereits überschritten wurde.



SYNTHÈSE

- Le présent rapport fournit des informations-clés sur le surpoids et l'obésité parmi les enfants vivant en Suisse. Elles s'appuient sur des données provenant de plusieurs enquêtes transversales. Le rapport vise à soutenir le développement d'une approche factuelle de la prévention, de la gestion et du traitement de l'obésité chez l'enfant.
- La proportion d'enfants en surpoids a notablement augmenté en Suisse. Entre 1960/65 et 2007, la prévalence du surpoids parmi les enfants âgés de 6 à 12/13 ans est passée de 5,1 % à 11,3 % pour les garçons et de 5,4 % à 9,9 % pour les filles. Des prévisions basées sur un modèle de régression non-linéaire indiquent qu'en 2022, la proportion d'enfants en surpoids pourrait passer à 12,5 % pour les garçons et à 18,4 % pour les filles.
- Entre 1960/65 et 2007, la prévalence de l'obésité parmi les enfants âgés de 6 à 12/13 ans est passée de 0 % à 5,4 % pour les garçons et de 0 % à 3,2 % pour les filles. Les prévisions montrent qu'en 2022, la proportion d'enfants obèses passera à 4,3 % pour les garçons et à 3,4 % pour les filles.
- Entre 1960/65 et 2007, la prévalence combinée du surpoids et de l'obésité parmi les enfants âgés de 6 à 12/13 ans est passée de 5,4 % à 16,8 % pour les garçons et de 5,8 % à 13,1 % pour les filles. Les prévisions montrent que d'ici 2022, la proportion d'enfants en surpoids et obèses pourrait passer à 16,8 % pour les garçons et à 22,7 % pour les filles.
- De toute évidence, les données actuellement disponibles sur la prévalence du surpoids et de l'obésité chez l'enfant ne permettent pas d'établir des prévisions précises. D'après l'augmentation de la prévalence du surpoids et de l'obésité observée du début des années soixante jusqu'à l'année dernière, on peut prévoir une poursuite de l'augmentation en s'appuyant sur un modèle de fonction logistique. Les résultats de futures enquêtes sont absolument nécessaires pour déterminer si la prévalence augmentera comme prévu.
- Entre 1992 et 2007, la prévalence de surpoids parmi les adolescents et les jeunes adultes (IMC > 25) âgés de 15 à 24 ans est passée de 9,9 % à 11,7 % pour l'ensemble de la population âgée de 15 à 24 ans, atteignant un total de 15,4 % pour les hommes et passant de 6,8 % à 7,7 % pour les femmes. Les prévisions indiquent que d'ici 2022, la proportion d'adolescents et de jeunes adultes en surpoids avec un IMC $\geq 25 < 30$ pourrait diminuer légèrement de 9,9 % (2007) à 9,7 %, augmentant légèrement de 13,6 % à 14,5 % pour les hommes et probablement de 7,7 % en 2007 à 9,3 % en 2022 pour les femmes.
- Entre 1992 et 2002, la prévalence de l'obésité parmi les adolescents et les



jeunes adultes âgés de 15 à 24 ans est passée de 0,9 % à 1,8 % au total, augmentant de 1,1 % à 1,8 % pour les hommes et de 0,7 % à 1,7 % pour les femmes. Les prévisions montrent qu'entre 2007 et 2022, la proportion d'adolescents et de jeunes adultes obèses pourrait se stabiliser à 1,7 %, demeurant pratiquement inchangée pour les hommes comparée à 2007 (1,8 %) et restant probablement à 1,7 % pour les femmes.

- En admettant que la prévision concernant l'évolution au sein du segment le plus jeune (15-24 ans), suivant immédiatement la population pédiatrique (6-12/13 ans), de la population adulte en surpoids (IMC > 25), soit confirmée par des résultats provenant d'enquêtes de santé ultérieures (2012, 2017), on peut raisonnablement conclure que le segment de la population suisse âgée de 15 à 24 ans en surpoids pourrait atteindre son niveau maximum dans les 15 prochaines années, sans tenir compte de l'analyse de la tendance actuelle du segment pédiatrique de la population suisse présentée dans ce rapport.

En conclusion, les incertitudes concernant l'augmentation du nombre d'enfants en surpoids et obèses en Suisse, qu'il s'agisse d'observations ou de prévisions, représentent un défi majeur pour les autorités suisses de la santé. Manifestement, la prévalence et les tendances en matière d'obésité chez l'enfant doivent faire l'objet d'un contrôle fréquent et minutieux en raison de leur importance pour la santé publique à l'âge adulte. Toutefois, il se pourrait tout à fait que – en se fondant sur les observations faites sur le segment le plus jeune (15-24 ans) de la population suisse adulte en surpoids (IMC >25) – le segment de la population pédiatrique en surpoids atteigne son point culminant dans un avenir proche, c.-à-d. dans les prochaines années ou que, dans le meilleur des cas, il l'ait déjà atteint.



SINTESI

- Questo rapporto presenta informazioni essenziali su sovrappeso e adiposità tra i bambini che vivono in Svizzera e si basa sui dati di alcune indagini trasversali. Esso si propone di concorrere allo sviluppo di un approccio evidence-based alla prevenzione, alla gestione e al trattamento dell'adiposità nei bambini.
- In Svizzera, la percentuale di bambini in sovrappeso è aumentata. Tra il 1960/65 e il 2007, la prevalenza del sovrappeso nei bambini di età compresa tra i 6 e i 12/13 anni è aumentata dal 5,1 % all'11,3 % nei maschi e dal 5,4 % al 9,9 % nelle femmine. Proiezioni delle previsioni, basate su un modello di regressione non lineare, indicano che nel 2022 la percentuale di bambini in sovrappeso potrebbe arrivare al 12,5 % nei maschi e al 18,4 % nelle femmine.
- Tra il 1960/65 e il 2007, la prevalenza dell'adiposità nei bambini di età compresa tra i 6 e i 12/13 anni è aumentata, in pratica, dallo 0 % al 5,4 % nei maschi e dallo 0 % al 3,2 % nelle femmine. Proiezioni delle previsioni mostrano che nel 2022 la percentuale di bambini affetti da adiposità arriverà al 4,3 % nei maschi e al 3,4 % nelle femmine.
- Tra il 1960/65 e il 2007, la prevalenza combinata di sovrappeso e adiposità nei bambini di età compresa tra i 6 e i 12/13 anni è aumentata dal 5,4 % al 16,8 % nei maschi ed è passata dal 5,7 % al 13,1 % nelle femmine. Proiezioni delle previsioni mostrano che, di qui al 2022, la percentuale di bambini in sovrappeso e affetti da adiposità potrebbe arrivare al 16,8 % nei maschi e al 22,7 % nelle femmine.
- Non c'è dubbio che i dati attualmente disponibili sulla prevalenza di sovrappeso e adiposità nei bambini non sono perfettamente idonei per la formulazione di una previsione accurata. Tuttavia, basandosi sull'incremento osservato nella prevalenza di sovrappeso e adiposità a partire dall'inizio degli anni Sessanta fino al 2007 e utilizzando un modello logistico, si può prevedere un ulteriore aumento. Per accertare la fondatezza del previsto aumento della prevalenza, occorre sicuramente attendere i risultati delle indagini future.
- Tra il 1992 e il 2007, la prevalenza del sovrappeso tra gli adolescenti e i giovani adulti (BMI >25) in età compresa tra i 15 e i 24 anni è passata dal 9,9 % all'11,7 % della popolazione complessiva di questa fascia d'età, raggiungendo una percentuale del 15,4 % tra i maschi e aumentando dal 6,8 % al 7,7 % tra le femmine. Proiezioni delle previsioni mostrano che, di qui al 2022, la percentuale di adolescenti e giovani adulti in sovrappeso con BMI $\geq 25 < 30$ potrebbe diminuire leggermente, passando dal 9,9 % (2007) al 9,7 %. È previsto un lieve aumento (dal 13,6 al 14,5 %) tra i maschi e possibile incremento (dal 7,7 % nel 2007 al 9,3 % nel 2022) tra le femmine.
- Tra il 1992 e il 2002, la prevalenza dell'adiposità tra gli adolescenti e i giovani adulti in età compresa tra i 15 e i 24 anni è cresciuta complessivamente dallo



0,9 % all'1,8 %, aumentando nel segmento maschile dall'1,1 % all'1,8 % e in quello femminile dallo 0,7 % all'1,7 %. Proiezioni delle previsioni indicano che, tra il 2007 e il 2022, la percentuale di adolescenti e giovani adulti affetti da obesità potrebbe restare stabile all'1,7 %, sostanzialmente immutata tra i maschi (dall'1,8 % del 2007 all'1,7 %) e stabile all'1,7 % tra le femmine.

- Presupponendo che l'evoluzione prevista nel segmento più giovane (15-24 anni) della popolazione adulta in sovrappeso (BMI >25), immediatamente successivo alla popolazione pediatrica (6-12/13 anni), sia convalidata da risultati simili nelle prossime Indagini sulla salute (2012, 2017), se ne potrebbe chiaramente dedurre che il segmento in sovrappeso della popolazione svizzera tra i 15 e i 24 anni potrebbe raggiungere la sua punta massima nei prossimi 15 anni. Ciò indipendentemente dall'analisi presentata in questo rapporto della tendenza effettiva esistente nel segmento pediatrico della popolazione svizzera.

Conclusione. L'incertezza a proposito sia dell'aumento osservato sia di quello previsto del numero di bambini in sovrappeso e affetti da adiposità in Svizzera rappresenta una delle sfide più importanti per le autorità sanitarie svizzere. È ovvio che la prevalenza e le tendenze dell'adiposità infantile vanno monitorate frequentemente e in modo approfondito, vista la loro importanza per la sanità pubblica con riferimento ai successivi sviluppi in età adulta. Tuttavia, è del tutto possibile affermare che, sulla base delle osservazioni svolte nel segmento più giovane (15-24 anni) della popolazione svizzera in sovrappeso (BMI >25), la punta massima nel segmento pediatrico di popolazione in sovrappeso potrebbe essere raggiunta in un vicino futuro, ossia nei prossimi anni, oppure, nell'ipotesi più favorevole, essere già stata superata.



1. INTRODUCTION

The rapid increase in overweight among children and adolescents is generating widespread concern. Obesity is related pathologically to a number of common morbid conditions (Jackson-Leach 2006). Most of these conditions are uncommon while young, but become prevalent in middle and later life. Current trends suggest that around 8% of obese 1–2-year-old children will be obese when they become adults, while 80% of children who are obese at age 10–14 will become obese adults, particularly if one their parents is also obese (Whitaker 1997). Clearly, the increasing prevalence of obesity in childhood is very likely to translate into greatly increased levels of obesity among adults, rendering them more susceptible to chronic, life-threatening illness (Jackson-Leach 2006).

Goal of the present study is

- to assess trends in the development of overweight and obesity in children in Switzerland over the past decades based on school polls and to forecast further development until 2022 also using the same modelling approach as for the adult population (see Part 1 of this report).

To tackle the obesity epidemic, prevalence trends need to be monitored continuously. This report presents available key information about the prevalence of overweight and obesity among children living in Switzerland. It is intended to support the development of an evidence-based approach to the prevention, management and treatment of obesity in children. The focus of this report is to forecast what levels of obesity in Switzerland may be existing in 2022, if current trends in overweight and obesity prevalence continue unchanged in children. An international comparison is performed to integrate the obesity findings in Swiss children into a global context.



2. METHODS

The classification of obesity in children is controversial because of difficulties originating from variation in normal patterns of growth, weight gain and changes in body composition during childhood. In this report to define overweight and obesity the 86th and 95th BMI for age CDC reference percentiles were used (Ogden 2002) since these have been validated previously in Swiss primary school children (Zimmermann 2004a).

The forecasting method in this report makes assumptions about future changes in obesity based on past patterns of change. For children aged 6 to 12 years, the data were obtained from cross sectional studies performed in 1960, 1980, 2002 and 2007 (Zimmermann 2004b). Data from the Swiss National Health Survey (1992-2007) were used to evaluate the degree of overweight and obesity in adolescents and young adults aged 15 to 24 years. The analyses were presented for overweight (BMI $\geq 25 < 30$), obese (BMI > 30) and combined (BMI > 25) for both genders.

Plots of the above mentioned data indicated that year to year changes in the prevalence of obesity were not always constant across the time period evaluated – but clearly showed overall an upward trend indicating an increase in the prevalence of childhood overweight and obesity from 1960 to 2007. However, since the type of data collections were considerably different from the first 2 longitudinal surveys (1960-65, 1980-90) compared to the last 2 studies (probability-proportionate-to-size cluster sampling) to obtain a national sample of 2500 Swiss children aged 6-13 (2002, 2007), a substantial uncertainty about the actual quality of the earlier data remains. The trends discernible have been projected forward to 2022 using a non-linear regression model approach with a 3-parameter logistic function and analysed in relation to population estimates for 2022 to forecast the number and proportion of the paediatric population estimated to be obese and overweight, if the current trend continues. The results presented show the expected proportions of Swiss children, who will be overweight and obese in 2022. The obtained rates are plotted as a nonlinear curve.

In addition, a literature review was performed to compare the prevalence development of obesity in children on an international level and to determine the possible consequences of childhood obesity for the next decade to come.



3. RESULTS

3.1 Prevalence of overweight and obesity in children in Switzerland, forecasting to 2022

The proportion of children who are overweight or obese has clearly increased since 1980 in Switzerland.

Population of boys

For boys, the levels of overweight rose from 4.7% in 1960/65 to 11.3% in 2007 (see Table 1). The obese segment increased from basically zero (0.3%) to 5.4%, whereas the combined population of overweight or obese boys rose from 5.4% in the sixties to 16.8% by 2007.

Table 1: Prevalence overweight/obese boys aged 6-12/13 years using the CDC BMI reference criteria (Ogden *et al.*, 2002)

Year	overweight	obese	ow + ob	Reference
1960-65	5.1	0.3	5.4	Zimmermann 2004
1980-90	3.9	0.8	4.7	Zimmermann 2004
2002	12.5	7.4	19.9	Zimmermann 2004
2007	11.3	5.4	16.8	Aeberli 2008; Diss.ETH No. 17791



Figure 1: Estimated prevalence of overweight/obesity in boys aged 6-12/13 years: Expected development of overweight and obesity based on the prevalence from 1960 to 2007

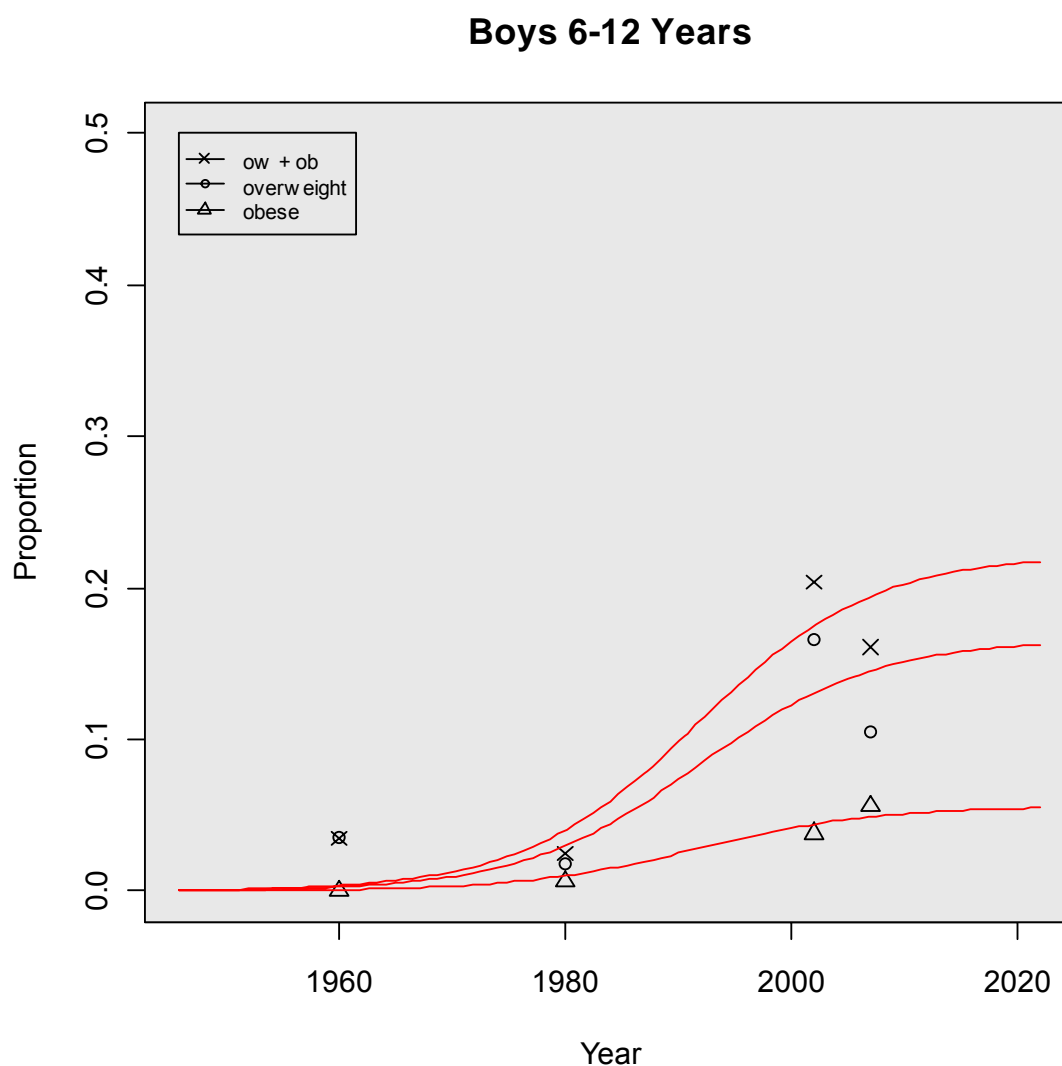


Figure 1 presents the non-linear trend in overweight boys aged 6 to 12 resp. 13 years in Switzerland from 1960 to 2022. This forecast projection shows that for the year 2022, no increase in the proportion of boys who are overweight or obese may be expected remaining relatively stable at around 21% compared to 16.8% in 2007. In the overweight segment alone, there may occur an increase from 11.3% in 2007 to about 15% or slightly higher in 2022, whereas the obese segment may show as slight decrease from 5.4% in 2007 to around 5% or below in 2022.



Population of girls

For girls aged 6-12/13 years, the level of overweight girls rose from 5.4% in 1960/65 to 9.9% in 2007 (see Table 2). The obese segment of the girls increased from basically nonexistent (0.4%) to 3.2%, whereas the combined population of overweight or obese girls rose from 5.8% in the sixties to 13.1% by 2007.

Table 2: Prevalence (%) overweight/obese girls aged 6-12/13 years using the CDC BMI reference criteria (Ogden *et al.*, 2002)

Year	overweight	obese	ow + ob	Reference
1960-65	5.4	0.4	5.8	Zimmermann 2004
1980-90	2.6	0.5	3.1	Zimmermann 2004
2002	13.2	5.7	18.9	Zimmermann 2004
2007	9.9	3.2	13.1	Aeberli 2008; Diss.ETH No. 17791



Figure 2: Estimated prevalence of overweight/obesity in girls aged 6-12/13 years: Expected development of overweight and obesity based on the prevalence from 1960 to 2007

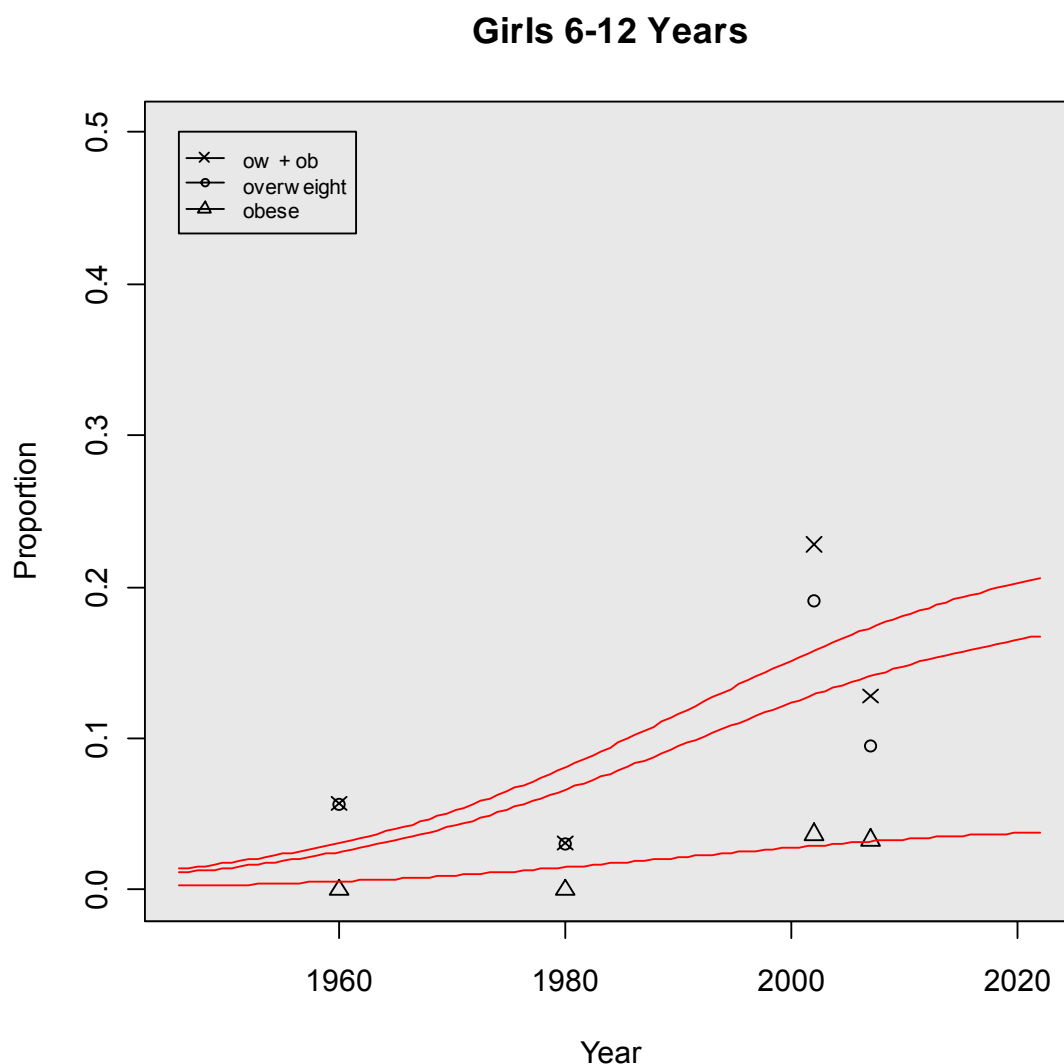


Figure 2 presents the non-linear trend in overweight girls aged 6 to 12 resp. 13 years in Switzerland from 1960 to 2022. This forecast projection shows that for the year 2022, an increase in the proportion of girls who are overweight or obese may be expected from 13.1% in 2007 to about 19% in 2022. This increase may be almost entirely assigned to the overweight segment alone as this segment is projected to increase by approx. 5% from 9.9% in 2007 to about 15% in 2022. The obese segment, however, may remain stable at around 3-4% until 2022 compared to 3.2% in 2007.



3.2 Prevalence of overweight and obesity in adolescents and young adults from 1992 to 2007, forecasting to 2022

The actual development of the prevalence of overweight and obesity in children precedes development in the youngest segment of the adult Swiss population, i.e. the age group between 15 and 24 years, and is indicative for the trend in future development on the entire overweight segment of the Swiss population. For this reason did we analyse this population segment, age 15-24, separately and according to gender.

Male population: age 15 – 24

Table 3 Data input, prevalence overweight and obesity in the age group 15-24 years of the Swiss male population in the years 1992, 1997, 2002 and 2007

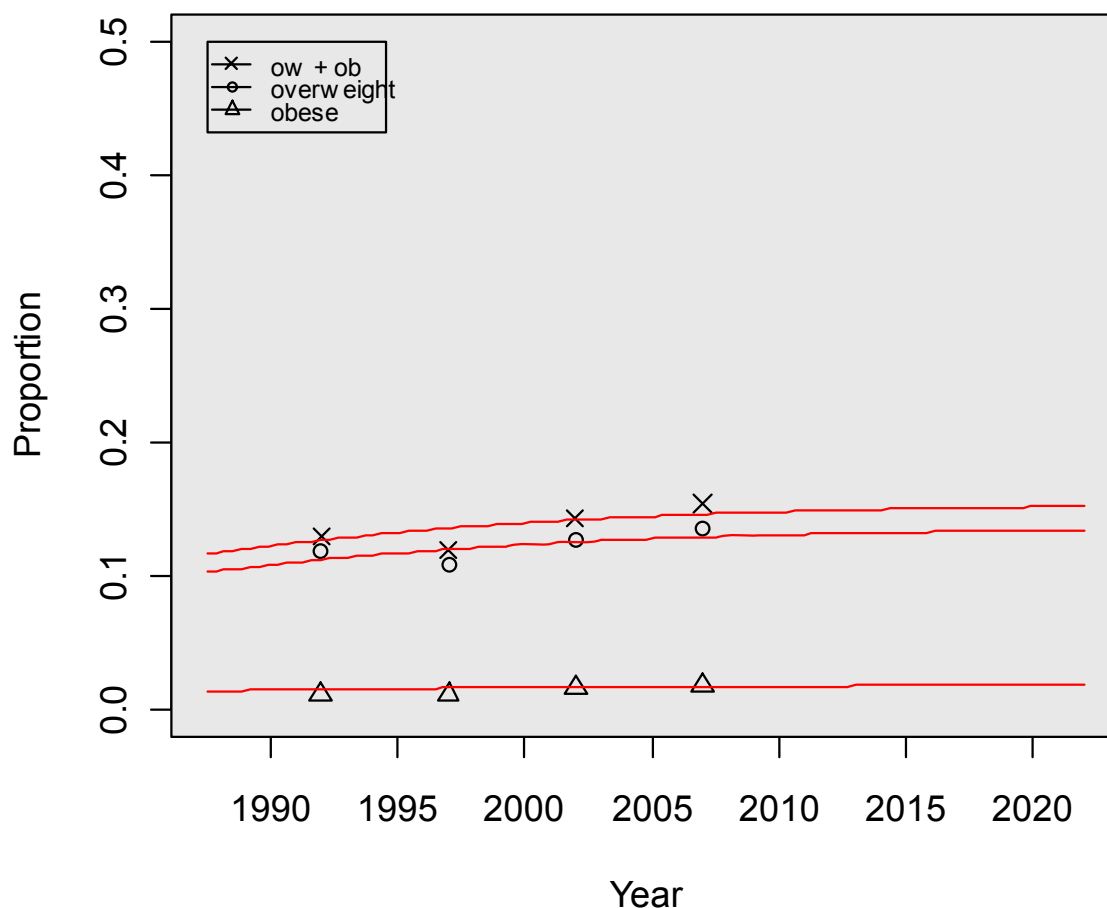
Schweizerische Gesundheitsbefragungen 1992- 2007							
<i>Bundesamt für Statistik, personal communication 27. October 2008</i>							
men, age 15-24							
year	count	BMI 25-30 %	count	BMI >30 %	count	BMI >25	total
1992	432 646	11.8	51'052	1.1	4'759	12.9	55'811
1997	406 866	10.8	43'942	1.1	4'476	11.9	48'417
2002	430 144	12.7	54'628	1.6	6'882	14.3	61'511
2007	486 648	13.6	66'184	1.8	8'760	15.4	74'944

In Table 3 and Figure 3 the prevalence rates in the years 1992, 1997, 2002 and 2007 and the expected development from 2007 to 2022 for overweight males between 15 and 24 years of age are shown. The prevalence rate increased by 2.5% between 1992 and 1997 reaching a total of 15.4% of the total male population. The corresponding increase in the proportion of overweight males, age 15-24, with BMI 25-30 amounted to 1.8% (from 11.8% to 13.6% of the total male population) and the obese male population grew by 0.7% (from 1.1% to 1.8%).



Figure 3: Expected development of overweight and obesity in the adult male Swiss population (age 15-24) based on the prevalence from 1992 to 2007

Males 15-24 Years



Projection of the development until 2022 shows an anticipated prevalence of 16.2% in the adult male Swiss population, 15-24 years of age, with BMI >25 indicating a 0.8% increase in prevalence compared to 2007 (15.4%). There is a prevalence of 14.5% expected in 2022 in the male population segment with BMI ≥25 to <30 (up by 0.9% from 13.6% in 2007), whereas the prevalence in the obese male population segment (BMI >30) is expected to remain basically unchanged at 1.7%, compared to 1.8% in 2007. Assuming, this projected development in the youngest segment (15-24 years) of the overweight population (BMI >25) is corroborated by corresponding findings in the upcoming 3 health surveys (2012, 2017, 2022), it may safely be concluded that the overweight segment of the Swiss male population aged 15-24 will approach its maximum in the next 15 years.



Female population: age 15 – 24

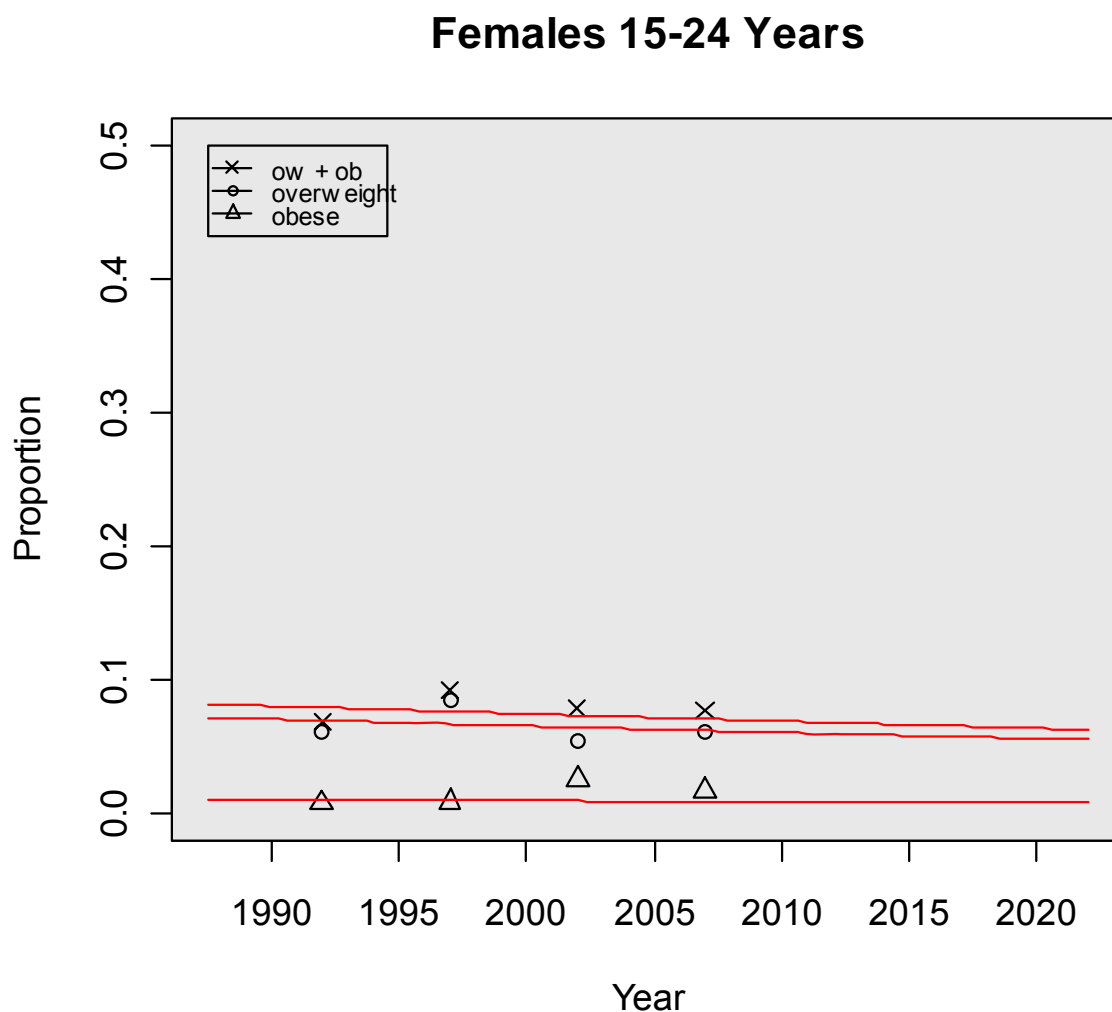
Table 4 Data input, prevalence overweight and obesity in the age group 15-24 years of the Swiss female population in the years 1992, 1997, 2002 and 2007

Schweizerische Gesundheitsbefragungen 1992- 2007							
<i>Bundesamt für Statistik, personal communication 27. October 2008</i>							
women, age 15-24							
year	BMI 25-30		BMI >30		BMI >25		total
	count	%	count	%	count	%	
1992	423 107	6.1	25'810	0.7	2'962	6.8	28'771
1997	400 874	8.4	33'673	0.8	3'207	9.2	36'880
2002	414 663	5.4	22'392	2.5	10'367	7.9	32'758
2007	458 298	6.0	27'498	1.7	7'791	7.7	35'289

Table 4 and Figure 4 depicts the evolvement of the BMI situation in the youngest adult female segment, aged 15 – 24, of the Swiss population. As shown, the female overweight population (BMI >25), aged 15-24, increased by 1.1 % from an absolute value of 6.8% in 1992 to 7.7% in 2007. Compared to the male overweight segment, aged 15-24, of the Swiss population, the corresponding female overweight segment was about 50% smaller(14.1% vs. 7.7%) in 2007 although the relative increase from 1992 to 2007 was only slightly lower between women and men (1.1% vs. 1.7%). The corresponding proportion of overweight females with BMI 25-30 decreased by 0.1% (from 6.1% to 6.0% of the total female population) whereas the obese female population grew by 1.0% (from 0.7% to 1.7%).



Figure 4: Expected development of overweight and obesity in the adult female Swiss population (age 15-24) based on the prevalence from 1992 to 2007



Anticipation of the further development until 2022 shows a potential prevalence of 9.3% (up 1.6% from 7.7% in 2007) in the adult female Swiss population, age 15-24, with BMI >25 indicating a small increase. There is an equivalent small increase expected until 2022 (from 6.0% in 2007 to 7.6% in 2022) in the youngest female population segment with BMI $\geq 25 < 30$ whereas the prevalence in the corresponding obese population segment (BMI >30) is anticipated to remain stable at 1.7% until 2022. If this projected development in the overweight female population (BMI >25) is confirmed by corresponding prevalence numbers in the upcoming 3 health surveys in 2012, 2017 and 2022, it appears likely that also the female overweight segment of the Swiss population will reached a plateau in the 15 years until 2022.



Entire population: age group 15 – 24

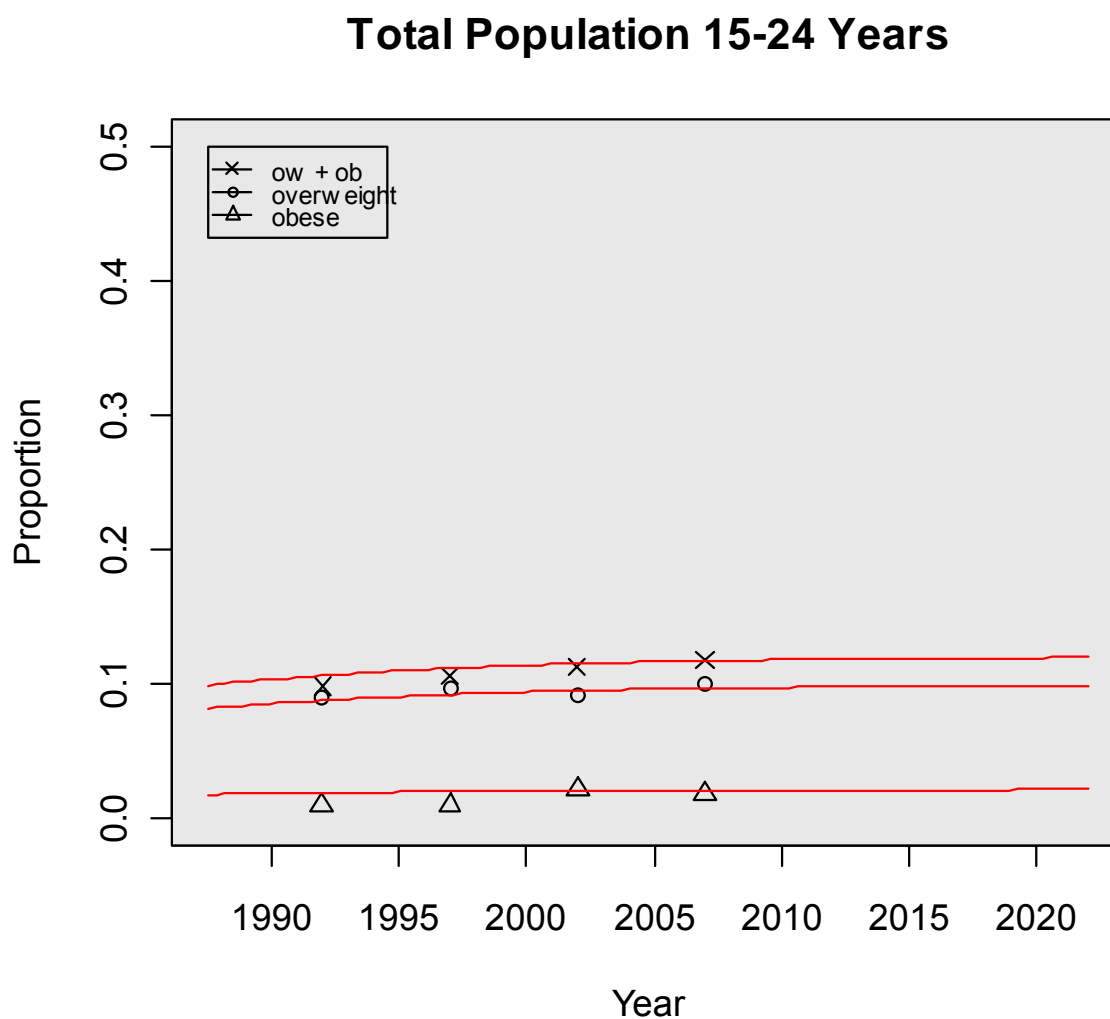
Table 5 Data input, prevalence overweight and obesity in the age group 15-24 years of the entire Swiss population in the years 1992, 1997, 2002 and 2007

Schweizerische Gesundheitsbefragungen 1992- 2007							
<i>Bundesamt für Statistik, personal communication 27.October 2008</i>							
total population, age 15-24							
	BMI 25-30		BMI >30		BMI >25		total
year	count	%	count	%	count		
1992	855 752	8.9	76'162	0.9	7'702	9.8	83'864
1997	807 739	9.6	77'543	0.9	7'270	10.5	84'813
2002	844 807	9.1	76'877	2.1	17'741	11.2	94'618
2007	944 947	9.9	93'550	1.8	17'009	11.7	110'559

In Table 5 and Figure 5 the prevalence rates in the years 1992, 1997, 2002 and 2007 and the expected development from 2007 to 2022 for overweight individuals between 15 and 24 years of age are depicted. As shown, the overweight population (BMI >25) in the age segment 15-24 increased by 1.8 % from an absolute value of 9.9% in 1992 to 11.7% in 2007. The corresponding increase in the proportion of overweight individuals with BMI 25-30 amounted to 1% (from 8.9% to 9.9% of the entire population) and the obese population grew by 0.9% (from 0.9% to 1.8%).



Figure 5: Expected development of overweight and obesity in the adult Swiss population (age 15-24) based on the prevalence from 1992 to 2007



Projection of the assumed prevalence in 2022 based on the prevalence data from 1992 to 2007 shows a small increase to 12.8% (from 11.7% in 2007) in the adult Swiss population, 15-24 years of age, with BMI >25. Similarly, there is a slight prevalence increase expected until 2022 in the population segment with BMI ≥25 to <30, 11.1% compared to 9.9% in 2007, and the one in the obese population segment (BMI >30) may remain stable at 1.7% (1.8% in 2007). Assuming, this projected development in the youngest segment (15-24 years) of the overweight population (BMI >25) is confirmed by corresponding findings in the upcoming 3 health surveys (2012, 2017, 2022), it may be concluded that the total overweight segment of the Swiss population may indeed reach a maximum in the coming 15 years.



3.3 Prevalence of overweight and obesity in children – an international comparison

In Europe, among children of primary school age, the highest prevalence of overweight was found in Spain (6–9 years, 35.2%) (Serra Majem 2003, Aranceta-Batrina 2005) and Portugal (7–9 years, 31.5%) (Padez 2004); the lowest was found in Slovakia (7–9 years, 15.2%) (Novakova 2006), France (7–9 years, 18.1%) (Rolland-Cachera 2002), Switzerland (6–9 years, 18.3%) (Zimmermann 2002) and Iceland (9 years, 18.5%) (Arnardóttir 2005). National surveys based on self-reported weight and height found a prevalence of overweight for both genders of 20.3% in Belgium (5–9 years) (Bayingana 2006), 19.5% in Sweden (8 years) (Becker 2004), 18.5% in Norway (8–9 years) (Andersen 2005) and 14.5 % in the Netherlands (2–9 years) (HSN 2006). The Pro Children study (Yngve 2005) showed that more boys (17.0%) than girls (14.3%) were overweight. Prevalence was highest in Portugal (boys: 27.1%; girls: 22.1%), Spain (boys: 21.3%; girls: 20.2%) and Austria (boys: 19.9%; girls: 15.3%), and lowest in Belgium (boys: 9.4%; girls: 10.9%), the Netherlands (boys: 11.6%; girls: 8.6%) and Denmark (boys: 12.5%; girls: 10.3%). For adolescents, the few studies that collected national representative BMI data (based on measured height and weight) showed the highest prevalence of overweight in Irish girls (27.3%, 9–12 years) (O'Neill 2006) and in Spanish boys (31.7%, 10–17 years) (Serra Majem 2003, Aranceta-Batrina 2005). The lowest prevalence of overweight adolescents was in the Czech Republic (9.0%, both sexes 14–17 years) (Lobstein 2003).

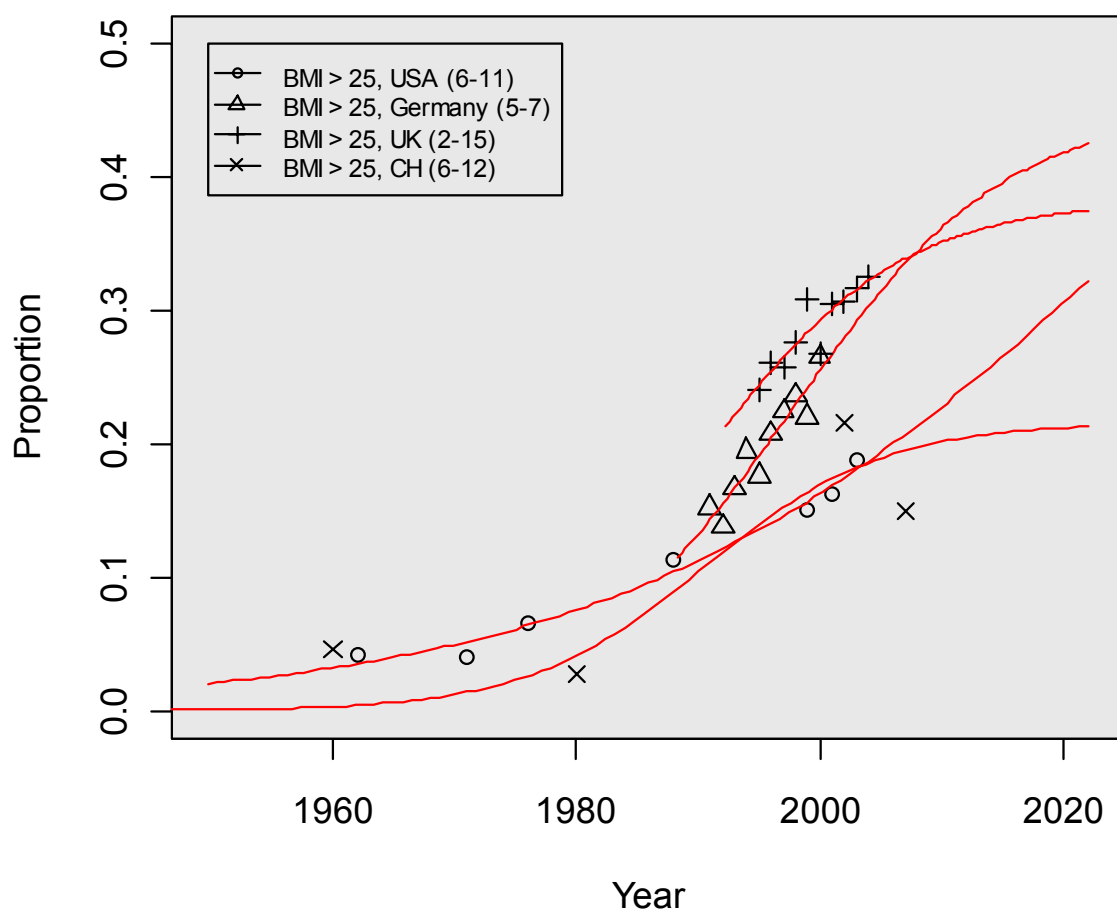
An international survey in school-aged children survey shows the prevalence of pre-obesity and obesity in the 13- and 15-year-olds. It indicated that, among 13-year-olds, up to 34% of boys and 24% of girls were overweight; among 15-year-olds, the corresponding figures were 28% and 31%, respectively. Up to 9% of both 13- and 15-year-old boys were obese, as were 5% of both 13- and 15-year-old girls (Currie 2004).

In Figure 6 the trend of the prevalence development of overweight and obesity in Switzerland (Zimmermann 2004) is compared to the one of the United Kingdom (National Health Survey), United States (Ogden 2006), Germany (Apfelbacher 2008) and Sweden (Holmbäck 2006) using the same model as in the above described prevalence projections. The graph shows increasing trends in overweight and obese children in all countries that followed prevalence development in paediatric overweight and obesity, but indicates levelling off in the coming decades in all countries but the US.



Figure 6: International comparison of the prevalence of overweight and obesity in children

Overweight and Obesity in Children - International



3.4 Health consequences of childhood obesity

Childhood overweight and obesity is receiving special attention lately, as overweight and obese children are likely to be obese into adulthood (Freedman 2005) and to have co-morbidities (Guo 2000) at a younger age. Obese children increase in the prevalence of childhood obesity, the health consequences are likely to be underestimated. For most co-morbidities resulting from obesity, the risks depend partly on the age of onset and duration of obesity. Obese children suffer from both short-term and long-term health consequences. Overweight and obesity are major risk factors for chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension, osteoporosis, and some cancers. Some children may develop sleep apnea, mature early, have increased LDL cholesterol, and run the risk of liver and gall bladder diseases (Dietz 2005).

Asthma – The risk of new-onset asthma is higher among children who are overweight, with boys having an increased risk in comparison with girls. Paradoxically, the effect is greater in nonallergic children (Gilliland 2003). One study of children with asthma found that obese children used more medicine, wheezed more, and made more visits to emergency rooms than their nonobese peers (Belamarich 2000).

Type 2 diabetes and cardiovascular risk – Impaired glucose tolerance is highly prevalent among children and adolescents with severe obesity, irrespective of ethnic group (Sinha 2002, Haines 2007). Studies link obesity in youth to an increase in type 2 diabetes, which can lead to blindness, heart disease, kidney disease, and loss of limbs (Pinhas-Hamiel 1996, Freedman 1999).

Previous research (Cook 2003) showed that 4% of adolescents and nearly 30% of overweight adolescents in the United States met the criteria for the metabolic syndrome. This has important implications for their future risk of type 2 diabetes and cardiovascular diseases. In addition, obese adolescents also have an increased risk of hepatic steatosis, gallstones, hypertension, sleep apnoea and orthopaedic complications. Very few studies have examined the long term effects, but results from these studies suggest that they are similar to those in obese adults (Quesenberry 1998). Also, fatty liver disease has long been recognized as a feature of childhood obesity, and the presence of fatty fibrosis in liver tissue appears to be linked to the duration of obesity, rather than the extent (Kinugasa 1984).

Table 6 shows an estimate of the number of children likely to be affected by several metabolic effects of obesity in the 25 countries belonging to the European Union in 2004 (Lobstein 2006). This indicates the worrisome risk of co-morbidities to which children are exposed as a result of excess body weight.



Table 6: Estimated number of children aged 5.0 to 17.9 years with obesity-related disease indicators in the EU, 2006

Indicator	Obese children Lowest likely prevalence (%)	Lowest likely number affected (millions)
Raised triglycerides	21.5	1.09
Raised total cholesterol	22.1	1.12
High LDL cholesterol	18.9	0.96
Low HDL cholesterol	18.7	0.95
Hypertension	21.8	1.11
Impaired glucose tolerance	8.4	0.42
Hyperinsulinaemia	33.9	1.72
Type 2 diabetes	0.5	0.027
Metabolic syndrome (3 indicators)*	23.9	1.21
Metabolic syndrome (4 indicators)**	4.6	0.13
Hepatic steatosis	27.9	1.42
Elevated aminotransferase	12.8	0.65

*Metabolic syndrome was defined as having a number of the following indicators: hypertension, central adiposity, raised HDL cholesterol, raised blood tryglicerides, raised blood glucose levels

**The age range is 10.0-17.9 years

The diagnosis of the metabolic syndrome in a young patient might appear to hold promise for enhanced prevention of diabetes and cardiovascular disease. Substantial uncertainties remain, however, about the clinical definition of the syndrome and whether risk factor clusters collectively indicate a discrete, unifying disorder. Most importantly, it is unclear whether diagnosing the syndrome will confer benefit beyond risk assessments or strategies associated with diagnosing and treating the syndrome's component traits (Meigs 2003).

Sleep apnea – Obstructive sleep apnea is a breathing disorder characterized by episodes of stopped breathing during sleep. Loud snoring, mouth breathing, frequent awakening, daytime sleepiness, and hyperactive behavior in children are all indicators of possible obstructive sleep apnea (Erler 2004). Consequences of untreated obstructive sleep apnea include failure to thrive, bedwetting, attention-deficit disorder, behavior problems, poor academic performance, and cardiopulmonary disease (Chan 2004). Studies suggest that obstructive sleep apnea occurs in approximately 17% of obese children and adolescents, and that many of these children are academically compromised as a result (Slyper 1998).

Psychosocial consequences – Certain children and young people are at risk of developing serious psychosocial burdens related to being overweight in a society that stigmatizes this condition. The likelihood of a severely obese child or adolescent having impaired, health-related quality of life was 5.5 times greater than a healthy child or adolescent, and similar to a child diagnosed as having cancer (Schwimmer



2003). Overweight children and youth with decreased levels of self-esteem reported increased rates of loneliness, sadness, and nervousness, and were more likely to smoke and consume alcohol (Strauss 2000). Overweight adolescents are more likely to be socially isolated and to be peripheral to social networks than normal-weight adolescents (Strauss 2003). Adolescent boys and girls who experience teasing from two sources (such as family and peers) have a higher prevalence of emotional health problems (Eisenberg 2003).



4. DISCUSSION

The rapid increase in the number of overweight and obese children in Switzerland is a major challenge. Trends in childhood obesity need to be closely monitored because of their public health importance. Rates of obesity and overweight in children have increased sharply in Switzerland since 1980s and according to our trend analysis are projected to continue to rise until 2022. In 2022, it is predicted that around 17% of boys and 23% of girls aged 6 to 12/13 years will be overweight or obese in Switzerland. The trends that we report for Switzerland are consistent with findings in other European countries: the annual increase in the prevalence of childhood obesity rose from below 0.1% per year in the 1980s to 0.3% per year in the late 1990s. By 2010, it is expected that 1 in 10 school children will be obese in Europe (Jackson-Leach 2006). In the UK the percentage of overweight children increased from 8% in 1974 to 20% in 2003 (Stamatakis 2005). In various regions of Spain, the prevalence of overweight in adolescents aged 13 to 14 years more than doubled from 1985 to 2002 (Moreno 2005). IOTF predicts that about 38% of school-age children in the WHO European Region will be overweight by 2010 and that more than a quarter of them will be obese (Wang 2006). This reinforces the epidemic of obesity observed in adults and creates a growing health challenge for the next generation.

In 2022, based on our nonlinear regression approach, it is possible that around 13% of boys and around 28% of girls aged 6 to 12/13 years will be overweight and around 4% of boys respectively 3% of girls will be obese in Switzerland. These projected figures indicate a rise in overweight and a stable level of obesity among children from 2007 onwards. It is notable that projected figures show a greater trend towards increase among girls than boys. An increasing trend in overweight is also observed in adolescents and young adults (age 15-24), whereas the obesity prevalence appears to remain stable over the coming 15 years until 2022. The differences in overweight prevalence trends between children and adolescents/young adults may partially be explained by the different methodologies used to determine obesity. Different growth patterns among boys and girls at each age mean that a universal categorization cannot be used to define childhood obesity as with adults. This report uses the CDC percentile classification to describe childhood overweight and obesity and BMI classification for adults i.e. BMI between 25 kg/m² and 30 kg/m² for overweight and BMI over 30 kg/m² for obese.

Predictions of overweight and obesity in 2022 were produced by applying a non-linear regression using a 3-parameter function to the obesity and overweight prevalence data in children between 1960/65 and 2007 and extrapolating this forward to 2022. This approach was selected as the best non-linear curve to be applied to the available overweight and obesity data for both, Swiss children and adults. Sensitivity analysis used the linear and polynomial curve. However, caution needs to be applied when interpreting these figures since data from only four surveys were available. The first two surveys were regional longitudinal studies in a small number of children allowing



only limited comparison to the later two national samples described as representative samples for Swiss children aged 6-13 (Aeberli 2008; Diss.ETH No. 17791). In addition, based on the results of the latter two surveys, it may be speculated about that the peak in children overweight and obesity may already have been passed (Aeberli 2008; Diss.ETH No. 17791). Such a conclusion, based on two surveys only, is not justified at present and results from further surveys are required to obtain a better sense of direction. With these limitations in the presently available background data in mind, it is extremely difficult to predict precise trends over the coming years. Nevertheless, the projections presented in our analysis indicate a continued increase in number of overweight and obese children in Switzerland that it is worth taking into consideration.

Interestingly, the projected development in the youngest segment (15-24 years) of the adult overweight population (BMI >25) to 2022 based on the prevalence data from 1992 to 2007 shows a small increase to 12.8% (from 11.7% in 2007). Similarly, there is a slight increase in prevalence expected until 2022 in the population segment with BMI \geq 25 to <30, to 11.1% compared to 9.9% in 2007, and the prevalence in the obese population segment (BMI >30) may remain stable at 1.7% (1.8% in 2007). If this trend is confirmed by corresponding findings in the upcoming 3 health surveys (2012, 2017, 2022), it may be concluded that the total overweight segment of the Swiss population may indeed reach its maximum in the coming 15 years. Similar projections were estimated for the male as well as the female segment of the 15-24 year old adult overweight population. Thus, under best circumstances, it appears possible that – based on the above observations in the youngest segment (15-24 years) of the overweight adult population (BMI >25) and the observations of Aeberli et al (Aeberli 2008; Diss.ETH No. 17791) – the peak level in the paediatric overweight segment of the Swiss population may be reached in the near future or, may have been passed already.

The observed increase in the prevalence of childhood overweight and obesity and its resultant co-morbidities is associated with significant health and financial burdens in the future and warrants strong and effective efforts regarding prevention. The prevention of weight gain offers the most effective means of controlling obesity among children and reducing the risk of complications associated with obesity. Decreasing physical activity and increasing sedentary behaviours are likely to be main forces driving the obesity epidemic (Lean 2006). Good nutrition and physical exercise in childhood can minimize health complications in later life and optimal approaches need to combine both dietary and physical activity interventions. The approach in managing obesity in childhood is highly individualized. Dietary and exercise management with the aim of reducing energy intake and increasing energy expenditure, can lead to long-term successful treatment for childhood obesity (Ebbeling 2002). In Switzerland, a decrease in sports practice was reported in adolescents during the last decade (Suris 2006).



Parents play an important role in ensuring that their children are eating sensibly and getting enough exercise. Keeping children healthy and active can be achieved through a balanced diet and regular physical activity. Together with parents and families, health professionals, schools, food companies, the community, and local governments have an important role in providing opportunities for children to stay healthy and active, and in fighting the obesity epidemic.



5. SUGGESTIONS / RECOMMENDATIONS

To be effective, strategies and interventions to counter childhood overweight and obesity need to be monitored and modelling is needed to predict the future demand for health services, including paediatric services and the costs of obesity affecting economic output.

Researchers, clinicians and government organizations in Switzerland need to gain a better understanding of the social and environmental contexts in which childhood obesity remains an ongoing problem and develop more efficacious methods regarding prevention and treatment of overweight and obesity in early childhood.

This report highlights the current situation with regard to childhood obesity in Switzerland and the impact this may have on children's current and future health. The high and eventually still increasing (projected) prevalence of excess body weight and obesity in children emphasises the need for comprehensive strategies to address the main driving forces of this health burden, including nutrition, physical activity and especially lifestyle. Action is needed at different levels: regional and international frameworks, social policies and national legislation, organizational and commercial practices, planning controls and regional strategies, community and cultural traditions, school and work practices and peer influence, family habits and choices, and individual action in order to achieve a reduction in childhood overweight and obesity in the next decades.



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